Assam down town University

Curriculum and Syllabus

Bachelor of Technology
in
Computer Science and Engineering

OUTCOME BASED EDUCATION FRAMEWORK
CHOICE BASED CREDIT SYSTEM
Version: 2.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Assam down town University
Guwahati-26
Panikhaiti

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, Dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators.

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

Programme Overview (not more than 100 words)

Bachelor of Technology in Computer Science and Engineering is an Under Graduate Degree awarded for the programme of Computer Science and Engineering. As one of the best computer engineering colleges, we intend to create a cohesive learning experience with the latest technological developments to that of industry demand.

I. Specific Features of the Curriculum

The B. Tech CSE curriculum, guided by the outlined Program Specific Outcomes (PSOs), emphasizes a comprehensive educational framework. It prepares students for competitive exams through updated and focused syllabi. It integrates advanced research principles with sustainable technology applications, ensuring graduates possess the necessary engineering and management skills for societal impact. The curriculum fosters effective communication, teamwork, and project management in multidisciplinary settings. Additionally, it incorporates contemporary industrial and research trends, encouraging innovation and entrepreneurial proficiency. This holistic approach equips students to develop novel software engineering solutions, addressing real-world problems with cutting-edge techniques and strategies.

II. Eligibility Criteria:

Minimum 45% with English, Physics & Mathematics in HS.

III. Program Educational Objectives (PEOs):

PEO 1: To produce graduates who have strong foundation of knowledge and skills in the field of Computer Science and Engineering.

PEO 2: To produce graduates who can provide solutions to challenging problems in their profession by applying Computer Engineering theory and practices.

PEO 3: To produce graduates who are employable in industries/public sector/research organizations or work as an entrepreneur, as well as can provide leadership and are effective in multidisciplinary environment.

IV. Program Specific Outcomes (PSOs):

PSO 1: Educational Advancement

Graduates will be prepared for state, national and international competitive examinations with

focused and updated syllabi.

PSO 2: Advanced Research

Graduates will have a holistic comprehension of engineering and management principles required for application of sustainable technologies for societal development, and also will be able to communicate effectively in oral, written, visual and graphic modes as a member and leader in a team, to manage projects in multidisciplinary environments.

PSO 3: Entrepreneurial Proficiency

Graduates will be acquainted with the contemporary trends in industrial/research environments and also will capable of innovating novel solutions to prevailing problems by applying software engineering techniques and strategies.

V. Program Outcome: (8-12)

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VI. Total Credits to be Earned:

The total credit to be earned is 176

VII. Career Prospects:

A B. Tech in Computer Science and Engineering (CSE) offers diverse and promising career prospects. Graduates can pursue roles such as software developers, data scientists, cybersecurity analysts, and AI/ML engineers in top tech firms. They are well-suited for positions in research and development, working on cutting-edge technologies. The curriculum also prepares them for competitive exams, enabling careers in public sector and government organizations. Additionally, the strong emphasis on entrepreneurial skills allows graduates to innovate and launch their own start-ups. With rapid advancements in technology, CSE graduates remain in high demand across various industries, ensuring robust career opportunities.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

A. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination)*	30
2.	In-Sem Exam – II (ISE-II) (Written Examination)*	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in the any of the component without any valid reason he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absent.

2. The report of evaluation of an activity towards the in-semester (sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

B. SEMESTER END EXAMINATION:

Time table for end semester examination is published at least 25 days prior to the start of Examination.

I. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

II. Admit Card:

Admit card for the examination may be downloaded through ERP where the system will generate a Unique ID Cards through online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

III. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.
Table

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.
3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyse	Classify, outline, categorize, analyze, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on basis of **all 6 knowledge levels.**

The format of the question paper across all the program follow a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl no	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

IV. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

V. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

VI. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the centre may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the exam with new answer sheet or may expel the student from appearing the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribe expulsion form. The student may not be allowed to write that examination.

VII. Instruction to the Students:

(i) The students shall not bring to the Examination Hall, any electronic gadget used as a means of communication or record except electronic calculator, if required.

(ii) The students shall not receive any book or printed or hand written or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

VIII. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

C. Credit Point:

It is the product of grade point and number of credits for a course, thus, CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades 'O' to 'P' shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in Table 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrolment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrolment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the ith completed Course and Ci is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

D. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a University appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or viva voce and wish to appear again may apply to be evaluated can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. Student- centric / Constructivist Approach:

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centric classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programme the student has to undergo project-based learning at least 4 months duration. This approach will help the student to think critically, evaluate, analyze, make decisions, collaborate, and more.

b. Inquiry-Based Learning: The teacher/ students are supposed to list at least five questions in each contact hour and student solve these question or search for answer which becomes the home work for the students "question-driven" learning approach. The teacher may look for the correctness of the solution or the best possible answer and discuss in the successive class. This will help in the preparation for various competitive examination and develop a habit for search for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watchvideo or lecture prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are more passive to an approach where students are active participants. As a result, this approach is also a student- centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

The teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework

Breakdown of Credits

Category	Total credits
University Core (UC)	13
University Elective (UE)	18
Program Core (PC)	114
Program Elective (PE)	24
Faculty Elective (FE)	7
	176

Breakdown by category of courses:

Sl. No	Category	Credits	%
1	Science	22	13.10%
2	Engineering	119	70.83%
3	Commerce and Management	35	20.83%
Total		176	100%

B.Tech CSE Curriculum 2022-26

	Sl. No	Course Title	Course Code	Category	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	Total Marks
Semester I	1	Engineering Mathematics I	22BTCS111R	DSC (Minor) / PC	4	3	1	0	0	0	0	40	60	0	100
	2	Introduction to Basic Mathematics, Logic and Coding	22BTCS112R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	3	Engineering Physics	22BTCS113R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	4	Basic Electrical Engineering	22BTCS114R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	5	Workshop Manufacturing Practices	22BTCS115R	DSC (Minor) / PC	3	1	0	4	0	0	0	40	60	100	200
	6	Introductory English for Engineers	22UBPD114R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	7	Extra-Curricular Activity	22UBEC111	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
					22	**32**	**14**	**18**	**18**	**4**	**0**	**200**	**500**	**900**	**1700**

	Sl. No	Course Title	Course Code	Category I	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	Total Marks
Semester II	1	Engineering Mathematics II	22BTCS121R	DSC(Minor) / PC	4	3	1	0	0	0	0	40	60	0	100
	2	Engineering Chemistry	22BTCS122R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	3	Programming for Problem Solving	22BTCS123R	DSC (Minor) / PC	4	3	0	2	0	0	0	40	60	100	200
	4	Engineering Graphics and Design	22BTCS124R	DSC (Minor) / PC	3	1	0	4	0	0	0	40	60	100	200
	5	Techno Profession	22BTCS125R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100

		al Skills I													
	6	Effective English for Engineers	22UBPD124R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	7	MOOCS I : Enhancing Study Skills	22MOSY124R	AEC / CBCS / FE	1	0	0	0	0	0	0	0	0	100	100
	8	Universal human values and Professional Ethics	22UUHV101R	VAC / UC	2	1	0	2	0	0	0	40	60	0	100
	9	Computational Systems and Digital World	22UCDL103R	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	10	Co-Curricular	22UBCC121	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	Extra-Curricular	22UBEC121	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
					24	**10**	**2**	**18**	**8**	**0**	**0**	**200**	**300**	**900**	**1400**

	Sl.No	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**Total Marks**
Semester III	1	Analog Electronic Circuits	22BTCS211R	DSC (Minor) / PC	4	3	0	2	0	0	0	40	60	100	200
	2	Digital Electronic Circuits	22BTCS212R	DSC (Minor) / PC	3	2	0	2	0	0	0	40	60	100	200
	3	Data Structure & Algorithms	22BTCS213R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	4	Biology for Engineers	22BTCS214R	DSC (Minor) / PC	2	2	0	0	0	0	0	40	60	0	100
	5	Mathematics III (Differential Calculus)	22BTCS215R	DSC (Minor) / PC	2	2	0	0	0	0	0	40	60	0	100
	6	Techno Professional Skills II	22BTCS216R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Basic Life Saving Skills	22UULS212R	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	8	Personal Financial Planning	22UUFL213R	MDC / UE	1	0	0	2	0	0	0	0	0	100	100
	9	English for Employabilit	22UBPD214R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100

		y for Engineers													
	10	MOOCS II	2MOCECS217R	MDC / FE	1	0	0	0	0	0	0	0	0	100	100
	11	Co-Curricular	22UBCC211	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	12	Extra-Curricular	22UBEC211	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
					23	**12**	**0**	**16**	**8**	**0**	**0**	**200**	**300**	**1000**	**1500**

	Sl. No	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**Total Marks**
Semester IV	1	Computer Organization & Architecture	22BTCS221R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	Operating Systems	22BTCS222R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	Design & Analysis of Algorithms	22BTCS223R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	Discrete Mathematics	22BTCS224R	DSC (Minor) / PC	4	3	1	0	0	0	0	40	60	0	100
	5	Environmental Science	22BTCS226R	VAC / UE	2	2	0	0	0	0	0	40	60	0	100
	6	Techno Professional Skills III	22BTCS225R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	English Language Proficiency for Engineers	22UBPD223R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS III : Web Application Development with Java Script and Mongo DB	22MOCS221R	SEC / FE	1	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC221	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC221	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	Basic Acclimatizing Skills (BAS)	22UULS221R	MDC / UE	1	0	0	2	0	0	0	40	60	0	100

				23	**14**	**1**	**10**	**8**	**0**	**0**	**240**	**360**	**600**	**1200**
Semester V	**Sl. No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**Total Marks**
	1	Signals and Systems	22BTCS311R	DSC (Minor) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	Database Management Systems	22BTCS312R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	Formal Language and Automata Theory	22BTCS313R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	Object Oriented Programming	22BTCS314R	DSC (Major) / PC	5	3	0	4	0	0	0	40	60	100	200
	5	PE I	22BTCS316R	PE	3	3	0	0	0	0	0	40	60	0	100
	6	Techno Professional Skills IV	22BTCS315R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Competent English for Engineers	22UBPD314R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS IV	MOOCSCECS4	MDC / FE	2	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC311	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC311	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
					25	**15**	**0**	**12**	**8**	**0**	**0**	**200**	**300**	**700**	**1200**
Semester VI	**Sl. No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**Total Marks**
	1	Compiler Design	22BTCS321R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	0	100
	2	Computer Networks	22BTCS322R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	PE II	22BTCS317R	PE	3	3	0	0	0	0	0	40	60	0	100
	4	PE III	22BTCS318R	PE	3	3	0	0	0	0	0	40	60	0	100
	5	Project I	22BTCS323	DSC	4	0	0	8	0	0	0	0	0	100	100

			R	(Major) / PC											
	6	Techno Professional Skills V	22BTCS324R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Corporate Proficiency for Engineers	22UBPD324R	VAC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS V	MOOCSCECS5	MDC / FE	2	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC321	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC321	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
					25	**12**	**0**	**18**	**8**	**0**	**0**	**160**	**240**	**700**	**1100**
Semester VII	**Sl. No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Software Engineering	22BTCS411R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	100	100
	2	PE IV	22BTCS414R	PE	3	2	1	0	0	0	0	40	60	0	100
	3	PE V	22BTCS416R	PE	3	2	1	0	0	0	0	40	60	0	100
	4	Project II	22BTCS412R	DSC (Major) / PC	6	0	0	12	0	0	0	0	0	100	100
	5	Summer Internship	22BTCS413R	Summer Internship / PC	2	0	0	0	0	0	0	0	0	100	100
	6	Techno Professional Skills VI	22BTCS125R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
					18	**7**	**2**	**14**	**0**	**0**	**0**	**120**	**180**	**400**	**600**
Semester VIII	**Sl. No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	PE VI	22BTCS127R	PE	3	3	0	0	0	0	0	40	60	0	100
	2	PE VII	22BTCS128R	PE	3	3	0	0	0	0	0	40	60	0	100
	3	PE VIII	22BTCS129R	PE	3	3	0	0	0	0	0	40	60	0	100
	4	Project III	22BTCS421R	DSC (Major) / PC	7	0	0	14	0	0	0	0	0	100	100
					16	**9**	**0**	**1**	**0**	**0**	**0**	**120**	**180**	**100**	**400**

					4							

List of Program Electives (PE)Paper		
Semester	**PE s No.**	**Electives Name**
V	PE-I	1. Foundation of Data Science 2. Neural Network
VI	PE-II	1. Artificial Intelligence 2. Data Mining
	PE-III	1. Machine Learning 2. Big Data Analytics
VII	PE-IV	1. Data Handling and Visualization 2. Computer Vision
	PE-V	1. Predictive Analysis 2. Social Network Analysis
VIII	PE-VI	1. Natural Language Processing 2. Speech and Video Processing
	PE-VII	1. Advanced Data Mining 2. Data Modeling and Simulation
	PE-VIII	1. Introduction to Virtual and Augmented Reality 2. Cryptography and Network Security

Semester	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
1	22	32	14	18	18	4	0	200	500	900	1700
2	24	10	2	18	8	0	0	200	300	900	1400
3	23	12	0	16	8	0	0	200	300	1000	1500
4	23	14	1	10	8	0	0	240	360	600	1200
5	25	15	0	12	8	0	0	200	300	700	1200
6	25	12	0	18	8	0	0	160	240	700	1100
7	18	7	2	14	0	0	0	120	180	400	600
8	16	9	0	14	0	0	0	120	180	100	400
Total	176	111	19	120	58	4	0	1440	2360	5300	9100

List of MOOCS				
Sl. No	**MOOCS Course No**	**Name of the Course**	**Course Code**	**Semester**
1	MOOCS I	ENHANCING STUDY SKILLS	22MOSY124R	II
2		COMMUNITY ENGAGEMENT AND SOCIAL RESPONSIBILITY	22MOSY125R	
1	MOOCS II	HTML	2MOCECS217R	III
2		FOUNDATION OF CYBERSECURITY	2MOCECS218R	
1	MOOCS III	WRITING, RUNNING AND FIXING CODE IN C	22MOCS221R	IV
2		FOUNDATIONS OF DIGITAL MARKETING AND E-COMMERCE	22MOCS222R	
1	MOOCS IV	JAVASCRIPT, JQUERY, AND JSON	MOOCSCECS4	V
2		INTERMEDIATE POSTGRESQL	MOOCSCECS5	
1	MOOCS V	MEAN STACK	MOOCSCECS6	VI
2		JAVA FULL STACK DEVELOPER	MOOCSCECS7	

SEMESTER – I									
Course Title	**Engineering Mathematics I**								
Course code	**22BTCS111R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 39T	**3**	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Mathematics**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To make understand to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma function must be introduced. To provide the application of differential and integral calculus. To make understand the convergence and divergence of sequence and series.								
CO1	Understand definite integrals and computation of surface areas and volumes, demonstrating proficiency in integration techniques.								
CO2	Utilize Rolle's Theorem and mean value theorems to analyze functions, ensuring conceptual mastery.								
CO3	Evaluate convergence of sequences and series, applying tests and constructing power series for functions.								
CO4	Analyze multivariable functions, determining limits, continuity, and extrema using partial derivatives and Lagrange multipliers.								
CO5	Demonstrate competence in matrix operations, eigenvalue computations, and orthogonal transformations, applying linear algebra principles.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Calculus:** Evaluates and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**8**	Evaluates definite and improper integrals, Beta and Gamma functions; applies integrals to calculate surface areas and volumes of revolutions.	**3, 5**
II	**Calculus:** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.	**12**	Understand and apply Rolle's Theorem, Mean Value Theorems, Taylor/Maclaurin series with remainders, L'Hospital's Rule, and techniques for finding maxima/minima.	**2, 3**
III	**Sequences and series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series,	**8**	Grasp convergence of sequences/series, apply tests, analyze power/Taylor series,	**3, 4**

	series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.		and study Fourier series, half-range expansions, and Parseval's theorem.	
IV	**Multivariable Calculus(Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	**6**	Understand and apply limits, continuity, partial/directional/total derivatives, tangent planes, extrema, Lagrange multipliers, and gradient, curl, and divergence concepts.	**2, 3**
V	**Matrices:** Inverse and rank of a matrix, rank- nullity theorem; System of linear equations; Symmetric, skew-symmetric	**5**	Understand and apply matrix inverses, rank, rank-nullity theorem, solve linear systems, and analyze symmetric and skew-symmetric matrices.	**2, 3**

TEXT BOOKS:

T1: G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint,2002.

T2: Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

T3: Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

R1: N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

R2: B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.

OTHER LEARNING RESOURCES:

O1: https://archive.nptel.ac.in/courses/111/105/111105121/

O2: https://www.geeksforgeeks.org/engineering-mathematics-tutorials/

O3: https://www.udemy.com/course/mathematics-for-engineering/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand definite integrals and computation of surface areas and volumes, demonstrating proficiency in integration techniques.	1,2, 3, 4, 5, 10, 12
2	Utilize Rolle's Theorem and mean value theorems to analyze functions, ensuring conceptual mastery.	1,2, 3, 4, 5, 10, 12
3	Evaluate convergence of sequences and series, applying tests and constructing power series for functions.	1,2, 3, 4, 5, 10, 12
4	Analyze multivariable functions, determining limits, continuity, and extrema using partial derivatives and Lagrange multipliers.	1,2, 3, 4, 5, 10, 12
5	Demonstrate competence in matrix operations, eigenvalue computations, and orthogonal transformations, applying linear algebra principles.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS111R	**Engineering Mathematics I**	CO1	3	2	3	3	3					3		2
		CO2	2	2	2	2	2					3		2
		CO3	2	2	2	2	2					3		2
		CO4	3	3	3	3	3					3		2
		CO5	3	3	3	3	3					3		2

SEMESTER – I									
Course Title	**Introduction to Basic Mathematics, Logic and Coding**								
Course code	**22BTCS112R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To understand and be able to use the language, symbols and notation of mathematics To develop the ability to create a programmable model for a given problem. To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations								
CO1	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding								
CO2	Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.								
CO3	Solve and devise solutions to a range of elementary real-world problems in mathematics and programming								
CO4	Explore and apply key concepts in logical thinking to business problems.								
CO5	Enable students to critically analyse information in order to evaluate evidence and construct reasoned arguments.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Basics of Set Theory and Functions:** **Sets**: Basic definitions, cardinality of a set, principle of exclusion and inclusion, combination of sets: union, intersection, difference, complement etc., De Morgan laws, Venn Diagram **Cartesian Products and Relations:** Basic Definitions, binary relations – composition and inverse, binary relation on a set: properties – reflexive, irreflexive, symmetric, anti-symmetric, transitive, equivalence relations, partial order relations **Functions:** Basic definition, domain and co-domain, image and range, identity function, one-to-one and onto functions, bijections, characteristic function, composition of functions, inverse of a function, operations on sets: unary operators – idempotence, binary operators – associativity, commutativity	**10**	Understand sets, cardinality, operations (union, intersection), De Morgan laws, Venn diagrams, relations, functions, number systems, and basic operations.	**2, 3**

	Number systems: Natural numbers, whole numbers, integers, rational numbers, real numbers, operations on numbers: addition, subtraction, multiplication and division			
II	**Introduction to Mathematical Logic and Induction:** **Mathematical Logic:** Truth values of mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables **Propositional Logic:** Constants, variables, assignment of variables in a formula, tautology, contradiction and satisfiability, truth table of a formula, equivalence of formulas, proving formulas and equivalences by truth table method **Mathematical Induction:** Principle of mathematical induction – induction basis and induction step, examples	**8**	Learn truth values, logical operators, De Morgan laws, propositional logic concepts (constants, variables, tautology), and principles of mathematical induction.	**2, 3**
III	**Introduction to Logic and Reasoning:** Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order , Puzzle, Blood Relations , Analogy, Cube and Dice, Coding-Decoding	**10**	Master alphanumeric series, direction sense, logical reasoning, data sufficiency, ranking, puzzles, blood relations, analogies, cubes and dice, and coding-decoding.	**3, 4**
IV	**Introduction to Coding:** **C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. **Control Statements:** Decision Making using if statement, Types of if...else block, Switch case Block, GOTO statement. **Looping:**	**10**	Learn C programming basics: language types, program structure, debugging, tokens, data types, operators, control statements (if, switch), loops (for, while, do-while).	**2, 3**

	Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement			
V	**Introduction to Arrays, Strings and Functions** **Arrays:** One Dimensional Arrays, Two-Dimensional Arrays, Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.	**7**	Understand arrays (1D, 2D, multidimensional, dynamic), string implementation and functions (user-defined, system-defined, function parameters and passing mechanisms).	**2**
Practical Component				
Practical 1	Write a C program to find sum and average of three numbers. Write a C program to find the sum of individual digits of a given positive Write a C program to generate the first n terms of the Fibonacci sequence	**3**	Develop proficiency in C programming: calculate sums/averages, manipulate digits, generate Fibonacci sequence, using variables, loops, and arithmetic for problem-solving.	3
Practical 2	Write a C program to generate prime numbers between 1 to n. Write a C program to Check whether given number is Armstrong Number or Not.	**3**	Master C programming skills: generate prime numbers and verify Armstrong numbers, demonstrating proficiency in loops, conditionals, and mathematical operations.	3
Practical 3	Write a C program to evaluate algebraic expression (ax)/ (ax-b). Write a C program to check whether given number is perfect number or Not Write a C program to check whether given number is strong number or not.	**3**	Master C programming: evaluate algebraic expressions, verify perfect numbers, and determine strong numbers, applying arithmetic, loops, and conditional statements effectively.	3, 4
Practical 4	a) Write a C program to find the roots of a quadratic equation. b) Write a C program perform arithmetic operations using switch statement.	**3**	Achieve proficiency in C programming by solving quadratic equations for roots and performing arithmetic operations with switch statements	3

			effectively.	
Practical 5	Write a C program to find factorial of a given integer using non-recursive Function. Write a C program to find factorial of a given integer using recursive function.	**3**	Master factorial computation in C: implement non-recursive and recursive functions, demonstrating understanding of functions, loops, and recursion for problem-solving.	6
Practical 6	Write C program to find GCD of two integers by using recursive function. Write C program to find GCD of two integers using non-recursive function.	**3**	Achieve proficiency in C programming: compute GCD of integers using recursive and non-recursive functions, applying logical and iterative problem-solving techniques efficiently.	3
Practical 7	Write a C program to find both the largest and smallest number in a list of Integers Write a C Program to Sort the Array in an Ascending Order. Write a C Program to find whether given matrix is symmetric or not.	**3**	Master C programming: find largest/smallest numbers in a list, sort arrays in ascending order, and determine matrix symmetry accurately using logical operations.	3, 4
Practical 8	Write a C program to perform addition of two matrices. Write a C program that uses functions to perform Multiplication of Two Matrices.	**3**	Achieve proficiency in C programming: add two matrices and multiply matrices using functions, demonstrating mastery of matrix operations and function usage.	3
Practical 9	Write a C program to use function to insert a sub-string in to given main string from a given position. Write a C program that uses functions to delete n Characters from a give position in a given string.	**3**	Master C programming: insert a substring into a main string and delete characters from a specified position using functions effectively and accurately.	6
Practical 10	Write a C program using user defined functions to determine whether the given string is palindrome or not. Write a C program that displays the position or index in the main string S where the sub string T begins, or -	**3**	Achieve proficiency in C programming: determine palindrome strings and locate substring positions using user-defined functions effectively and accurately.	3

	1 if S doesn't contain T.			

TEXT BOOKS:

T1: Byron Gottfried, “Schaum's Outline of Programming with C”, Third Edition.
T2: E. Balaguruswamy, “Programming in ANSI C”, Eight Edition.
T3: Lipschitz, Lipsonand and Patil, “Discrete Mathematics”, Revised Third Edition
T4: Sastry and Nayak, “A Textbook on Discrete Mathematics”

REFERENCE BOOKS:

R1: R S Agarwal , “A Modern Approach To Verbal & Non Verbal Reasoning”, Revised Edition.
R2: Sijwali B S, “Analytical and Logical Reasoning”, Revised Edition.
R3: Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Second Edition.
R4: Lipschutz and Lipson, “2000 Solved Problems in Discrete Mathematics”.

OTHER LEARNING RESOURCES:

O1: https://www.javatpoint.com/discrete-mathematics-tutorial

O2: https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logical-reasoning--article
getting-started

O3:https://www.javatpoint.com/c-programming-language-tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding	1,2, 3, 4, 5, 10, 12
2	Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.	1,2, 3, 4, 5, 10, 12
3	Solve and devise solutions to a range of elementary real-world problems in mathematics and programming	1,2, 3, 4, 5, 10, 12
4	Explore and apply key concepts in logical thinking to business problems.	1,2, 3, 4, 5, 10, 12
5	Enable students to critically analyse information in order to evaluate evidence and construct reasoned arguments.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
2BTCS112R	**Introduction to Basic Mathematics, Logic and Coding**	CO 1	2	3	3	2	2					2		2
		CO 2	3	3	3	2	2					2		2
		CO 3	3	3	2	2	1					2		2
		CO 4	3	3	3	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – I									
Course Title	**Engineering Physics**								
Course code	**22BTCS113R**	**Total credits: 4** **Total hours: 40T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Basic knowledge of Physics**	**Co-requisite**	**Mathematics**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To understand the theories of physics To apply the concepts in practical problems To understand the physics of any process								
CO1	Apply electric field and potential calculations, Compute the vectors and scalar representation of forces and nature of forces.								
CO2	Analyze electrostatics in dielectric media, conservative and non-conservative forces, angular momentum and energy equations.								
CO3	Compute basics of non-inertial frames, harmonic oscillator and forced oscillations.								
CO4	Demonstrate understanding of magnetostatics in linear magnetic media, and the usage of common electrical measuring instruments.								
CO5	Understand the basic characteristics of transformers and electrical machines.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Electrostatics in vacuum	**8**	Study electrostatic phenomena in vacuum: Coulomb's law, electric field, potential, Gauss's law, and behaviour of charges and fields.	**2**
II	Magnetostatics	**8**	Learn magnetostatic principles: Biot-Savart law, magnetic field of currents, Ampère's law, magnetic materials, and applications in electromagnetism.	**2**
III	Faraday’s law	**8**	Understand Faraday's law: electromagnetic induction, induced electromotive force (emf), Lenz's law, applications in generators and transformers.	**2**
IV	Displacement current, Magnetic field due to time-dependent electric field and Maxwell’s equations	**8**	Explore displacement current, magnetic field from time-varying electric fields, and Maxwell's equations linking electricity, magnetism, and electromagnetic waves.	**4**

V	Electromagnetic waves	**8**	Study electromagnetic waves: properties, wave equations, propagation in vacuum and media, polarization, and applications in communication and technology.	**2**
Practical Component				
Practical 1	To verify the ohm's law and hence determine the unknown resistance of the given material of the wire.	**6**	Demonstrate understanding and application of Ohm's Law to determine unknown resistance of wire material through experimental verification and calculation.	3
Practical 2	To find the value of a given resistance by using meter bridge.	**3**	Achieve proficiency in using a meter bridge to accurately measure the resistance of a given material through experimental observation and calculation.	3
Practical 3	To convert the galvanometer in to voltmeter and hence calibrate it with a standard resistance and ammeter.	**6**	Master the process of converting a galvanometer into a voltmeter, calibrating it using a standard resistance, and verifying accuracy with an ammeter.	6
Practical 4	To determine the internal resistance of a cell by using potentiometer.	**6**	Achieve proficiency in determining the internal resistance of a cell using a potentiometer through accurate experimental measurements and calculation techniques.	3
Practical 5	To determine the frequency of a tuning fork by Melde's apparatus.	**3**	Achieve proficiency in determining the frequency of a tuning fork using Melde's apparatus through precise experimental setup and frequency measurement techniques.	3
Practical 6	To determine the moment of inertia of a body about an axis passing through its center of gravity and	**3**	Achieve proficiency in determining the moment of inertia of a body by	3

	perpendicular to its length.		accurately measuring its mass distribution and rotational properties experimentally.	
Practical 7	To determine the ECE of copper by using copper voltmeter and ammeter.	**3**	Achieve proficiency in determining the Electrical Conductivity (ECE) of copper using a copper voltmeter and ammeter through precise experimental measurements and calculations.	3

TEXT BOOKS:

T1: K G Mazumdar and B.Ghosh, "A Textbook on Practical Physics", Sreedhar Publishers, 209B, Kolkata.
T2: David Griffiths, "Introduction to Electrodynamics", Prentice Hall, Upper Saddle River, New Jersey, 07458
T3: IE IRODOV, "Basic Laws of Electromagnetism".
T4: C L Arora, "BSc Practical Physics", S. Chand Publishing, 2001.

REFERENCE BOOKS:

R1: P R Sasi Kumar, "Practical Physics", Phi Learning Private Ltd,2011.
R2: Sijwali B S, "Analytical and Logical Reasoning", Revised Edition.
R3: G. L. Squires, "Practical Physics", Cambridge.University Press, 30 Aug 2001.
R4: Resnick Halliday, "Principles of physics".

OTHER LEARNING RESOURCES:

O1:https://www.sciencedirect.com/science/article/pii/S0951832022005142

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply electric field and potential calculations, Compute the vectors and scalar representation of forces and nature of forces.	1,2, 3, 4, 5, 10, 12
2	Analyze electrostatics in dielectric media, conservative and non-conservative forces, angular momentum and energy equations.	1,2, 3, 4, 5, 10, 12
3	Compute basics of non-inertial frames, harmonic oscillator and forced oscillations.	1,2, 3, 4, 5, 10, 12
4	Demonstrate understanding of magnetostatics in linear magnetic media, and the usage of common electrical measuring instruments.	1,2, 3, 4, 5, 10, 12

5	Understand the basic characteristics of transformers and electrical machines.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS113R	**Engineering Physics**	CO1	3	3	3	2	1					2		3
		CO2	3	3	3	2	2					2		3
		CO3	3	3	3	2	1					2		3
		CO4	3	3	3	2	2					2		3
		CO5	3	3	3	2	2					2		3

SEMESTER – I									
Course Title	**Basic Electrical Engineering**								
Course code	**22BTCS114R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T+30P	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	Explain operative principle of transformer with background of magnetic circuits. Classify and compare different types of Electrical machines**.**								
CO1	Analyze and apply basic electric and magnetic circuits.								
CO2	Understand the working principles of electrical machines and power converters.								
CO3	Understand the components of low-voltage electrical installations.								
CO4	Understand the usage of common electrical measuring instruments.								
CO5	Understand the working and basic characteristics of transformers and electrical machines.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**DC Circuits:** Electrical circuit elements (R,L,C), voltage and current source, Kirchoff's current and voltage law, analysis of simple circuit, Thevenin, Norton and Superposition theorem	**5**	Learn DC circuit fundamentals: resistors, inductors, capacitors, voltage/current sources, Kirchhoff's laws, circuit analysis methods (Thevenin, Norton, Superposition).	**2**
II	**AC Circuit**: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single phase accircuits consisting of R,L,C.RL,RC,RLC combination(series and parallel), voltage and current relationship in star and delta connection	**7**	Learn AC circuit essentials: sinusoidal waveforms, phasor representation, power calculations (real, reactive, apparent), and analysis of R, L, C components in various configurations.	**2**
III	**Transformer:**		Understand transformers: magnetic materials, ideal	**2**

	Magnetic materials, ideal and practical transformer, equivalent circuit, losses in transformer, regulation and efficiency, auto transformer, three phase transformer connection	**6**	vs. practical models, losses, regulation, efficiency, auto transformers, and three-phase connections for power distribution systems.	
IV	**Electrical Machines:** Generation of rotating magnetic fields, construction and working of three phase induction motor, torque-slip characteristics, losses and efficiency, Single phase induction motor, working of synchronous Generator	**6**	Study electrical machines: rotating magnetic field generation, three-phase induction motors, torque-slip characteristics, losses, efficiency, single-phase induction motors, and synchronous generator operation.	**2**
V	**Power converter and electrical installation:** DC-DC buck and boost converter, single phase and three phase voltage source inverter, Fuse, MCB, ELCB, MCCB Earthing, wires and cables, types of batteries	**6**	Learn power converters: DC-DC buck and boost converters, single-phase and three-phase voltage source inverters, electrical installations including fuses, breakers, earthing, cables, and batteries.	**2**
Practical Component				
Practical 1	To Study specification and uses of instruments	**3**	Understand and apply knowledge of instrument specifications and uses, ensuring accurate selection and utilization for various technical applications.	2
Practical 2	To Study Ohm's Law for DC Circuits	**3**	Understand and apply Ohm's Law to analyze and solve problems in DC circuits through experimental verification and calculations.	2
Practical 3	To verify KCL and KVL Circuits	**3**	Verify Kirchhoff's Current and Voltage Laws (KCL and KVL) through practical circuit analysis, enhancing understanding of electrical network behaviour.	4
Practical 4	To verify The venin's Theorem	**3**	Verify Thevenin's Theorem through circuit experiments,	4

			demonstrating the ability to simplify complex circuits into equivalent single-source representations.	
Practical 5	To verify Norton's Theorem	**3**	Verify Norton's Theorem by conducting circuit experiments, demonstrating proficiency in converting complex circuits into equivalent current-source models.	4
Practical 6	To verify Maximum Power Transfer Theorem	**3**	Verify Maximum Power Transfer Theorem through circuit experiments, ensuring maximum power delivery from source to load under optimal resistance conditions.	4
Practical 7	To verify super position Theorem	**3**	Verify Superposition Theorem by analyzing circuits with multiple sources, demonstrating the ability to determine individual effects on overall circuit behaviour.	4
Practical 8	To Study transformation ratio of single-phase transformer	**3**	Understand and determine the transformation ratio of a single-phase transformer through experimental analysis and accurate measurement techniques.	2
Practical 9	Mini-project	**6**	At the end of the mini-project, students will demonstrate fundamental knowledge and practical skills in Basic Electrical Engineering concepts.	2, 3

TEXT BOOKS:

T5: D. P. Kothari and I. J.Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

REFERENCE BOOKS:

R1:D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill,2009.
R2:E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze and apply basic electric and magnetic circuits.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
2	Understand the working principles of electrical machines and power converters.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
3	Understand the components of low-voltage electrical installations.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
4	Understand the usage of common electrical measuring instruments.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
5	Understand the working and basic characteristics of transformers and electrical machines.	1, 2, 3, 4, 5, 6, 9,10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS11R	**Basic Electrical Engineering**	CO1	3	3	3	2	2	1			1	2	1	3
		CO2	3	3	3	2	2	1			1	2	1	3
		CO3	3	3	3	2	2	1			1	2	1	3
		CO4	3	3	3	2	2	1			1	2	1	3
		CO5	3	3	3	2	2	1			1	2	1	3

SEMESTER – I									
Course Title	**Workshop Manufacturing Practices**								
Course code	**22BTCS115R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10T+30P	**1**	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	Learning this course will lead you to understand basic concepts of workshop and manufacturing. Apply fundamental knowledge of workshop and manufacturing in day-to-day life. Recognize components using different materials.								
CO1	Introduction to various manufacturing methods like casting, Forming, machining etc.								
CO2	Application of computer coding in automation of Machines.								
CO3	Introduction to Carpentry & fitting operations and its application in industries.								
CO4	Different machining operations like turning, milling.								
CO5	Learning the different types of welding and its field of application.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Manufacturing Methods** Casting, forming, machining, joining, advanced manufacturing methods	**3**	Study manufacturing methods: casting, forming, machining, joining techniques, and advanced manufacturing processes for producing industrial components efficiently and effectively.	**4**
II	**CNC machining, Additive Manufacturing** Overview of CNC machining process, overview of additive manufacturing	**2**	Learn CNC machining: process overview including programming and operations. Understand additive manufacturing techniques for	**3**

			producing objects layer by layer.	
III	**Carpentry & Fitting operations** Carpentry tools, carpentry operations, fitting tools, fitting operations	**1**	Learn carpentry: tools and operations for woodwork. Understand fitting: tools and operations for assembling components accurately in manufacturing and construction.	**2**
IV	**Machining operations** Turning, milling, turning processes, milling processes	**2**	Study machining operations: learn turning and milling processes, including techniques, tools, and applications in manufacturing precision components.	**4**
V	**Welding** Arcwelding & gas welding, brazing	**2**	Learn welding techniques: arc welding, gas welding, and brazing methods, covering processes, safety measures, and applications in metal fabrication and construction.	**2**
Practical Component				

Practical 1	**Abriefintroductionofworkshop** Machineshop,Fittingshop,carpentryshop,weldingshop	**5**	Students gain introductory knowledge of workshop areas: Machine shop, Fitting shop, Carpentry shop, Welding shop, emphasizing basic operations and safety protocols.	2
Practical 2	**Machine shop** Plainturning,Taperturning,Stepturning	**10**	Students will demonstrate proficiency in plain turning, taper turning, and step turning techniques in machine shop.	3
Practical 3	**Carpentry shop** Dovetailjoint,T-lapjoint,Cross-lapjoint,Corner-lapjoint	**5**	At the end of the session, students will demonstrate proficiency in constructing dovetail, T-lap, cross-lap, and corner-lap joints in carpentry shop.	3
Practical 4	**Welding shop** Arcwelding(Buttjoint,T-joint,Lapjoint,Cornerjoint)	**5**	Students will demonstrate proficiency in arc welding techniques for butt, T-joint, lap, and corner joints.	3
Practical 5	**Fitting shop** Angle fitting, square fitting,corner fitting	**5**	Students will demonstrate proficiency in angle fitting,	3

			square fitting, and corner fitting techniques in fitting shop.	

TEXT BOOKS:

TI: Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, "Elements of Workshop Technology", Vol I 2008 and Vol II 2010, Media promoters and publishers private limited, Mumbai.

REFERENCE BOOKS:

R1: Manufacturing Technology – I, Pearson Education, 2008.
R2: Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

OTHER LEARNING RESOURCES:

O1: https://easyengineering.net/introduction-to-basic-manufacturing-process-workshop-technology

O2:
https://www.academia.edu/30316555/Introduction_to_Basic_Manufacturing_Processes_and_Workshop_Technology

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Introduction to various manufacturing methods like casting, Forming, machining etc.	1, 2, 3, 4, 5, 6, 10, 12
2	Application of computer coding in automation of Machines.	1, 2, 3, 4, 5, 6, 10, 12
3	Introduction to Carpentry & fitting operations and its application in industries.	1, 2, 3, 4, 5, 6, 10, 12
4	Different machining operations like turning, milling.	1, 2, 3, 4, 5, 6, 10, 12
5	Learning the different types of welding and its field of application.	1, 2, 3, 4, 5, 6, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS115R	**Workshop Manufacturing Practices**	CO1	3	2	2	2	3	2				1		2
		CO2	3	3	3	3	3	3				3		3
		CO3	3	2	2	2	3	2				1		2
		CO4	3	2	2	2	3	2				1		2
		CO5	3	3	2	2	3	2				1		2

SEMESTER – I									
Course Title	**Introductory English for Engineers** (Communicative English & Soft Skills)								
Course code	**22UBPD114R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To capacitate the students with mastery over Basic English grammar. To enable the students to communicate confidently with a focus on listening and speaki skills. With the help of the basics of Phonetics, the students will be able to pronounce wor correctly. To interact successfully and with decorum.								
CO1	Analyze and apply the rules of Parts of Speech in constructing grammatically corre sentences.								
CO2	Evaluate sentence structures, employ varied sentence types, and demonstrate effective comprehension skills.								
CO3	Assess listening skills, identify factors influencing listening, and implement strategies for improved listening.								
CO4	Demonstrate effective speaking skills, including self-introduction, pronunciation, and extempore speech delivery.								
CO5	Apply communication theories, recognize barriers, and enhance skills for diverse communication situations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Grammar** Parts of Speech Articles Auxiliary Verbs Affirmative and Negative Sentences	**5**	Learn grammar basics: parts of speech (noun, verb, adjective, etc.), articles (a, an, the), auxiliary verbs, affirmative and negative sentence structures.	**2**
II	**Grammar** Determiners Sentence Construction Types of Sentences (Assertive, Imperative, etc.) Degree of Comparison Comprehension Exercises	**7**	Learn grammar essentials: determiners, sentence construction, types of sentences (assertive, imperative), degree of comparison, and practice comprehension exercises for skill development.	**2**
III	**Listening Skills** What is listening? The Process of Listening Factors that adversely affect	**6**	Develop listening skills: understand listening vs. hearing, process, factors affecting it, importance, purpose, and methods for enhancing effective	**2**

	Listening Difference between Listening and Hearing, Purpose and Importance of Effective Listening How to Improve Listening Process.		listening abilities.	
IV	**Speaking Skills** Introducing yourself Self-discovery Basics of Phonetics , pronunciation Extempore speech Video Recording for Self reflection	**6**	Enhance speaking skills: self-introduction, phonetics, pronunciation basics, extempore speaking, and self-reflection through video recording for improvement.	**3**
V	**Communication Skills** Introduction to Communication, Importance of Communication Skills, Purpose of Communication, Types of Communication, Formal and informal communication Importance of Communication, Barriers to Communication, How to improve/ tips to improve Communication skills. Responding to different questions in various situations(formal/informal)	**6**	Learn communication fundamentals: introduction, importance, types, formal vs. informal, barriers, tips for improvement, and effective responses in different contexts.	**2**

TEXT BOOKS:

T6: Chaturvedi, P.D., Chaturvedi Mukesh, "Business Communication: Concepts, Cases and Applications", Second edition, Pearson, Noida, 2011.

T7: Alex K., Chand, S, "Soft Skills: Know Yourself and Know the World", first edition, S. Chand and Company Ltd., New Delhi, 2009.

REFERENCE BOOKS:

R1: Quirk, Randolp, "A Comprehensive Grammar of the English Language", Randolph Quirk, Sidney Greenbaum, Pearson Education India, 2010..

R2: Marks, Jonathan, "IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score". Book + CD-ROM, Delta Publishing, 2017.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/bEB8-SWMYhI

O2:https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze and apply the rules of Parts of Speech in constructing grammatically correct sentences.	1, 2, 3, 4, 5, 10, 12
2	Evaluate sentence structures, employ varied sentence types, and demonstrate effective comprehension skills.	1, 2, 3, 4, 5, 10, 12
3	Assess listening skills, identify factors influencing listening, and implement strategies for improved listening.	1, 2, 3, 4, 5, 10, 12
4	Demonstrate effective speaking skills, including self-introduction, pronunciation, and extempore speech delivery.	1, 2, 3, 4, 5, 10, 12
5	Apply communication theories, recognize barriers, and enhance skills for diverse communication situations.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD114R	**Introductory English for Engineers**	**CO1**	1	1	1	1	1					3		2
		CO2	1	1	1	1	1					3		2
		CO3	1	1	1	1	1					3		2
		CO4	1	1	1	1	1					3		2
		CO5	1	1	1	1	1					3		2

<table>
<tr><td colspan="10">SEMESTER – I</td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>Course Title</td><td colspan="9">Extra-Curricular Activities</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UBEC111</td><td rowspan="2">Total credits: 1
Total hours: 15S</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>4</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">Bachelor of Technology in Computer Science & Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">1</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">To develop the social and soft skills
To promote a holistic development of the learners</td></tr>
<tr><td>CO1</td><td colspan="9">Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.</td></tr>
<tr><td>CO2</td><td colspan="9">Transform passionate students who demonstrate leadership and pursue interests beyond their academics.</td></tr>
<tr><td>CO3</td><td colspan="9">Learn to participate in various co-curricular activities leading to their multifaceted personality development.</td></tr>
<tr><td>CO4</td><td colspan="9">Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.</td></tr>
<tr><td>CO5</td><td colspan="9">Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.</td></tr>
<tr><td>Unit-No.</td><td colspan="4">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="4">AdtU encourages a range of activities outside the regular curriculum intended to meet learner’s interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.</td><td>15</td><td colspan="3">ADTU fosters holistic development through clubs like Dance, Music, Photography, Drama, and Literature, encouraging participation in workshops and competitions.</td><td></td></tr>
</table>

TEXT BOOKS:

REFERENCE BOOKS:

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1, 2, 3, 4, 5, 6, 10, 12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1, 2, 3, 4, 5, 6, 10, 12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1, 2, 3, 4, 5, 6, 10, 12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1, 2, 3, 4, 5, 6, 10, 12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1, 2, 3, 4, 5, 6, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC111	**Extra-Curricular Activities**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – II									
Course Title	**Engineering Mathematics II**								
Course code	**22BTCS121R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Mathematics**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	Describe the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems. Apply the concept of graphs. Understand and apply concepts of multivariable calculus including partial derivatives, multiple integrals, and vector calculus								
CO1	Apply solutions of ordinary differential equations of various order.								
CO2	Apply solutions of partial differentiation equation of higher order.								
CO3	Analyse the complex analysis and solutions.								
CO4	Understand the concept of basic probability and its application.								
CO5	Understand the concept of basic and applied statistics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Sets, relations and functions:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	**5**	Grasp the concept of relations, including properties like reflexivity, symmetry, and transitivity, and be able to represent relations using ordered pairs, matrices, and graphs. Need to differentiate between injective, surjective, and bijective mappings, understand function composition and inverses, and work with various types of functions, such as linear and exponential.	**1,2,3**
II	***Propositional Logic:*** Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order	**7**	Construct and interpret truth tables to evaluate the validity, satisfiability, and tautological nature of propositions, and differentiate between valid and invalid arguments through direct and indirect	**3,4**

	theory.		proofs, including proof by contradiction.	
III	***Algebraic Structures:*** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	**6**	Perform operations within these structures, verify axioms, and apply homomorphisms and isomorphisms to explore structural similarities. Additionally, students should comprehend the significance of substructures like subgroups, subrings, and subfields, and use theorems such as Lagrange's theorem and the Fundamental Theorem of Algebra to solve related problems. Developing proficiency in proving properties and relationships within algebraic structures, students will be equipped to apply these concepts to more advanced mathematical contexts and real-world scenarios.	**3,4**
IV	***Introduction to Counting:*** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	**6**	Solve problems involving counting without replacement, use the binomial theorem for expansion, and apply Pascal's triangle in combinatorial contexts. Additionally, students should grasp more advanced topics such as the inclusion-exclusion principle, Pigeonhole Principle, and solving problems involving partitions of sets.	**4**
V	***Introduction to Graphs:*** Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	**6**	Learn to represent graphs using adjacency matrices and lists, and apply fundamental algorithms for traversing graphs, Understand and apply	**4**

			concepts of graph coloring, planarity, and isomorphism, and solve problems involving Eulerian and Hamiltonian paths and circuits. Mastery of these concepts will enable students to apply graph theory to real-world problems in computer science, network analysis, and other fields.	
Practical Component				
Practical 1	**Expert no 1**	**30**	LO	1,2,3,4
Practical 2	**Expert no 2**			
……				
Practical 15				

TEXT BOOKS:

T1: C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill,2000.
T2: K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, a.2007.

REFERENCE BOOKS:

R1: R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

OTHER LEARNING RESOURCES:

O1: Coursera: Platforms like Coursera offer courses such as "Mathematics for Engineers" which cover topics ranging from calculus to differential equations and linear algebra.
O2: edX: Courses like "Engineering Mathematics" provide an in-depth study of mathematical techniques important in engineering disciplines

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply solutions of ordinary differential equations of various order.	1,2,3,4,5,10,12
2	Apply solutions of partial differentiation equation of higher order.	1,2,3,4,5,10,12
3	Analyse the complex analysis and solutions.	1,2,3,4,5,10,12
4	Understand the concept of basic probability and its application.	1,2,3,4,5,10,12
5	Understand the concept of basic and applied statistics.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS121R	**Engineering Mathematics II**	CO 1	3	2	3	3	3					3		2
		CO 2	2	2	2	2	2					3		2
		CO 3	2	2	2	2	2					3		2
		CO 4	3	3	3	3	3					3		2
		CO 5	3	3	3	3	3					3		2

SEMESTER – II									
Course Title	**Engineering Chemistry**								
Course code	**22BTCS122R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	Identify scientific reasoning and quantitative analysis. Revise the scope, content, and pedagogy for one of existing general chemistry course sequences Produce the content of chemistry set in a current and relevant context for engineers.								
CO1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.								
CO2	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques								
CO3	Understand bulk properties and processes using thermodynamic considerations								
CO4	Understand periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity								
CO5	Analyse major chemical reactions that are used in the synthesis of molecules.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Atomic and molecular structure (12 lectures)** Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations .Molecular orbitals of diatomic molecules and plots of the multicentre orbitals .Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.	**5**	Comprehensive understanding of the organization of atoms, including the roles of protons, neutrons, and electrons within the nucleus and their distributions in electron orbitals. They should grasp the principles governing atomic spectra, electron configurations, and periodic trends.	**1,2,3**
II	**Spectroscopic techniques and applications (8 lectures)** Principles of spectroscopy and selections rules. Electronic	**7**	Comprehensive understanding of the principles and methods used to analyze the interaction between	**3,4**

	spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging. Surface characterization techniques. Diffraction and scattering.		matter and electromagnetic radiation across different wavelengths. They should be able to describe and apply techniques such as UV-Vis spectroscopy, infrared spectroscopy (IR), nuclear magnetic resonance spectroscopy (NMR), and mass spectrometry (MS) for qualitative and quantitative analysis of compounds.	
III	**Intermolecular forces and potential energy surfaces** Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces oh H_3 ,H_2F and HCN and trajectories on these surfaces **Use of free energy in chemical equilibria (6 lectures)** Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energies and emf. Cell potentials, the Nernst equations and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham Diagrams	**6**	grasp the fundamental interactions between molecules and their implications in physical properties and chemical behavior. Intermolecular forces, including van der Waals forces, hydrogen bonding, and dipole-dipole interactions, dictate the stability of molecular aggregates and influence phenomena such as boiling points, solubility, and viscosity. Understanding the concept of free energy in chemical equilibria is essential for students to comprehend the spontaneity and directionality of chemical reactions. Free energy (G) represents the energy available to do work under constant temperature and pressure conditions	**3,4**
IV	**Periodic Properties (4 lectures)**	**6**	Grasp the underlying principles governing	**4**

	Effective nuclear charge. Penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes. Ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries		these trends, such as effective nuclear charge and shielding effects, and how these influence the reactivity, chemical bonding, and physical properties of elements. Additionally, students should be able to predict and interpret periodic trends using periodic tables, understand the factors that affect these trends, and apply this knowledge to explain phenomena such as the formation of ions, trends in chemical reactivity, and the periodic classification of elements according to their properties.	
V	**Stereochemistry (4 lectures)** Representations of 3 dimensional structures, structural isomers and stereo isomers. Configurations and symmetry and chirality, enantiomers, diastereomers, optical activity , absolute configurations and conformational analysis. Isomerism in transitional metal compounds. **Organic reactions and synthesis of a drug molecule (4 lectures)** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule	**6**	understand the fundamental concepts of chirality, stereoisomerism, and geometric isomerism, and be able to distinguish between different types of stereoisomers such as enantiomers and diastereomers. They should comprehend how stereochemistry influences molecular interactions, including biological recognition processes and drug efficacy. Moreover, students should apply stereochemical principles to predict the outcomes of reactions, particularly in organic chemistry, and recognize the importance of spatial arrangement in shaping the physical and chemical properties of	**4**

			molecules. Mastery of stereochemistry enables students to understand complex molecular structures and their behaviors, essential for fields such as pharmaceuticals, materials science, and biochemistry.	
Practical Component				
Practical 1	QualitativeOrganicAnalysis(Minimum5 numberofsamples)	**5**	Learn to identify unknown organic compounds using a systematic approach involving several key techniques. They should be able to perform tests such as solubility tests, functional group tests (e.g., bromine water test for alkenes, silver nitrate test for halides), and spectroscopic methods including infrared (IR) and nuclear magnetic resonance (NMR) spectroscopy.	**1,2,3**
Practical 2	Estimationof IronUsingstandard$KMnO_4$ solution	**5**	Estimating iron using a standard potassium permanganate (KMnO4) solution involves a titration method that students should master for analytical chemistry. Initially, students prepare an acidic solution containing iron ions, then titrate it with KMnO4 solution until a color change occurs, typically from purple to colorless.	**3,4**
Practical 3	DeterminationofTotalHardnessof waterandEstimationofCa	**5**	Determining the total hardness of water and estimating the calcium ion concentration involves titration	**3,4**

			techniques essential in environmental and analytical chemistry.	
Practical 4	Determinationofsurface tensionofgivenliquid	**5**	Determining the surface tension of a liquid involves several experimental methods that students should master in physical chemistry and fluid mechanics. One common method is the capillary rise method, where students measure the height to which the liquid rises in a capillary tube due to capillary action.	**4**
Practical 5	Determinationofviscosityof givenliquid	**5**	Determining the viscosity of a liquid involves several experimental techniques that are fundamental in fluid mechanics and physical chemistry. One common method is the capillary viscometer technique, where students measure the time it takes for a liquid to flow through a narrow capillary tube under gravity.	**4**
Practical 6	Synthesisof apolymer/drug	**5**	Synthesizing a polymer or drug involves a series of chemical reactions and processes aimed at creating a specific molecular structure with desired properties. For polymers, students typically learn methods such as polymerization reactions (e.g., condensation polymerization, addition polymerization) to link monomers into long chains.	**4**

TEXT BOOKS:

T1: University chemistry, by B. H. Mahan

T2: University chemistry, by B. H. Mahan

T3: Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

T4: Fundamentals of Molecular Spectroscopy, by C. N. Banwell

T5: Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

REFERENCE BOOKS:

R1: Physical Chemistry, by P. W. Atkins

R2: Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

OTHER LEARNING RESOURCES:

O1:Coursera: Offers courses on engineering chemistry topics such as materials science, environmental chemistry, and chemical engineering principles.
O2: edX: Provides courses from universities worldwide covering topics like nanotechnology, renewable energy, and chemical process design.
O3: MIT Open Course Ware: Offers free lecture notes, exams, and videos from actual MIT courses in chemistry and chemical engineering.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	1,2,3,4,5,10,12
2	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques	1,2,3,4,5,10,12
3	Understand bulk properties and processes using thermodynamic considerations	1,2,3,4,5,10,12
4	Understand periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity	1,2,3,4,5,10,12
5	Analyse major chemical reactions that are used in the synthesis of molecules.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS122R	**Engineering Chemistry**	CO 1	3	2	1	3	1					1		3
		CO 2	3	2	2	2	2					2		2
		CO 3	3	2	1	3	1					1		3
		CO 4	3	2	2	2	2					2		2
		CO 5	3	2	2	2	2					2		2

SEMESTER – II									
Course Title	**Programming for Problem Solving**								
Course code	**22BTCS123R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To formulate simple algorithms for arithmetic and logical problems. To test and execute the programs and correct syntax and logical errors. Understanding algorithms, data structures, and computational thinking, enabling them to analyze problems logically and develop systematic solutions through coding								
CO1	Understand computer system elements and a foundational comprehension of algorithms and programming.								
CO2	Utilize branching and looping statements to address decision-making programming problems.								
CO3	Apply homogeneous derived data types, heterogeneous data types, strings, and functions effectively for programming tasks.								
CO4	Demonstrate understanding of pointers and applying their concepts skillfully in programming scenarios.								
CO5	Apply file handling concepts in C programming with competence, ensuring effective data management and storage solutions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Programming:** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code	**8**	Understanding of programming concepts, including variables, data types, control structures (such as loops and conditionals), functions, and basic data structures like arrays and lists. They should become proficient in writing, testing, and debugging code using a programming language such as Python, Java, or C++.	**1,2,3**
II	**Arithmetic expressions and precedence Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent	**12**	Understand how to construct and evaluate arithmetic expressions with correct operator precedence and	**3,4**

	branching, Iteration and loops Arrays: Arrays (1-D, 2-D), Character arrays and Strings Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formaldefinition required)		associativity rules to ensure accurate calculations. They should master using conditional branching (if, else-if, else statements) to direct program flow based on Boolean conditions, enabling the execution of different code blocks based on varying input scenarios.	
III	**Function:** Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Mergesort.	**8**	Understand the concepts of parameters, return values, and scope, ensuring proper data flow and variable accessibility within and outside functions.	**3,4**
IV	**Structure:** Structures, Defining structures and Array of Structures **Pointers:** Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)	**6**	Understand how to define and use structures to create complex data types that group different variables under a single name, enhancing data organization and manipulation. They should learn how to declare and access structure members, and understand memory layout and alignment.	**4**
V	File handling (only if time is available, otherwise should be done as part of the lab)	**5**	Learn how to open, read, write, and close files using programming languages such as Python, Java, or C++. They should understand the importance of file modes (e.g., read, write, append) and be able to handle different file types, such as text and binary files.	**4**
Practical Component				
Practical 1	Write a C program to find sum and average of three numbers.	**2**	These programs cover basic arithmetic	**1,2**

	Write a C program to find the sum of individual digits of a given positive Write a C program to generate the first n terms of the Fibonacci sequence		operations, digit manipulation, and sequence generation in C, demonstrating fundamental programming concepts such as loops, conditionals, and input/output operations	
Practical 2	Write a C program to generate prime numbers between 1 to n. Write a C program to Check whether given number is Armstrong Number or Not.	**2**	These programs demonstrate how to generate prime numbers within a specified range and how to check if a given number is an Armstrong number, illustrating fundamental concepts such as loops, conditionals, and basic mathematical operations in C.	**1,2**
Practical 3	Write a C program to evaluate algebraic expression (ax)/ (ax-b). Write a C program to check whether given number is perfect number or Not Write a C program to check whether given number is strong number or not.	**3**	These programs illustrate the evaluation of an algebraic expression, checking for perfect numbers, and identifying strong numbers, employing concepts such as mathematical operations, loops, conditionals, and functions in C.	**1,2**
Practical 4	a) Write a C program to find the roots of a quadratic equation. b) Write a C program perform arithmetic operations using switch statement.	**2**	These programs illustrate how to find the roots of a quadratic equation using mathematical formulas and handle various cases based on the discriminant, and how to perform basic arithmetic operations using a switch statement to select the operation based on user input, employing control structures, and mathematical operations in C.	**1,2**
Practical 5	Write a C program to find factorial of a given integer using non-recursive Function. Write a C program to find factorial	**2**	These programs demonstrate how to calculate the factorial of a given integer using both	**1,2**

	of a given integer using recursive function.		non-recursive and recursive approaches. The non-recursive approach employs a simple loop to multiply the integers up to the given number, while the recursive approach calls the function itself with a decremented value until it reaches the base case, illustrating fundamental concepts of iteration and recursion in C.	
Practical 6	Write C program to find GCD of two integers by using recursive function. Write C program to find GCD of two integers using non-recursive function.	**2**	These programs illustrate how to find the Greatest Common Divisor (GCD) of two integers using both recursive and non-recursive approaches. The recursive approach uses Euclid's algorithm, calling the function with the remainder until the base case of zero is reached. The non-recursive approach implements the same algorithm using a loop, demonstrating fundamental concepts of recursion and iteration in C.	**1,2**
Practical 7	Write a C program to find both the largest and smallest number in a list of Integers Write a C Program to Sort the Array in an Ascending Order. Write a C Program to find whether given matrix is symmetric or not.	**2**	These programs demonstrate how to find the largest and smallest numbers in a list of integers, sort an array in ascending order using the bubble sort algorithm, and check whether a given matrix is symmetric by comparing elements across the main diagonal, illustrating fundamental concepts of arrays, sorting, and matrix operations in C	**3,4**
Practical 8	Write a C program to perform addition of two matrices. Write a C program that uses functions to perform Multiplication	**2**	These programs demonstrate matrix operations in C. The first program performs the	**3,4**

	of Two Matrices.		addition of two matrices by iterating through each element and summing corresponding elements. The second program defines a function to multiply two matrices, adhering to matrix multiplication rules, and then uses this function to compute the product, illustrating modular programming and array manipulation in C	
Practical 9	Write a C program to use function to insert a sub-string in to given main string from a given position. Write a C program that uses functions to delete n Characters from a give position in a given string.	**2**	These programs demonstrate string manipulation in C. The first program inserts a sub-string into a main string at a specified position using a function, while the second program deletes a specified number of characters from a given position in a string using a function. These tasks illustrate the handling of character arrays, string operations, and function use in C	**3,4**
Practical 10	Write a C program using user defined functions to determine whether the given string is palindrome or not. Write a C program that displays the position or index in the main string S where the sub string T begins, or -1 if S doesn't contain T	**3**	These programs illustrate string operations in C using user-defined functions. The first program checks if a given string is a palindrome by comparing characters from both ends toward the center. The second program finds the starting index of a sub-string within a main string or returns -1 if the sub-string is not found, demonstrating the implementation of string search algorithms.	**3,4**
Practical 11	Write C program to count the number of lines, words and characters in a given text.	**2**	These programs demonstrate string and	**3,4**

	Write a C program to find the length of the string using Pointer.		character manipulation in C. The first program counts the number of lines, words, and characters in a given text by iterating through the characters and detecting spaces, tabs, and newline characters to determine word boundaries and lines. The second program calculates the length of a string using a pointer, iterating through the characters until it reaches the null terminator, showcasing the use of pointers in C for string operations. These tasks highlight foundational concepts in C programming related to strings, pointers, and character handling.	
Practical 12	Write a C program to Display array elements usingcalloc ( ) function Write a C Program to Calculate Total and Percentage marks of a student using structure.	**2**	These programs demonstrate practical uses of calloc() for dynamic memory allocation and structures for organizing data related to students' academic information, showcasing core concepts in C programming such as memory management and structured data handling.	**3,4**
Practical 13	Write a C program that uses functions and structures to perform the following operations: Reading a complex number Writing a complex number Addition of two complex numbers Multiplication of two complex numbers Write a C program to display the contents of a file	**2**	These programs illustrate practical applications of structures, functions, file handling, and basic operations with complex numbers in C, showcasing fundamental concepts in programming and data handling.	**3,4**
Practical 14	Write a C program to copy the contents of one file to another. Write a C program to merge two files into a third file.	**2**	These programs illustrate file handling operations in C, including reading, writing, and manipulating	**3,4**

	Write a C program to reverse the first n characters in a file		file contents based on user input, showcasing fundamental concepts in file handling and C programming.	

TEXT BOOKS:

T1:E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill.

T2: Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHallof India.

REFERENCE BOOKS:

R1: Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

OTHER LEARNING RESOURCES:

O1:Coursera: Courses such as "Programming for Everybody (Getting Started with C).

O2: edX: Introduction to C Programming" by Dartmouth College.

O3:Udemy: Various courses on C programming, including "C Programming For Beginners - Master the C Language".

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand computer system elements and a foundational comprehension of algorithms and programming.	1,2,3,5,11,12
2	Utilize branching and looping statements to address decision-making programming problems.	1,2,3,4,5,9,11,12
3	Apply homogeneous derived data types, heterogeneous data types, strings, and functions effectively for programming tasks.	1,2,3,4,5,9,11,12
4	Demonstrate understanding of pointers and applying their concepts skillfully in programming scenarios.	1,2,3,4,5,11,12
5	Apply file handling concepts in C programming with competence, ensuring effective data management and storage solutions.	1,2,3,4,5,9,11,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCS1 23R	**Programm ing for Problem Solving**	CO 1	3	3	3	2	2	1				2		3
		CO 2	3	2	2	2	2	1				2		2
		CO 3	3	2	2	2	2	1				2		2
		CO 4	3	3	3	2	2	1				2		3
		CO 5	3	3	3	2	2	1				2		3

Semester II									
Course Title	**Engineering Graphics and Design**								
Course code	**22BTCS124R**	**Total credits: 3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing To impart knowledge on the projection of points, lines and plane surfaces To improve the visualization skills for better understanding of projection of solids To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces To make the students understand the viewing perception of a solid object in Isometric and Perspective projections								
CO1	Understand drawing principles accurately for conic sections, cycloid, epicycloid, hypocycloid, and involute.								
CO2	Create solid orthographic projections, auxiliary views, annotations, dimensions, and floor plans with windows, doors, and fixtures.								
CO3	Apply isometric principles and convert views, showing understanding of scale and conventions.								
CO4	Utilize computer graphics in CAD drawing, demonstrating knowledge of software theory, customizing settings, applying ISO and ANSI standards, and producing drawings using different coordinate input methods for lines and circles.								
CO5	Apply computer-aided geometric design.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Engineering Graphics and curves**: Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction. Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals along with normal and tangent to each curve	**5**	Learn the fundamental principles and techniques of technical drawing and drafting. They should become proficient in creating and interpreting various types of engineering drawings, including orthographic projections, isometric views, and sectional views. Students should understand the use of standard drawing instruments and computer-aided design (CAD) software for precision and efficiency.	**1,2,3**

II	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes Projections of Planes: Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	**7**	Understand the principles of orthographic projection, including the projection of points and lines onto various planes. They should learn to accurately depict the position of points in different quadrants and the true length and inclination of lines relative to the projection planes.	**3,4**
III	**Projections of Solids and Section of Solids**: Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section	**6**	Learn to accurately draw various solids such as prisms, cylinders, pyramids, and cones in different orientations and positions relative to the projection planes. Additionally, students should understand how to create sectional views by cutting through solids to reveal internal features, using cutting planes and identifying sectional shapes.	**3,4**
IV	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial - 35% view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view	**6**	Understand how to create multiple views (front, top, side) of objects using orthographic projection methods, ensuring accurate depiction of object dimensions, shapes, and spatial relationships. Students should master the conventions of first-angle and third-angle projection systems, apply projection rules to generate orthogonal views from isometric or perspective drawings, and interpret engineering drawings to extract geometric	**4**

			information for manufacturing and construction purposes.	
V	**Isometric Projections and Isometric View or Drawing**: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing	**6**	Understand the principles of isometric projection, which involves projecting object edges onto three mutually perpendicular axes at equal angles of 120 degrees. Students learn to create isometric views that accurately depict the shape, size, and orientation of objects, providing a realistic and intuitive representation useful in fields such as engineering, architecture, and design.	**4**
Practical Component				
Practical 1	**Introduction to Engineering Drawing**, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales. **Principles of Orthographic** Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;	**6**	Learn the fundamental principles and techniques essential for creating precise and standardized technical drawings used in engineering disciplines. They acquire skills in producing orthographic projections, isometric views, and sectional views of objects, ensuring accurate representation of dimensions, shapes, and relationships in two-dimensional formats	**1,2**
Practical 2	**Projections of Regular Solids** Covering those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. **Sections and Sectional Views** of Right Angular Solids Covering Prism, Cylinder, Pyramid, Cone– Auxiliary Views; Development of surfaces of Right Regular Solids -	**6**	Grasp how to create sectional views to reveal internal structures of regular solids, employing cutting planes to illustrate cross-sections and understand spatial relationships within the objects. Mastery of these skills in engineering drawing and technical illustration allows students to communicate design	**1,2**

	Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects. From industry and dwellings (foundation to slab only)		concepts effectively, aiding in manufacturing, architectural planning, and spatial analysis in various engineering disciplines.	
Practical 3	**Isometric Projections** Covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions	**6**	Learn how to create accurate and visually appealing representations of objects by projecting their edges onto three mutually perpendicular axes at equal angles of 120 degrees. This technique allows for the visualization of objects from different perspectives, enhancing spatial understanding and design communication in fields such as engineering, architecture, and product design.	**1,2,3**
Practical 4	**Overview of Computer Graphics** Covering listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software,	**6**	Learn about the basic principles of rasterization, vector graphics, and rendering techniques such as ray tracing and rasterization. They explore topics like geometric transformations, 3D modeling, shading, and texture mapping, essential for creating realistic and interactive virtual environments in fields like gaming, animation, simulation, and virtual reality.	**3,4**
Practical 5	**Customization & CAD Drawing** consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and to learning; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to	**6**	Learn to customize designs by manipulating geometric shapes, dimensions, and materials to meet specific project requirements. Students gain proficiency in CAD tools to draft 2D and 3D models, apply engineering principles, and simulate real-world conditions for design validation.	**3,4**

	Draw straight lines, Applying various ways of drawing circles			

TEXT BOOKS:

T1: Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
T2: Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS:

R1: Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
R2: Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
R3: Corresponding set of) CAD Software Theory and User Manuals

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing	1,2,3,4,5,6,10,12
2	To impart knowledge on the projection of points, lines and plane surfaces	1,2,3,4,5,6,10,12
3	To improve the visualization skills for better understanding of projection of solids	1,2,3,4,5,6,10,12
4	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces	1,2,3,4,5,6,10,12
5	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS124R	**Engineering Graphics and Design**	CO1	3	3	3	2	2	1				2		3
		CO2	3	2	2	2	2	1				2		2

		CO 3	3	2	2	2	2	1				2		2
		CO 4	3	3	3	2	2	1				2		3
		CO 5	3	3	3	2	2	1				2		3

SEMESTER – II									
Course Title	**Techno Professional Skills I**								
Course code	**22BTCS125R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations To acquire elementary knowledge of programming code style. Problem-solving skills are honed through analytical thinking and practical application of technical knowledge to real-world challenges.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens, Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions.	**6**	Understanding of programming concepts, including variables, data types, control structures (such as loops and conditionals), functions, and basic data structures like arrays and lists. They should become proficient in writing, testing, and debugging code using a programming language.	**1,2,3**
II	**Control Statements:** Decision Making using if statement, Types of if ...else block, Switch case Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement, Introduction to Arrays, Strings and Functions.	**6**	Understand how to construct and evaluate arithmetic expressions with correct operator precedence and associativity rules to ensure accurate calculations. They should master using conditional branching (if, else-if, else statements) to direct	**3,4**

			program flow based on Boolean conditions, enabling the execution of different code blocks based.	
III	**Arrays:** One Dimensional Arrays, Two-dimensional Arrays, Multidimensional Arrays, Dynamic Arrays.	**6**	Grasp the importance of array operations including sorting, searching, and iterating through elements, which are fundamental for implementing algorithms and solving computational problems. Mastery of arrays enables students to manage large datasets, optimize memory usage, and enhance the performance of software applications across diverse domains such as data analysis, image processing, and simulation modeling.	**3,4**
IV	**Strings:** Implementing String Variables, String handling Functions.	**6**	Learn how to declare, initialize, and access individual characters or substrings within strings using indexing and slicing techniques. Students also explore various operations and functions available for manipulating strings, including concatenation, comparison, and modification.	**4**
V	**Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.	**6**	Understand the concepts of parameters, return values, and scope, ensuring proper data flow and variable accessibility within and outside functions.	**4**
Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill.

REFERENCE BOOKS:

R1: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
R2: Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
R3: Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.
R4: Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
R5: Dr. Guruprasad Nagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,10,12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2

22BTCS125R	**Techno Professional Skills I**	CO 1	2	1	1	1	1					3		2
		CO 2	2	1	3	1	1					3		2
		CO 3	2	3	1	1	1					3		2
		CO 4	2	2	2	2	2					3		2
		CO 5	2	2	2	2	2					3		2

SEMESTER – II									
Course Title	**EFFECTIVE ENGLISH FOR ENGINEERS**								
Course code	**22UBPD124R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Civil Engineering/B.Tech in Mechanical Engineering/B.Tech in Computer Science and Engineering/ B.Tech in Computer Science and Engineering (B)/ B.Tech in Mechanical Engineering (B)/ B.Tech in Civil Engineering (B)/ B.Tech in Computer Science and Engineering on Cloud Technology and Information Security**								
Semester	**Fall/I or Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	This course will enable the students to acquire the important knowledge on grammar like the formation of sentences. To enable the students to use vocabulary meaningfully for a successful conversation. To establish Reputation and Rapport, a dress code session is much needed The 3 P's (Planning, Prioritizing, and Performing) of Time Management will be taught to the students.								
CO1	Understand and identify common errors in English writing.								
CO2	Acquire skill of report writing.								
CO3	Develop the ability as critical readers and writers.								
CO4	Improve speaking ability in English both in terms of fluency and comprehensibility.								
CO5	Understand the correct usage of English grammar in writing and speaking.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Grammar** Interchange of Interrogative and Assertive Sentences Interchange of Exclamatory and Assertive Sentences Analysis of Sentences Types of Tenses Exercises on Tense	**6**	Understanding the rules and structures that govern the formation and arrangement of words and phrases in a language. Students explore the components of grammar such as syntax, morphology, and semantics, learning how these elements combine to form meaningful sentences and expressions.	**1,2,3**
II	**Vocabulary** Synonyms Antonyms Homonyms	**6**	Acquiring and understanding the meanings, usage, and contexts of words within a language. Students focus on expanding their vocabulary by learning new words, idiomatic	**3,4**

			expressions, and specialized terminology relevant to their fields of study or interests. They develop skills in recognizing word forms, meanings, and relationships through activities such as reading, listening, and practice exercises.	
III	**Reading Skills** Techniques of Effective Reading Gathering ideas and information from a text The SQ3RTechnique Interpret the text	**6**	Learn to apply strategies such as skimming and scanning to locate specific information quickly, while also improving their ability to infer meaning from context and draw conclusions. Mastery of reading skills enhances students' capacity to synthesize information, evaluate arguments, and critically assess sources across various disciplines and genres.	**3,4**
IV	**Dress Code Ethics** Introduction to Dress Code Ethics, Purpose and Importance, How to Make FIRSTIMPRESSION What to Wear During Interviews or Any Other Formal Meetings – Male &	**6**	Learn the importance of presenting themselves professionally and respectfully through their clothing choices. They understand the impact of attire on first impressions, professionalism, and cultural sensitivity. By adhering to dress code policies, students demonstrate their understanding of workplace norms and expectations, preparing them for future careers and professional interactions.	**4**
V	**Time-Management Skills** Introduction To Time Management, Purpose And Importance of Time Management, Basic Tips to Maintain Time.	**6**	Learn to identify and set realistic objectives, break tasks into manageable steps, and create schedules or timelines to organize their workload. They develop strategies such as	**4**

			setting priorities, avoiding procrastination, and using tools like calendars or task management apps to optimize productivity.	
Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: Wren,P.C and Martin,H. 1995. High School English Grammar and Composition, S Chand Publishing.
T1: Barrett,Grant.2016.PerfectEnglishGrammar:TheIndispensibleGuidetoExcellent Writing and Speaking, ZephyrosPress

REFERENCE BOOKS:
R1: Carthy. (2008) English Vocabulary in Use Upper - Intermediate with CD-ROM, Cambridge University Press
R1: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in	1,2,3,4,5,10,12

	practice.	
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBPD124R	**EFFECTIVE ENGLISH FOR ENGINEERS**	CO 1	1	1	1	1	1					3		2
		CO 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – II									
Course Title	**MOOCS I: Enhancing Study Skills**								
Course code	**22MOSY124R**	**Total credits: 2** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Computer Science Engineering**								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	Develop critical thinking and problem-solving abilities to approach academic challenges systematically. To enable the students to use vocabulary meaningfully for a successful conversation. Teach time-management skills to help students prioritize tasks, set goals, and create effective study schedules. Enhance reading comprehension and note-taking techniques for better information retention and understanding. Improve test-taking strategies, including preparation, anxiety management, and answering techniques								
CO1	Students will learn to analyze your learning style, set realistic goals, and create a structured schedule that maximizes your learning potential.								
CO2	To discover time management techniques like prioritization, task scheduling, and identifying and overcoming procrastination tendencies.								
CO3	Apply information literacy skills to effectively research, evaluate, and synthesize information from various sources, including academic databases, credible websites, and scholarly articles.								
CO4	To develop strategies for analyzing complex information, identifying main ideas, evaluating arguments, and drawing insightful conclusions from reading materials.								
CO5	To explore Explore various test-taking approaches, including exam preparation techniques, managing test anxiety, and developing test-specific strategies that boost your confidence and performance.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	Introduction: Defining effective studying and its importance for academic success. Learning Styles: Identifying your preferred learning style (visual, auditory, kinesthetic) and tailoring your study strategies accordingly. Goal Setting: Setting SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound) for your studies. Developing a Personalized Study Plan: Creating a schedule that incorporates class time, study sessions, breaks, and personal		**8**		Learn to assess their individual learning styles, strengths, and areas for improvement to create an effective and tailored approach to their studies. They should understand how to set realistic and achievable academic goals, prioritize tasks, and allocate appropriate time for each subject or activity.				**1,2,3**

	commitments. Self-Assessment Tools: Introduction to self-assessment exercises to evaluate your current study habits and identify areas for improvement.			
II	Time Management Techniques: Exploring various time management strategies like the Eisenhower Matrix, the Pomodoro Technique, and time tracking tools. Prioritization: Learning to prioritize tasks based on urgency and importance and allocate study time accordingly. Identifying Time Wasters: Recognizing and eliminating distractions like social media, multitasking, and disorganized study areas. Combating Procrastination: Understanding the root causes of procrastination and developing strategies to overcome it (e.g., breaking down tasks, reward systems). Creating a Sustainable Study Routine: Establishing a consistent study schedule that integrates well with your overall lifestyle	**12**	Learn to effectively organize their tasks and responsibilities to maximize productivity and achieve their goals. They should understand and apply strategies such as prioritizing tasks using methods like the Eisenhower Matrix, setting SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound), and breaking down larger projects into manageable steps.	**3,4**
III	Research Strategies: Developing effective research techniques including using library resources, academic databases, and credible online sources. Evaluating Information: Learning to assess the credibility of sources, identify biases, and distinguish between fact and opinion. Citation Styles: Understanding different citation styles (APA, MLA, Chicago) and practicing proper citation methods. Note-taking Techniques: Exploring various note-taking methods (e.g., outlining, mind mapping) and choosing a method that suits your learning style. Information Organization:	**8**	Learn to systematically gather, analyze, and interpret information to address specific questions or problems effectively. They should understand how to define a clear research question or hypothesis, conduct comprehensive literature reviews, and utilize various sources, including academic journals, books, and credible online resources. Students should become proficient in employing different research methodologies, such as qualitative,	**3,4**

	Developing strategies for organizing research findings, including using reference management tools..		quantitative, or mixed methods, and in using tools for data collection and analysis.	
IV	Active Reading Strategies: Learning to read actively by highlighting key points, annotating text, and summarizing information in your own words. Critical Analysis: Developing skills to analyze arguments, identify assumptions and biases, and evaluate evidence presented in reading materials. Comprehension Strategies: Building comprehension skills through techniques like SQ3R (Survey, Question, Read, Recite, Review) and identifying main ideas and supporting details. Information Synthesis: Learning to synthesize information from different sources, identify connections, and draw well-supported conclusions. Critical Thinking Exercises: Practicing critical thinking skills through analyzing case studies, engaging in debates, and formulating persuasive arguments	**6**	Learn techniques to enhance their comprehension, retention, and critical engagement with texts. They should understand how to set reading goals and preview materials to identify key themes and structure. Students should practice annotating texts by highlighting important points, making notes in the margins, and summarizing sections in their own words. They should also develop the ability to ask critical questions, make inferences, and connect new information to prior knowledge.	**4**
V	Test Preparation Techniques: Creating a study plan specifically for exams, including reviewing class materials, practicing with past exams, and forming study groups. Test Anxiety Management: Understanding and combating test anxiety through relaxation techniques, positive self-talk, and visualization exercises. Test-Taking Strategies: Learning different test-taking approaches for various question formats (multiple choice, essay, short answer) and maximizing your exam performance. Time Management During Exams: Developing strategies for allocating time effectively during exams and prioritizing responses.	**5**	Learn strategies to enhance their understanding and recall of material, reduce anxiety, and perform effectively during exams. They should understand how to create a study schedule that allocates sufficient time for reviewing each subject, utilizing techniques such as spaced repetition and active recall. Students should practice summarizing notes, creating mind maps, and using flashcards for key concepts. They should also engage in self-testing	**4**

	Self-Evaluation and Reflection: Learning from exam experiences by reviewing results, identifying areas for improvement, and setting goals for future exams		through practice exams and quizzes to identify areas needing improvement.	
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Brown, Peter C., Henry L. Roediger III, and Mark A. McDaniel. Make it stick: The science of successful learning. Harvard University Press, 2014..

REFERENCE BOOKS:

R1: Newport, Cal. How to become a straight-A student: The unconventional strategies real college students use to score high while studying less. Crown, 2006.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Students will learn to analyze your learning style, set realistic goals, and create a structured schedule that maximizes your learning potential.	1,2,3,4,5,10,12
2	To discover time management techniques like prioritization, task scheduling, and identifying and overcoming procrastination tendencies.	1,2,3,4,5,10,12
3	Apply information literacy skills to effectively research, evaluate, and synthesize information from various sources, including academic databases, credible websites, and scholarly articles.	1,2,3,4,5,10,12
4	To develop strategies for analyzing complex information, identifying main ideas, evaluating arguments, and drawing insightful conclusions from reading materials.	1,2,3,4,5,10,12
5	To explore Explore various test-taking approaches, including exam preparation techniques, managing test anxiety, and developing test-specific strategies that boost your confidence and performance.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22MOSY124R	**MOOCSI: Enhancing Study Skills**	CO 1	2	2	2	2	3					2		2
		CO 2	2	3	3	2	3					2		2
		CO 3	2	2	2	2	3					2		2
		CO 4	2	2	2	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – II									
Course Title	**Universal Human Values and Professional Ethics**								
Course code	**22UUHV101R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**1**	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Computer Science Engineering**								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession To help students understand the meaning of happiness and prosperity for a human being. To facilitate the students to understand harmony at all the levels of human living, and live accordingly. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life								
CO1	Evaluate the importance and process of Value Education, aligning it with human aspirations.								
CO2	Analyze the concept of harmony within oneself, emphasizing the connection between 'I' and the body.								
CO3	Assess and apply foundational values in family and society for comprehensive human goals.								
CO4	Examine the interconnectedness and mutual fulfillment in nature, emphasizing co-existence principles.								
CO5	Demonstrate competence in professional ethics, incorporating a holistic understanding for eco-friendly production systems.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration– what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario,		3		Understand the need for value education in fostering ethical, moral, and socially responsible behavior. The basic guidelines include promoting core values such as integrity, empathy, respect, and responsibility. The course content covers various dimensions of human values, ethical theories, and real-life applications in personal and professional contexts. The process involves interactive teaching methods, including discussions, case studies, reflective exercises, and				**1,2,3**

	Method to fulfill the above human aspirations: understanding and living in harmony at various levels.		community service activities, to engage students in deep thinking and practical application of values.	
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya	3	Learn to identify and align their thoughts, emotions, and actions through self-awareness and self-regulation techniques. The course emphasizes the integration of the body, mind, and spirit, promoting practices such as mindfulness, meditation, and reflective journaling to achieve internal balance. Students are encouraged to recognize their intrinsic values and aspirations, fostering a sense of purpose and contentment.	**3,4**
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious	3	Learn about the importance of empathy, effective communication, mutual respect, and cooperation in fostering strong and positive human connections. The course emphasizes the roles and responsibilities of individuals in contributing to the well-being of their families and communities, encouraging practices that promote trust, understanding, and support. Students are taught conflict resolution strategies and the value of compassion and ethical behavior in interpersonal interactions.	**3,4**

	order in societyUndivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!.			
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	3	Learn to recognize the intrinsic balance and mutual dependence that sustain ecosystems and the broader environment. The course emphasizes the concept of co-existence, where harmony arises from understanding and respecting the natural world's interdependent relationships. Students are encouraged to adopt sustainable practices and an ethical attitude towards nature, recognizing their role in maintaining ecological balance.	**4**
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	3	It fosters values such as integrity, empathy, and sustainability, guiding professionals to consider the broader impact of their decisions and actions. Professionals are encouraged to cultivate a balanced approach that respects diverse perspectives, promotes collaboration, and prioritizes ethical conduct in business practices. This holistic perspective also emphasizes accountability and responsibility towards stakeholders, communities, and the environment, encouraging ethical leadership and long-term sustainability in organizational strategies and operations.	**4**

Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: Business Ethics: Ethical Decision Making & Cases by O.C. Ferrell and John Fraedrich.
T2: Professional Ethics and Human Values by Jayakumar.

REFERENCE BOOKS:

R1: The Oxford Companion to Philosophy edited by Ted Honderich.

R2: The Cambridge Encyclopedia of Language edited by David Crystal.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Evaluate the importance and process of Value Education, aligning it with human aspirations.	1,2,3,4,6,7,10,12
2	Analyze the concept of harmony within oneself, emphasizing the connection between 'I' and the body.	1,2,3,4,6,7,10,12
3	Assess and apply foundational values in family and society for comprehensive human goals.	1,2,3,4,6,7,10,12
4	Examine the interconnectedness and mutual fulfillment in nature, emphasizing co-existence principles.	1,2,3,4,6,7,10,12
5	Demonstrate competence in professional ethics, incorporating a holistic understanding for eco-friendly production systems.	1,2,3,4,6,7,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UUHV101R	**Universal Human Values and Professional Ethics**	CO 1	1	1	1	2		2	2			1		2
		CO 2	1	2	1	2		3	3			1		2
		CO 3	1	1	1	2		2	3			1		2
		CO 4	1	2	1	2		3	3			1		2
		CO 5	1	1	1	2		3	3			1		2

<table>
<tr><th colspan="10">SEMESTER – II</th></tr>
<tr><td>Course Title</td><td colspan="9">COMPUTATIONAL SYSTEMS AND DIGITAL WORLD</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UCDL103R</td><td rowspan="2">Total credits: 1
Total hours: 30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>PROGRAMMES
(All Degree / Diploma programme of Engineering, Computer Technology, Management, Humanities, Science, and Agricultural Sciences)</td><td colspan="9">BachelorofArtsinPerformingArts
BachelorofScienceinActuarialScience
BachelorofScienceinForensicScience
BachelorofBusinessAdministration
BachelorofHotelManagement andCateringTechnology
Bachelor ofBusinessAdministration
BachelorofSocialWork
BachelorofArtsinSociology
BachelorofArtsinPsychology
BachelorofScienceinBiotechnology
B.Sc.(Hons)Agriculture
BachelorofScienceinMicrobiology
BachelorofScienceinFoodNutritionandDietetics
BachelorofComputer Application
B.TechinCivilEngineering
B.TechinMechanicalEngineering
B.TechinComputerScienceandEngineering
B.TechinComputerScienceandEngineering
MasterofBusinessAdministration
MasterofBusiness AdministrationinHealthcareManagement
MasterofSocialWork
MasterofArtsinAppliedPsychology
MasterofScienceinClinicalPsychology
MasterofArtsinSociology
MasterofScienceinBiotechnology
MasterofScienceinMicrobiology
MasterofScienceinFoodNutritionandDietetics
Master ofScienceinBotany</td></tr>
</table>

	Master ofScienceinZoology MasterofComputerTechnology			
Semester	**Winter/II Semester of First Year of the Programme**			
Course Objectives (Minimum 3)	Students will be able to understand the fundamentals of computer systems and Internet search along with advanced features of MS-Office. Students will be able to understand about the introduction to Social Media and E-Commerce and utility software Students will develop a solid foundation in computational thinking, which includes problem- solving, algorithmic design, and logical reasoning.			
CO1	FundamentalsofComputerSystems,OfficeAutomationandInternetSearch.			
CO2	KnowmoreabouttheInternet&CyberWorld			
CO3	Know Social Media, E-Commerce, and apply the samefordigital branding			
CO4	Knowtousethedigitalpaymentsanddigitaltransactions, andotherutilitysoftware			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Fundamentals of Computer Systems, Office Automation and Internet Search**	**7**	Learn about computer hardware components, operating systems, and software applications that facilitate office automation tasks such as word processing, spreadsheets, and presentations. Additionally, students delve into internet search strategies, mastering techniques to efficiently locate and evaluate information using search engines, databases, and online resources.	**1,2, 3**

II	**Internet&CyberWorld**	**8**	Encompasses exploring the interconnected global network of computers and digital systems that facilitate communication, information sharing, and collaboration on a massive scale. Students delve into the technical infrastructure of the internet, including protocols, servers, and data transmission methods, as well as the evolution and impact of cyberspace on society. They learn about cybersecurity principles and practices to safeguard data, systems, and personal information from cyber threats such as hacking, phishing, and malware.	**3,4**
III	**SocialMedia,E-Commerce,anddigitalbranding**	**7**	Understanding their interconnected roles in modern digital marketing and communication strategies. Students explore how social	**3,4**

			media platforms such as Facebook, Instagram, and Twitter are utilized for brand promotion, customer engagement, and community building. They learn about e-commerce principles, including online retail strategies, payment systems, and logistics management, essential for conducting business in the digital age.	
IV	**Digitalpaymentsanddigitaltransactions,andother utilitysoftware**	**8**	Learn about digital payment methods such as mobile wallets, online banking, and cryptocurrencies, understanding their security protocols, transaction processes, and integration with e-commerce platforms. They also explore utility software applications that streamline tasks such as document management, scheduling, and communication, enhancing	**4**

			productivity in personal and professional environments.	
Practical Component				
Practical 1	**Experiment 1**: Disassemble and reassemble a desktop computer, identifying and explaining the function of each component. Discuss the importance of hardware compatibility. **Experiment 2**: Install an operating system (e.g., Windows or Linux) on a virtual machine. Configure essential settings, such as user accounts, network connections, and system updates. **Experiment 3:** Use office software (e.g., Microsoft Office or Google Workspace) to create documents, spreadsheets, and presentations. Teach formatting, inserting images, and collaboration features. **Experiment 4:** Instruct students on effective internet searching, including the use of search engines, keywords, and advanced search operators. **Experiment 5:** Set up email accounts, compose and send emails, attach files, and organize emails into folders. Discuss email etiquette and best practices. **Experiment 6:** Use cloud storage services (e.g., Google Drive or Dropbox) to store and synchronize files. Create a backup of important data and discuss data recovery options.	**8**	Familiarize students with computer hardware components.	**1,2, 3**
Practical 2	**Experiment 1:** Set up a small local network with routers and computers. Configure network settings, assign IP addresses, and establish connectivity. Explore basic network diagnostics. **Experiment 2**: Guide students in creating a simple website using HTML and CSS. They should design webpages, add text and images, and format their content using CSS. Discuss web hosting and domain registration. **Experiment 3**: Use email clients that support encryption (e.g., Thunderbird) to send and receive encrypted emails. Practice creating and verifying digital signatures for email authenticity.	**7**	Introduce students to the fundamentals of the internet and network configuration.	**3,4**
Practical 3	**Experiment 1:** Instruct students to create	**8**	Familiarize	**3,4**

	accounts on popular social media platforms (e.g., Facebook, Twitter, Instagram). Guide them through profile setup, privacy settings, and content posting. **Experiment 2:** Have students create a content calendar for a fictional business or brand. Plan posts, including text, images, and hashtags, and use social media management tools to schedule posts. **Experiment 3:** Guide students in building a basic e-commerce website using platforms like Shopify or WooCommerce. They should add products, set up payment gateways, and configure the online store. **Experiment 4:** Set up a payment gateway for the e-commerce website created in Experiment 3. Test payment transactions and discuss security protocols such as SSL encryption. **Experiment 5**: Create and manage paid social media advertising campaigns using platforms like Facebook Ads or Google Ads. Monitor campaign performance and adjust ad targeting. **Experiment 6**: Simulate an influencer marketing campaign. Students should identify potential influencers, negotiate partnerships, and track the impact of influencer promotions. **Experiment 7:** Analyze online reviews and social media mentions related to a fictional brand. Develop strategies to manage and improve the brand's online reputation.		students with social media platforms and digital branding	
Practical 4	**Experiment 1:** Instruct students to create accounts on popular digital payment platforms (e.g., PayPal, Venmo, or a mobile payment app). Guide them through account verification, linking bank accounts or cards, and adding funds. **Experiment 2**: Provide a list of online shopping websites. Students should select products, add them to the cart, and complete transactions using the digital payment methods they set up in Experiment 1. **Experiment 3:** Make digital purchases and collect digital receipts. Discuss the advantages of digital receipts, such as organization and ease of tracking expenses. **Experiment 4:** Provide a list of utility software applications (e.g., antivirus, system optimization tools). Have students select one, download it, and install it on their computers.	**7**	Familiarize students with digital payment methods and their setup.	**4**

TEXT BOOKS:

T1: Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems Applications. 3rd ed. New Delhi: BPB Publications.
T2: Goel, A, 2010. Computer Fundamentals, Pearson India.

REFERENCE BOOKS:

R1: Balaguruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.

R2: Balaguruswamy, 2014. E. Fund Of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-Hill Education.

R3: Lawson, C. 2022. Introduction to Social Media, Oklahoma State University.

OTHER LEARNING RESOURCES:

O1:https://www.w3schools.com

O2:https://edu.gcfglobal.org

O3:https://www.tutorialspoint.com

O4:https://www.javatpoint.com/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	FundamentalsofComputerSystems,OfficeAutomationandInternetSearch.	1,2,3,4,5,10,12
2	Know more about the Internet & Cyber World	1,2,3,4,5,10,12
3	Know Social Media, E-Commerce, and apply the same for digital branding	1,2,3,4,5,10,12
4	Know to use the digital payments and digital transactions, and other utility software	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UCDL103R	**COMPUTATIONAL SYSTEMS AND DIGITAL WORLD**	CO 1	3	3	3	2	3					2		3
		CO 2	3	3	1	3	3					2		3
		CO 3	2	3	1	2	3					2		3
		CO 4	2	3	1	3	3					2		3

Evaluation Criteria:

SlNo	Evaluation Type	Total Marks
1	In-Semester Examination	70
2	End Semester Examination	30
Total		**100**

a. In-Semester Examination Details(70)

SlNo	Components	Count	Individual Components Marks	Total Marks	Remarks
1	Skill Test	2	20	40	The student's score out of 100willbe Converted to a eoutof70.
2	Quizzes	2	10	20	
3	Lab Experiments (Eachexperiments16inno'swillcarry20marks,later reducedtooverall20)	---	20	20	
4	Home Assignments (Eachassignments5inno'swill carry20marks,later reducedtooverall10)	---	10	10	
5	Participation in Class	---	10	10	
Grand Total				**100**	

b. End Semester Examination Details (30)

SlNo	Components	al Components Marks	Total Marks	Remarks
1	Theory(MCQ based)	20	20	The student's scoreoutof100 will be Converted to a e out of 30.
2	Practical Experiments	60	60	
3	Viva	20	20	
Grand Total			**100**	

SEMESTER – II									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15S	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programmes	All UG Programmes								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	It is to develop the social and soft skills and to promote a holistic development of the learners								
CO1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc.								
CO2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies								
CO3	The students will be trained to represent ADTU in various inter university, state and national level competitions								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct	**10**	ADTU fosters holistic development through clubs participation in workshops and competitions. This course promotes promotes a holistic development of the learners.	

	workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			
Practical Component				
Practical 1				
Practical 2				
Practical 3				
Practical 4				

TEXT BOOKS:

T1:

REFERENCE BOOKS:

R1:

OTHER LEARNING RESOURCES:

O1:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc.	1,2,3,4,5,6,10,12
2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies	1,2,3,4,5,6,10,12
3	The students will be trained to represent ADTU in various inter university, state and national level competitions	1,2,3,4,5,6,10,12
4	The students will be given a platform to earn from invited experts in their respective fields.	1,2,3,4,5,6,10,12
5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBCC121	CO CURRICULAR ACTIVITIES	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – II									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15S	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programmes	All UG Programmes								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	It is to develop the social and soft skills and to promote a holistic development of the learners								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the	**10**	ADTU fosters holistic development through clubs like Dance, Music, Photography, Drama, and Literature, encouraging participation in workshops and competitions.	

	platform to learn from experts in the respective fields.			
Practical Component				
Practical 1				
Practical 2				
Practical 3				
Practical 4				

TEXT BOOKS:

T1:

REFERENCE BOOKS:

R1:

OTHER LEARNING RESOURCES:

O1:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBEC121	**EXTRA CURRICULAR ACTIVITIES**	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – III									
Course Title	**Analog Electronic Circuits**								
Course code	**22BTCS211R**	Total credits: 4	L	T	P	S	R	O/F	C
		Total hours: 45T+30P	3	0	2	0	0	0	4
Pre-requisite	Nil	Co-requisite	Nil						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3rd semester of the second year of the program**								
Course Objectives (Minimum 3)	Design and analysis of CE, CB, CC amplifiers using small signal h-model and pi-model and derivation of voltage gain, current gain, input impedance and output impedance. Design and analysis of common source FET amplifier. Behaviour of operational amplifier.								
CO1	To understand the characteristics of transistor								
CO2	Design and analyse various rectifier circuits								
CO3	Design and analyse various amplifier circuits								
CO4	Design sinusoidal and non-sinusoidal oscillators								
CO5	Understand the function an op amp and design op amp based circuits								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.	7	Understand P-N junction operation; use rectifiers for AC to DC conversion; apply Zener diodes for voltage regulation; design clamping/clipping circuits for waveform modification.	1,2,3

II	Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits	10	Understand BJT structure, I-V characteristics; use as switch, amplifier (small-signal model, biasing circuits); analyze common-emitter, common-base, common-collector configurations; grasp small-signal and high-frequency equivalent circuits.	3
III	MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits- gain, input and output impedances, trans-conductance, high frequency equivalent circuit.	10	Understand MOSFET structure, I-V characteristics; utilize as switch, amplifier (small-signal model, biasing circuits); analyze common-source, common-gate, common-drain configurations; grasp small-signal parameters, high-frequency behavior.	3,4
IV	Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product	8	Understand differential amplifier operation; design power amplifiers and direct-coupled multi-stage amplifiers; analyze operational amplifier internals, ideal behavior, and non-idealities (offsets, bias currents, slew rate, gain-bandwidth product).	3,4

V	Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.) Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.	10	Analyze op-amp circuits: inverting/non-inverting amplifiers, differential amp, integrator, active filters, controllers, oscillators, analog-to-digital conversion, comparators, detectors, generators, rectifiers, and monostable multivibrators.	3,4
PRACTICAL COMPONENT				
1	To Study the V-I characteristics of Forward Biased	2	Students will be able to describe the V-I characteristics of a forward-biased diode, and analyze and interpret the experimental data to explain the behavior of the diode under different voltage conditions.	2,3
2	To Study the Reverse characteristics of Zener diode.	2	Understand and explain the reverse characteristics of a Zener diode, identifying key concepts such as breakdown voltage and reverse current. Analyze and interpret the behavior of Zener diodes in reverse bias conditions through experimental data.	2,4

3	To Study the working of a diode as half wave rectifier with and without filter.	3	Explain the basic operation of a diode in a half-wave rectifier circuit, both with and without a filter.Compare the performance and output characteristics of a half-wave rectifier circuit with and without a filter using practical observations.	2,4
4	To study the input and output characteristic of BJT in CE configuration.	3	Students will be able to analyze and interpret the input and output characteristics of a BJT in CE configuration. Students will be able to evaluatethe performance parameters of a BJT based on its characteristic curves.	4,5
5	To design an Inverting Amplifier for the given specifications using Op-Amp IC 741.	3	Upon completing this task, students will be able to design an inverting amplifier circuit using the Op-Amp IC 741 to meet specified requirements and they will analyze the circuit's performance to ensure it meets the given specifications.	3,4
6	To design and setup a non-inverting amplifier circuit with OPAMP 741 for a fixed gain, plot the waveforms, observe the phase reversal.	3	By the end of this task, students will be able to design and set up a non-inverting amplifier circuit using OPAMP 741 for a fixed gain and plot and analyze the resulting waveforms to observe phase reversal.	3,4

7	To study a low pass and a high pass filter with a given cut off frequency.	3	Describe the functioning and applications of low pass and high pass filters, including their cut off frequencies. Students will be able to design and implement low pass and high pass filters with specified cut off frequencies in practical circuits. (Bloom's Level 3: Applying)	2,3
8	To study a low pass and a high pass filter with a given cut off frequency.	3	Understand the fundamental principles and applications of low pass and high pass filters with given cut off frequencies. Apply their knowledge to analyze and design basic low pass and high pass filter circuits.	2,3
9	To design a differentiator and integrator using OPAMP IC741.	3	Design both a differentiator and an integrator circuit using the OPAMP IC741 and analyzetheir performance in various applications.	6,4
10	To design and setup a summing amplifier circuit with OPAMP 741 for a fixed gain and verify the output**.**	3	Understand and apply the principles of summing amplifier circuits using OPAMP 741 to achieve a fixed gain. Analyze and verify the output of the designed summing amplifier circuit to ensure it meets the specified requirements.	3,4

TEXT BOOKS:

T1:Micro Electronics by Millman And Grabel , McGRAW HILL
T2: Integrated Electronics by Millman &Halkias ,McGRAW HILL

T3: Electronic Devices and Circuits by Boylstead&Nashelsky, Pearson

REFERENCE BOOKS:
R1: Micro electronics circuit by Sedra and Smith, Oxford University;
R2: Microelectronics circuit analysis and design, by Rashid , PWS publication house;
R3: Electronic devices and integrated circuit- BP Singh and Rekha Singh, Pearson.
R4: Electronic Prith Ed. by Albert Malvino

OTHER LEARNING RESOURCES:

1. Analog Devices - Op-Amp Circuits
2. All About Circuits - Operational Amplifier Circuits

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To understand the characteristics of transistor.	1,2,3,5,10 and 12
2	Design and analyse various rectifier circuits	1,2,3,5,9,10 and 12
3	Design and analyse various amplifier circuits	1,2,3,4,5,6,10 and 12
4	Design sinusoidal and non-sinusoidal oscillators	1,2,3,4,5,6,10 and 12
5	Understand the function an op amp and design op amp based circuits	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS211R	**Analog Electronic Circuits**	CO1	3	3	2		2					2		2
		CO2	3	3	2		2				2	2		3
		CO3	3	2	1	2	2	2				2		2
		CO4	2	3	2	2	2	2				2		2
		CO5	3	3	3	3	3	3				2		3

SEMESTER – III									
Course Title	**Digital Electronic Circuits**								
Course code	22BTCS212R	Total credits: 4	L	T	P	S	R	O/F	C
		Total hours: 45T+30P	2	0	2	0	0	0	3
Pre-requisite	Nil	Co-requisite	Nil						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3rd semester of the second year of the program**								
Course Objectives (Minimum 3)	To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems. The course will help in design and analysis of the digital circuit and system. Apply skills in digital system integration and troubleshooting								
CO1	Apply Boolean algebra and analyze digital logic families, demonstrating proficiency in interfacing and understanding characteristics of digital ICs.								
CO2	Design and simplify logic functions using K-maps, implement combinatorial digital circuits, showcasing expertise in MSI chips and function realization using the Q-M method.								
CO3	Analyze and design sequential circuits, demonstrating proficiency in applications and design considerations of various types of flip-flops and counters.								
CO4	Evaluate and design digital-to-analog converters, understanding of quantization, encoding, and various A/D converter types.								
CO5	Analyze semiconductor memories and programmable logic devices, demonstrating proficiency in the operation, classification, and characteristics of different memory technologies and PLDs.								
Unit-No.	Content		Contact Hour	Learning Outcome					KL

I	Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.	7	Understanding digital signals, circuits, logic operations, Boolean algebra, IC gates, binary number systems, arithmetic, error codes, digital IC characteristics, TTL, Schottky TTL, CMOS logic, and interfacing techniques including tri-state logic.	**1,2,3**
II	Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.	10	Understanding combinational digital circuits: logic function representation, K-map simplification, multiplexers, demultiplexers, adders, subtractors, ALU design, MSI chips, comparators, encoders, decoders, display drivers, and function realization methods like Q-M method.	**3,4**
III	Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	10	Understanding sequential circuits: 1-bit memory, bistable latch properties, clocked SR flip-flop, JK, T, D flip-flops, applications, shift registers, converters, counters, special ICs, and their applications in digital memory, timing, and sequence control systems.	**3,4**

IV	A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D	8	Understanding A/D and D/A converters: types (weighted resistor, R-2R ladder), specifications, IC examples, sample-and-hold circuits, A/D conversion techniques (parallel comparator, successive approximation, counting, dual slope), and their applications in digital systems.	**4**
V	Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	10	Understanding semiconductor memories: organization, expanding size, types (ROM, RAM, CAM, CCD), characteristics, commonly used chips, ROM as PLD, programmable logic devices (PLAs, PALs, CPLDs, FPGAs), and their roles in digital systems.	**4**
PRACTICAL COMPONENT				
1	To study and verify the truth table of logic gates.	3	Understand and explain the functionality and truth tables of basic logic gates. Apply knowledge to construct and verify the truth tables of various logic gates through experimentation	2,3

2	To design and implementation using NAND gate & NOR gate as Universal Gate.	3	1. Understand and apply the concept of using NAND and NOR gates as universal gates in digital circuit design 2. Construct and evaluate various digital logic circuits using only NAND and NOR gates to demonstrate their universality.	3,5
3	To study about Ex-OR gates and verify their Truth Table.	3	Understand the fundamental operation and logic of Ex-OR gates. Apply knowledge to verify the truth table of Ex-OR gates through practical experimentation	2,3
4	To study about adder circuits, half adder circuits and verify their truth table.	3	Understand the concepts and functionality of adder and half-adder circuits. Analyze and verify the truth tables of adder and half-adder circuits to ensure their correct operation.	2,4
5	To study about adder circuits, full adder circuits and verify their truth table.	3	Comprehend the concepts and functionality of adder and full adder circuits. Apply knowledge to verify the truth tables of adder and full adder circuits through practical implementation	2,3
6	To study half subtractor using basic gates.	3	Understandthe functionality and design of a half subtractor using basic logic gates. Construct and verify the operation of a half subtractor circuit to demonstrate its subtraction capability	2,3

7	To study full subtractor using basic gates.	3	Understand the operation and logic of a full subtractor circuit using basic gates. Implement and analyze a full subtractor circuit to verify its functionality	2,4
8	To design and set up a 4:1 and 2:1 Multiplexer.	3	Design and construct 4:1 and 2:1 multiplexer circuits, demonstrating an understanding of their functional principles. Evaluate and test the performance of the constructed multiplexer circuits to ensure accurate operation	3,4
9	To design and set up a 1:4 Demultiplexer (DE-MUX) .	3	Understand the functional principles of a 1:4 Demultiplexer and apply this knowledge to design and set up the circuit. Evaluate the performance of the 1:4 Demultiplexer to ensure correct signal distribution and functionality	3,5
10	Implementation and verification of decoder and encoder using logic gates.	3	Apply knowledge of digital logic to design and implement encoder and decoder circuits using logic gates. Evaluate the functionality of the encoder and decoder circuits through systematic verification	3,5

TEXT BOOKS:
T1:Dr. Sanjay Sharma “Digital Electronics and logic Design”, Katson Books, fourth edition 2015

REFERENCE BOOKS:
R1: R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009
R2: Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.,

OTHER LEARNING RESOURCES:
www.nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply Boolean algebra and analyze digital logic families, demonstrating proficiency in interfacing and understanding characteristics of digital ICs.	1,2,3,10 and 12
2	Design and simplify logic functions using K-maps, implement combinatorial digital circuits, showcasing expertise in MSI chips and function realization using the Q-M method.	1,2,3,4,5,10 and 12
3	Analyze and design sequential circuits, demonstrating proficiency in applications and design considerations of various types of flip-flops and counters.	1,2,3,4,5,10 and 12
4	Evaluate and design digital-to-analog converters, understanding of quantization, encoding, and various A/D converter types.	1,2,3,4,5,10 and 12
5	Analyze semiconductor memories and programmable logic devices, demonstrating proficiency in the operation, classification, and characteristics of different memory technologies and PLDs.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
22BTCS212R	**Digital Electronic Circuits**	CO1	2	2	1							1		1
		CO2	3	3	2	2	1					1		2
		CO3	3	3	3	1	1					1		2
		CO4	3	3	2	2	1					1		2

		CO5	3	3	2	2	1					1		2

SEMESTER – III									
Course Title	**Data Structure& Algorithms**								
Course code	**22BTCS213R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Fundamentals of programming logic**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To impart the basic concepts of data structures and algorithms. To understand basic concepts about stacks, queues, lists, trees and graphs. To understand concepts about searching and sorting techniques								
CO1	Analyze algorithms using asymptotic notations, demonstrating proficiency in searching techniques like linear search and binary search, and making informed time-space trade-offs.								
CO2	Design and analyze algorithms for stack and queue operations, including expression conversion and evaluation, demonstrating mastery in implementing and evaluating various types of queues.								
CO3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.								
CO4	Apply tree terminologies and operations on different types of trees, with a focus on algorithmic analysis and practical applications.								
CO5	Evaluate and compare various sorting algorithms and hashing techniques; demonstrate proficiency in graph terminologies, representations, and algorithms for search and traversal with complexity analysis.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	**Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.		**8**		By learning these concepts, students will understand data organization, perform key operations on data structures, analyze algorithms using asymptotic notations, and evaluate search techniques for efficiency, understanding their time-space trade-offs.				**1,2,3**
II	**Stacks and Queues**: ADT Stack and its operations: Algorithms and their complexity analysis,		**8**		Understand stack and queue ADTs, perform and analyze stack operations,				**3,4**

	Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.		apply stacks in expression conversion and evaluation, and explore various queue types with their operations and complexities.	
III	**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**10**	Comprehend singly, doubly, and circular linked lists, perform operations like traversal, insertion, deletion, and implement linked representations of stack and queue. They will analyze algorithms and complexities associated with these data structures..	**3,4**
IV	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.	**10**	Understand binary trees, BSTs, AVL trees, B trees, and B+ trees. They'll perform operations, analyze algorithms, and explore applications, enhancing skills in data organization and algorithmic analysis.	**4**
V	**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	**9**	Understand hashing techniques. In graph theory, they'll grasp basic terms, representations, search algorithms, and analyze complexities, enhancing problem-solving skills in data manipulation.	**4**
Practical Component				
Practical 1	Array Operations Program to perform basic array operations (insertion, deletion, search, update).	**3**	Gain proficiency in implementing and analyzing basic array operations in programming. Understand their implications and	4

			efficiency in problem-solving contexts.	
Practical 2	Linked List Operations Program to implement singly linked list operations (insertion, deletion, traversal). Program to implement doubly linked list operations (insertion, deletion, traversal). Circular Linked List Program to implement circular linked list operations (insertion, deletion, traversal).	**3**	Implemented singly, doubly, and circular linked list operations (insertion, deletion, traversal) in Python, fostering understanding, implementation skills, and analytical comparison of dynamic data structures in programming.	5
Practical 3	Stacks and Queues Stack Using Array Program to implement stack operations using arrays (push, pop, peek). Stack Using Linked List Program to implement stack operations using linked lists. Infix to Postfix Conversion Program to convert infix expression to postfix expression using stack.	**3**	Implement stack operations (push, pop, peek) using arrays in Python, emphasizing stack properties and array-based implementation efficiency.	4
Practical 4	Queue Using Array Program to implement queue operations using arrays (enqueue, dequeue, front, rear). Queue Using Linked List Program to implement queue operations using linked lists. Circular Queue Program to implement circular queue using arrays.	**3**	Implement queue operations (enqueue, dequeue, front, rear) using linked lists in Python, emphasizing dynamic memory management and efficient queue operations.	4
Practical 5	Trees	**3**	Create a binary tree in Python and perform preorder, inorder, and	5

	Binary Tree Creation Program to create a binary tree and perform preorder, inorder, and postorder traversals. Binary Search Tree (BST) Operations Program to implement BST operations (insertion, deletion, search).		postorder traversals, illustrating tree structure and traversal algorithms.	
Practical 6	AVL Tree Implementation Program to implement AVL tree operations (insertion with rotations). Heap Implementation Program to implement a max-heap or min-heap and perform heap operations (insert, delete, heapify).	**3**	Implement AVL tree operations (insertion with rotations) in Python, ensuring balance and efficient search, insertion, and deletion operations in self-balancing trees.	4
Practical 7	Sorting Programs Merge Sort Implementation: Write a C program to implement the merge sort algorithm to sort an array of integers. Quick Sort Implementation: Implement the quick sort algorithm in C to sort an array of integers. Heap Sort Implementation: Write a C program to implement the heap sort algorithm to sort an array of integers.	**3**	Implement merge sort in C for array sorting, emphasizing divide-and-conquer principles and efficient sorting of large datasets. Implement quick sort in C for array sorting, focusing on partitioning and recursion for efficient average-case sorting of arrays.Implement heap sort in C for array sorting, showcasing heap properties and efficient in-place sorting using a max-heap or min-heap structure.	5
Practical 8	Hash Table with Chaining: Implement a hash table using chaining for collision resolution in C. Include functions to insert, search, and display elements.	**3**	Implement hash table with chaining in C, handling collisions with linked lists for efficient insert, search, and display operations in hash-based data storage.	5
Practical 9	Hash Table with Linear Probing: Write a C program to implement a	**3**	Implement hash table with linear probing in C, resolving collisions by	4

	hash table using open addressing with linear probing for collision resolution. Include functions to insert, search, and display elements.		linearly searching for open slots, ensuring efficient key-value storage and retrieval.	
Practical 10	Hash Table with Quadratic Probing: Implement a hash table using open addressing with quadratic probing for collision resolution in C. Include functions to insert, search, and display elements	**3**	Implement hash table with quadratic probing in C, resolving collisions using quadratic increments for open slots, ensuring efficient key-value storage and retrieval.	5

TEXT BOOKS:

T8:"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

REFERENCE BOOKS:

R3: Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

R4: "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

OTHER LEARNING RESOURCES:

1. https://books.google.co.in/books/about/Data_Structures_and_Algorithms.html?id=1lCHYj5eV-EC&redir_esc=y
2. https://techdevguide.withgoogle.com/paths/data-structures-and-algorithms/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze algorithms using asymptotic notations, demonstrating proficiency in searching techniques like linear search and binary search, and making informed time-space trade-offs.	1,2,3,10 and 12
2	Design and analyze algorithms for stack and queue operations, including expression conversion and evaluation, demonstrating mastery in implementing and evaluating various types of queues.	1,2,3,4,5,10 and 12
3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.	1,2,3,4,5,10 and 12
4	Apply tree terminologies and operations on different types of trees, with a focus on algorithmic analysis and practical applications.	1,2,3,4,5,10 and 12

5	Evaluate and compare various sorting algorithms and hashing techniques; demonstrate proficiency in graph terminologies, representations, and algorithms for search and traversal with complexity analysis.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS213R	Data Structure& Algorithms	CO 1	2	2	1							1		1
		CO 2	3	3	2	2	1					1		2
		CO 3	3	3	3	1	1					1		2
		CO 4	3	3	2	2	1					1		2
		CO 5	3	3	2	2	1					1		2

SEMESTER – III									
Course Title	**Biology For Engineers**								
Course code	**22BTCS214R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**C Programming**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To introduce the students about the biological concepts from an engineering perspective. To enable the students to have a strong knowledge of functioning of an ecosystem and identification of organisms. To introduce with the concepts of genetics and mechanisms related to it. To describe about the genetic code and its applicability. To explain the students about different physiological phenomenon occurring in human body.								
CO1	Analyze and differentiate between the fundamental principles of biology and engineering, emphasizing the significance of biological observations.								
CO2	Evaluate the importance of classification in biology, considering criteria such as cellularity, ultrastructure, energy utilization, and molecular taxonomy.								
CO3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.								
CO4	Explore the molecular basis of information transfer in genetics, understanding the hierarchy of DNA structure, the universality of the genetic code, and defining genes.								
CO5	Explore the fundamental principles of microbiology, including identification, classification, and ecological aspects of single-celled organisms.								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	Introduction Importance and scope of Biology as an important scientific discipline. Branches of biological sciences. Fundamental differences between science and engineering. Comparison between the working mechanism of eye and camera, Bird flying and aircraft. Biological observations of 18th century that lead to major discoveries in the world Steps in scientific research works. Brownian motion in biological sciences.		**8**	.Understand the importance and scope of Biology, its branches, and differences from engineering. They'll compare biological phenomena like vision and flight with man-made technologies, grasp historical biological observations, scientific research steps, and Brownian motion's significance.					**1,2,3**
II	**Classification & Ecology** Classification of organisms, Basis of classification: Morphological,		**8**	Classify organisms based on morphology, biochemistry, and ecology, understand unicellular vs.					**3,4**

	biochemical or ecological, level of organization, symmetry, germ layer organization, segmentation, notochord. Concept of unicellular and multicellular organisms; prokaryotes and eukaryotes; Habitat & Adaptations. Concept of Ecosystem: Structure & Function. Energy flow in an ecosystem: Lindemann ten percent law. Types of excretion: Ammonotelism, Ureotelism and Uricotelism. Animal Kingdom: Characters of phylum with examples. Model organisms for the study of biology come from different groups. E. coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.		multicellular, prokaryotic vs. eukaryotic organisms, habitats, and adaptations. They'll grasp ecosystem structure, energy flow, types of excretion, and characteristics of major animal phyla.	
III	**Genetics & Biomolecules** Concept of Allele; Dominance &Recessive; Monohybrid, Dihybrid & Trihybrid cross; Mitosis & Meiosis. Mendel's laws, Concept of Segregation and Independent assortment. Concept of co-dominance and incomplete dominance with illustrations. Sex determination in human. Genetic disorders in human beings. DNA & RNA as genetic material. Enzymes: Classification; Mechanism of enzyme action.	**10**	Understand allele concepts, dominance, inheritance patterns, mitosis, meiosis, Mendelian laws, co-dominance, incomplete dominance, sex determination, genetic disorders, DNA/RNA roles, enzyme classification, and mechanisms, enhancing understanding of genetic principles and biomolecules.	**3,4**
IV	**Information Transfer & Metabolism** Genetic code: Properties Structure of DNA Concept of recombination and crossing over Proteins: Primary secondary, tertiary and quaternary structure. Concept of Central dogma ATP as an energy currency of cell. Concept of docking: Protein Ligand	**10**	grasp properties of the genetic code, DNA structure, recombination, protein structures, the central dogma, ATP's role in cellular energy, and protein-ligand interactions, enhancing understanding of information transfer and metabolism in biological systems.	**4**

	interaction			
V	**Physiology** Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosisfetalis. Neuroendocrine system of human: Endocrine glands and their functions. Human Excretory system: Structure of Kidney and Nephron Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse. Human Respiratory System: Structure of lungs and exchange of gases. Human digestive enzymes: Components and enzymes. Mechanism of muscle contraction.	**9**	understand the functioning of the human circulatory, neuroendocrine, excretory, respiratory systems, nervous system, and muscle contraction mechanism. They'll grasp blood groups, erythroblastosis, kidney structure, neuron function, digestive enzymes, and gas exchange, enhancing physiological knowledge.	**4**

TEXT BOOKS:

T1: Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
T2: Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
T3: Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

REFERENCE BOOKS:

R1: Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
R2: Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

OTHER LEARNING RESOURCES:

1. **IEEE Transactions on Biomedical Engineering**: Research articles and reviews on biomedical engineering topics.
2. **Nature Biotechnology**: Leading journal in biotechnology and biological engineering.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze and differentiate between the fundamental principles of biology and engineering, emphasizing the significance of biological observations.	2,3,4,6,8,9,10 and 12

2	Evaluate the importance of classification in biology, considering criteria such as cellularity, ultrastructure, energy utilization, and molecular taxonomy.	2,3,4,6,8,9,10 and 12
3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.	2,3,4,6,8,9,10 and 12
4	Explore the molecular basis of information transfer in genetics, understanding the hierarchy of DNA structure, the universality of the genetic code, and defining genes.	2,3,4,6,8,9,10 and 12
5	Explore the fundamental principles of microbiology, including identification, classification, and ecological aspects of single-celled organisms.	2,3,4,6,8,9,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22BTCS214R	**Biology For Engineers**	CO 1		2	2	3		1		3	1	1		2
		CO 2		3	2	3		1		2	1	1		2
		CO 3		3	2	2		1		2	1	1		2
		CO 4		2	3	2		1		2	1	1		2
		CO 5		2	3	3		1		3	1	1		2

SEMESTER – III									
Course Title	**Mathematics III (Differential Calculus)**								
Course code	**22BTCS215R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Gather, analyze, evaluate, and synthesize information relevant to a question or issue. Manipulate and analyze numerical data and arrive at an informed conclusion. Understand applications of derivatives in optimization, related rates, and curve sketching.								
CO1	Understand the skills of partial derivatives with their applications.								
CO2	Understand the skills of vector calculus								
CO3	Analyse the application of integral calculus								
CO4	Understand the concept of line integral, surface integral and volume integral.								
CO5	Understand the concept of applications of multivariable calculus (Integration).								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Sequences, Series and Mean value theorems** Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test –Cauchy's root test – Alternate series– Leibnitz's rule. Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem.	**8**	Convergence and divergence tests for sequences and series, including ratio, comparison, integral, Cauchy's root, and alternating series tests. They'll understand and apply Rolle's and Lagrange's mean value theorems in solving mathematical problems effectively.	**1,2,3**
II	**Differential equations of first order and first degree** Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exactform. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories–Electrical circuits.E. coli, S.cerevisiae, D. Melanogaster,	**8**	Students will learn to solve first-order linear, Bernoulli, and exact differential equations, and apply them to real-world scenarios such as Newton's Law of cooling, growth and decay laws, electrical circuits, and orthogonal trajectories, enhancing problem-	**3,4**

	C. elegance, A. Thaliana, M. musculus.		solving skills in differential equations.	
III	**Linear differential equations of higher order** Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type eax, sin ax, cos ax, polynomials in xn, eaxV(x) and xnV(x) – Method of Variation of parameters, Cauchy and Legendre's linear equations.	**10**	Students will master solving linear differential equations of higher order with constant coefficients, both homogeneous and non-homogeneous, using methods such as variation of parameters and Cauchy-Legendre equations. They'll apply these techniques to diverse mathematical and scientific contexts.	**3,4**
IV	**Partial differentiation** Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange'smethod.	**10**	Understand partial differentiation, including homogeneous functions, Euler's theorem, total derivative, chain rule, Jacobian, and Taylor/MacLaurin series for functions of two variables. They'll apply these concepts to find extrema using Lagrange's method, enhancing problem-solving abilities in multivariable calculus.	**4**
V	**Multiple integrals** Double and Triple integrals – Change of order of integration in double integrals – Change of variables topolar, cylindrical and spherical coordinates..	**9**	Students will learn double and triple integrals, change of integration order in double integrals, and transformations to polar, cylindrical, and spherical coordinates. They'll apply these techniques to compute volumes and solve practical problems in diverse fields.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Introduction to Integral Calculus: Systematic Studies with Engineering Applications for Beginners, Ulrich L. Rohde, 2011.

REFERENCE BOOKS:

R5: Calculus. Gilbert Strang, 1991.

OTHER LEARNING RESOURCES:

1. **Wolfram Alpha** - Computational tool for exploring differential calculus concepts, performing calculations, and visualizing functions.
2. **Mathematical Association of America (MAA) -** Offers resources, journals, and articles related to calculus and mathematics education.
3. **MathWorld** - Online mathematics encyclopedia that provides detailed explanations and definitions related to differential calculus concepts.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the skills of partial derivatives with their applications.	1,2,3,4,5,10 and 12
2	Understand the skills of vector calculus	1,2,3,4,5,10 and 12
3	Analyse the application of integral calculus	1,2,3,4,5,10 and 12
4	Understand the concept of line integral, surface integral and volume integral.	1,2,3,4,5,10 and 12
5	Understand the concept of applications of multivariable calculus (Integration).	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS215R	**Mathematics III (Differential Calculus)**	CO 1	3	2	3	3	3					3		2
		CO 2	2	2	2	2	2					3		2
		CO 3	2	2	2	2	2					3		2
		CO 4	3	3	3	3	3					3		2
		CO 5	3	3	3	3	3					3		2

SEMESTER – III									
Course Title	**Techno Professional Skills II**								
Course code	**22BTCS216R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations To acquire advanced practical knowledge of programming code style. Gain advanced practical knowledge and expertise in programming code style, emphasizing clarity, efficiency, and maintainability in software development.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language,Structure of a 'C' Program, Executing and Debugging a 'C'Program, 'C' Tokens, Keywords and Identifiers, Operators, Constants, Variables, DataTypes, Precedence of Operators, Scope and Lifetime of Variables,Arithmetic Expressions, Evaluation of Expressions.	**8**	Understand the fundamentals of C programming, including language evolution, program structure, execution, debugging, tokens, keywords, identifiers, operators, data types, variable scope and lifetime, arithmetic expressions, and expression evaluation, enhancing their coding proficiency and problem-solving skills.	**1,2,3**
II	**Control Statements:** Decision Making using if statement, Types of if ...else block,Switch case	**8**	Master control statements (if, if-else, switch-case, GOTO) for decision-	**3,4**

	Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop,Do- while loop, jumpingin Loop, break and continue statement, Introduction to Arrays, Strings and Functions.		making, and looping structures (for, while, do-while) with break, continue, and jump statements. They'll understand arrays, strings, and functions, enhancing their ability to design structured and efficient C programs.	
III	**Arrays:** One Dimensional Arrays, Two-dimensional Arrays,Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-definedFunctions, passing in Functions.	**10**	Students will proficiently handle one-dimensional, two-dimensional, and multidimensional arrays, including dynamic arrays. They will implement string variables, utilize string handling functions effectively, and grasp the concepts of user-defined and system-defined functions, enhancing their ability to develop robust and modular C programs.	**3,4**
IV	**Pointers in C:** Pointers: Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing a Variable through its Pointer, Pointer Expressions, Pointer Increments and Scale Factor.	**10**	Understand pointers in C, including declaration, initialization, and accessing variables through pointers. They will manipulate pointer expressions, perform increments, and comprehend scale factors, enhancing their ability to manage memory efficiently and solve complex programming tasks.	**4**

V	**Structures:** Introduction, Defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures. **Unions:** Defining a Union,using a Union, Difference between Structure and Union. **File Management in C:** Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files.	**9**	Students will grasp structures in C: defining, declaring, accessing members, initializing, and using arrays of structures. They'll understand unions, differentiate them from structures, and manage file operations, including defining, opening, closing files, and handling input/output and errors effectively.	**4**
Practical Component				
Practical 1				
Practical 2				
Practical 10				

TEXT BOOKS:

T1: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

REFERENCE BOOKS:

R1: PradipDey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

R2: Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

R3: Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.

OTHER LEARNING RESOURCES:

1. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
2. Dr. GuruprasadNagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome

1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10 and 12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,10 and 12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10 and 12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10 and 12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22BTCS216R	**Techno Professional Skills II**	**CO 1**	2	1	1	1	1					3		2
		CO 2	2	1	3	1	1					3		2
		CO 3	2	3	1	1	1					3		2
		CO 4	2	2	2	2	2					3		2
		CO 5	2	2	2	2	2					3		2

<table>
<tr><th colspan="10">SEMESTER – III</th></tr>
<tr><td>Course Title</td><td colspan="9">BASIC LIFE SAVING SKILLS</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UULS212R</td><td rowspan="2">Total credits: 4
Total hours:
45T+30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td>Co-requisite</td><td colspan="7">NIL</td></tr>
<tr><td>Programme</td><td colspan="9">Bachelor of Technology in Computer Science & Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">3</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">Equip learners with essential knowledge and practical skills for handling emergency fire situations, including fire safety protocols, evacuation procedures, and fire prevention measures.
Teach learners to provide basic management and treatment for injuries resulting from fire emergencies, focusing on immediate first aid techniques, injury assessment, and stabilization.
Enhance learners' capability to respond effectively to fire-related injuries by emphasizing practical skills in first aid administration and emergency response protocols..</td></tr>
<tr><td>CO1</td><td colspan="9">Basic Life Support (BLS) is the specific skills and knowledge that individuals should acquire and demonstrate after completing a BLS training course. These outcomes are essential for anyone who may encounter a medical emergency and need to provide immediate assistance before professional medical help arrives.</td></tr>
<tr><td>CO2</td><td colspan="9">Soft skills encompass personal attributes and abilities enabling effective interpersonal interactions in personal and professional settings. They enhance communication, collaboration, and overall success in diverse aspects of life, emphasizing their significant value in achieving personal and professional goals</td></tr>
<tr><td>CO3</td><td colspan="9">Focuses on equipping healthcare professionals, first responders, and emergency care providers with the knowledge and skills to promptly recognize, assess, and effectively manage various types of traumatic injuries and emergencies. This training is critical for ensuring timely and appropriate care in emergencies, enhancing overall preparedness and response capabilities.</td></tr>
<tr><td>CO4</td><td colspan="9">The course aims to educate on the principles and purpose of the Triage system in healthcare, focusing on prioritizing patient care based on urgency. Learners will explore triage levels such as immediate, delayed, minimal, and expectant, understanding their significance in allocating resources and treatment. They will identify medical conditions and injuries needing immediate attention versus those manageable later. Emphasis is on accurate and timely patient assessment during triage to optimize outcomes in emergency settings.</td></tr>
<tr><td>CO5</td><td colspan="9">Learners will identify and distinguish common medical emergency conditions such as myocardial infarction (heart attack), stroke, diabetic emergencies (hypoglycemia and hyperglycemia), anaphylaxis, respiratory distress (including asthma exacerbation), seizures (epileptic and non-epileptic), and allergic reactions (including severe allergic reactions or anaphylactic shock)..</td></tr>
</table>

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Basic Life Support(BLS)** Introduction of BLS Chain of survival ABCs Assessment CPR and Ventilation Technique AED Choking for adult and children	**8**	Basic Life Support (BLS) teaches lifesaving skills, including the Chain of Survival, ABCs Assessment, CPR and ventilation techniques, AED usage, and choking management for adults and children.	**1,2,3**
II	**Soft skills** Introduction Communications Skills Situational Skills Team Work Other Soft Skills	**8**	Soft skills training enhances communication, situational awareness, and teamwork. Learning outcomes include improved communication skills, effective situational responses, and collaborative teamwork, along with other essential interpersonal skills.	**3,4**
III	Trauma emergencies ● Introduction ● Priorities of Initial approach inpre-hospital care a) Scene safety b) Primary assessment c) Bleeding control d) Helmet removal e) Care of amputated body part f) Extrication of victims and safe transfer g) Cervical spine stabilization h) Cervical collar application i) Splinting of broken Limbs	**10**	Trauma emergency training covers initial pre-hospital care priorities: scene safety, primary assessment, bleeding control, helmet removal, amputated body part care, victim extrication, cervical spine stabilization, collar application, and limb splinting.	**3,4**
IV	Triage system ● Introduction ● Flowchart approach of Triage ● Triage of Multiple Casualties in Pre-Hospital setting	**10**	Triage system training includes understanding the triage flowchart, managing multiple casualties in pre-hospital settings, and prioritizing single casualty	**4**

	● Triage of Single casualty		care, ensuring efficient and effective emergency response.	
V	Medical emergencies ● Introduction ● Victim centred approach in medical emergency ● Management of a)seizures b)heart attack c)asthma Diabetic emergencies d)emergency child birth e)stroke recovery position	**9**	Medical emergency training covers victim-centered care and management of seizures, heart attacks, asthma, diabetic emergencies, emergency childbirth, and stroke recovery positions, ensuring effective and compassionate emergency response.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Nancy Caroline'S Emergency Care in the streets Seventh edition by Jones and Bartlett First Aid book by LC Gupta

REFERENCE BOOKS:

R1: Advance Cardio vascular life support and Basic life support provider manual @ American Heart Association (AHA)

OTHER LEARNING RESOURCES:

1. **Red Cross First Aid App**: Provides step-by-step instructions for responding to emergencies and locating nearby AEDs.
2. **PulsePoint**: Alerts CPR-trained individuals to nearby cardiac arrests and AED locations.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Basic Life Support (BLS) is the specific skills and knowledge that individuals should acquire and demonstrate after completing a BLS training course. These outcomes are essential for anyone who may encounter a medical emergency and need to provide immediate assistance before professional medical help arrives	1,2,3,4,5,9,11 and 12
2	Soft skills encompass personal attributes and abilities enabling effective interpersonal interactions in personal and professional settings. They enhance communication, collaboration, and overall success in diverse aspects of life, emphasizing their significant value in achieving personal and professional goals.	1,2,3,4,5,9,11 and 12
3	Focuses on equipping healthcare professionals, first responders, and emergency care providers with the knowledge and skills to promptly recognize, assess, and effectively manage various types of traumatic injuries and emergencies. This training is critical for ensuring timely and appropriate care in emergencies, enhancing overall preparedness and response capabilities.	1,2,3,4,5,9,11 and 12
4	The course aims to educate on the principles and purpose of the Triage system in healthcare, focusing on prioritizing patient care based on urgency. Learners will explore triage levels such as immediate, delayed, minimal, and expectant, understanding their significance in allocating resources and treatment. They will identify medical conditions and injuries needing immediate attention versus those manageable later. Emphasis is on accurate and timely patient assessment during triage to optimize outcomes in emergency settings.	1,2,3,4,5,9,11 and 12
5	Learners will identify and distinguish common medical emergency conditions such as myocardial infarction (heart attack), stroke, diabetic emergencies (hypoglycemia and hyperglycemia), anaphylaxis, respiratory distress (including asthma exacerbation), seizures (epileptic and non-epileptic), and allergic reactions (including severe allergic reactions or anaphylactic shock)..	1,2,3,4,5,9,11 and 12

MAPPING TABLE

Course code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UULS212R	BASIC LIFE SAVING SKILLS	CO 1	2	2	3	2	2				3		3	3
		CO 2	3	2	3	2	2				2		3	3
		CO 3	3	2	3	3	3				3		3	2
		CO 4	3	2	3	1	3				2		3	2
		CO 5	3	2	3	3	3				2		2	2

SEMESTER – III									
Course Title	**PERSONAL FINANCIAL PLANNING**								
Course code	22UUFL213R	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	Introduction to Financial Budgeting And Planning	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	1. The course would offer an inclusive approach to understand the relevant concepts of money, borrowing, lending, taxes and their application to financial planning. 2. Assess the personal financial planning process, the life cycle of financial plans, and methods of goal achievement. 3. Formulate a budget, record-keeping system, and tax planning strategy based on current financial goals.								
CO1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.								
CO2	Design a diversified investment portfolio that addresses several different investment objectives.								
CO3	Differentiate between open and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.								
CO4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.								
CO5	Apply financial knowledge and skills to make informed decisions, ensuring long-term financial stability and security.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Fundamentals of Financial Planning - i. Functions of money; ii. Inflation- Meaning, causes, how it can be controlled; iii.process official planning, iv. Time value of money-simple and	**8**	Fundamentals of Financial Planning covers understanding money's functions, inflation causes and control, financial planning processes, time value of money including simple and compound interest, Net Present Value (NPV) and Future Value (FV), compounding	**1,2,3**

	compound interest; v.Net Present Value and Future value, vi. Power of Compounding; vii. Doubling period and Rule of 72.		power, doubling periods, and the Rule of 72 for effective financial decision-making.	
II	Income Tax Planning- i. Meaning of Income, ii. Direct & Indirect Taxes, Taxable Income, various heads of Income for tax Calculation, iii. Non-taxable Income, iv. Tax evasion and tax avoidance, v.GST, Tax Planning Strategies.	**8**	Learning Outcome: Gain proficiency in understanding income, taxes (direct, indirect), taxable and non-taxable income, tax evasion, avoidance, GST, and effective tax planning strategies.	**3,4**
III	Entrepreneurial planning - i. Meaning of Entrepreneurship, prerequisites for becoming an entrepreneur, ii. Entrepreneurship Support Systems in India, iii. Institutional support systems for entrepreneurs, iv. Financial support systems for entrepreneurs; v. Venture Capital, Business Angels, vi. Assistant of Government, vii. Commercial Bank Loans and Overdraft.	**10**	Understand entrepreneurship fundamentals, support systems in India, institutional and financial support mechanisms (venture capital, business angels, government assistance, commercial bank loans), enabling effective entrepreneurial planning and implementation.	**3,4**
IV	Planning for investing in securities market - i. Investment avenues offered by Securities Markets.. Primary Market and Secondary Market, ii . Stock market- meaning, features, functions of NSE, BSE DEMAT trading account,	**10**	Gain knowledge of investment avenues in securities markets, primary and secondary markets, stock market functions (NSE, BSE), DEMAT trading, security repositories, stock brokers, operational aspects (order placement, contract notes,	**4**

	iii. Security repository, stock brokers. Operational aspects of securities markets: placement of orders, contract note, pay-in and pay-out, trading and settlement cycle, iv. Various risks involved in investing in securities markets; Role of Financial Intermediaries; Stock indices. v. Mutual Funds- meaning concept, definition, types, importance and drawbacks of mutual funds, mutual funds in India, investing in mutual funds, vi. Systematic Investment Plan (SIP) and its advantages.		trading cycles), risks, financial intermediaries, stock indices, mutual funds (types, importance, drawbacks, investing in India), and advantages of Systematic Investment Plans (SIPs).	
V	Planning for debts and Retirement i. Consumer credit Introduction to consumer credit; choosing a source of credit, the cost of credit alternatives, ii. Consumer Legal Protection; iii. Housing Decision: Factors and Finance: Vehicle Decisions. iv. Retirement planning Meaning of cost of living; retirement need analysis; development of retirement plan, various retirement schemes. v. Estate Planning; Pension and Medicare Planning; Wills.	**9**	Develop skills in consumer credit management, including choosing credit sources and evaluating costs. Understand consumer legal protections and factors influencing housing and vehicle decisions. Master retirement planning, including cost-of-living considerations, retirement needs analysis, retirement scheme evaluation, estate planning, pension, Medicare planning, and wills.	**4**
Practical Component				
Practical 1				
Practical 2				
Practical 10				

TEXT BOOKS:

T1: Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems &The Million- Dollar Financial Advisor: Powerful Lessons and Proven Strategies from Top Producers by David J. Mullen Jr

T2: Personal Finance and Planning by Dr. Rajni

T3: Peaceful Personal Finance: A Short Read on the Basics of Personal Finance and Planning Kindle Edition by Hema Singh

REFERENCE BOOKS:

R1: Be Your Own Financial Advisor: Financial Planning, Investment Options, Risk Management, Tax Management, Succession Planning Kindle Edition y Sushil Bali

R2: The Dumb Things Smart People Do with Their Money: Thirteen Ways to Right Your Financial Wrongs Kindle Edition y Jill Schlesinger

OTHER LEARNING RESOURCES:

1. **Financial Planning Association (FPA)**:Offers resources, workshops, and events for financial planners and individuals seeking financial advice.
2. **Local Community Resources**: Check local libraries, community centers, and universities for workshops or seminars on personal financial planning.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.	1,2,4,5,11 and 12
2	Design a diversified investment portfolio that addresses several different investment objectives.	1,2,4,5,11 and 12
3	Differentiate between open and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.	1,2,4,5,11 and 12
4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.	1,2,4,5,11 and 12
5	Apply financial knowledge and skills to make informed decisions, ensuring long-term financial stability and security.	1,2,4,5,11 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
22UUFL202R	PERSONAL FINANCIAL PLANNING	CO 1	1	2		3	3						3	3
		CO 2	1	2		3	3						3	3
		CO 3	1	3		2	3						3	3
		CO 4	1	2		3	3						3	3
		CO 5												

SEMESTER – III									
Course Title	**ENGLISH FOR EMPLOYABILITY FOR ENGINEERS**								
Course code	**22UBPD214R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To introduce the types of sentences and their significance. To strengthen the vocabulary of the students to enhance student' vocabulary to enhance their speaking and writing skills it the importance of dress codes in various organizations. To overcome fear of Public Speaking To understand the process of Effective Reading techniques and Listening skills.								
CO1	Create effective written communication for professional scenarios, incorporating engineering terminology and conventions.								
CO2	Demonstrate proficient verbal communication skills, applying engineering vocabulary and technical language appropriately.								
CO3	Evaluate and apply effective teamwork strategies in engineering contexts, fostering collaboration and innovation.								
CO4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.								
CO5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence**.**								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Module 1: Reading Skills** Exercise 1: Interpreting different texts Exercise 2: Importance and significance of Punctuation Exercise 3: Story -reading Exercise 4: News-reading Exercise 5: Comprehending texts of different genres	**8**	Reading Skills enhances abilities to interpret various texts, understand punctuation significance, read stories and news, and comprehend different genres, fostering improved reading comprehension and analysis.	**1,2,3**
II	**Unit 2: Non-Verbal Communication** **i.** Understanding Non-Verbal Communication & Body Language Types of Body Language ii. Importance and Impact of Body Language &Introduction to Haptics,	**8**	Non-Verbal Communication teaches understanding and interpreting body language, the importance and impact of non-verbal cues, and introduces haptics, kinesics, and proxemics for effective	**3,4**

	Kinesics and Proxemics		interpersonal communication.	
III	**Unit 3: Grammar (Flipped Classroom)** i. Types of Sentences (using Assertive, Imperative, exclamatory in respective contexts), ii. Degrees of Comparison	**10**	Grammar (Flipped Classroom) covers using assertive, imperative, and exclamatory sentences in context, and understanding degrees of comparison, enhancing grammatical accuracy and contextual sentence construction.	**3,4**
IV	**Unit 4: Public Speaking Skills** i. Introduction to public speaking Preparation for Public speaking (scripts, non-verbal cues) ii. Understanding and overcoming Fear of Public Speaking Tips Public Speaking	**10**	Public Speaking Skills focuses on preparing and delivering speeches, utilizing non-verbal cues, overcoming fear of public speaking, and applying effective tips for confident and engaging public presentations.	**4**
V	**Module 5: Listening Skills** i. Process of listening ii. Understanding listening barriers iii. Difference between Listening and Hearing, iv. Importance of Effective Listening Practice Session: Listening to podcasts, Lectures, Audio Books etc.	**9**	Listening Skills explores the listening process, identifies barriers, distinguishes between listening and hearing, underscores the importance of effective listening, and includes practical sessions with podcasts, lectures, and audio books to enhance listening proficiency.	**4**

TEXT BOOKS:

T1: Wren, P.C and Martin, H. 1995. High School English Grammar and Composition, S Chand Publishing.

T2: Barrett, Grant. 2016. Perfect English Grammar: The indispensable Guide to Excellent Writing and Speaking, Zephyros Press

REFERENCE BOOKS:

R1: Mccarthy. (2008) English Vocabulary in Use Upper - Intermediate with CD ROM, Cambridge University Press

R2: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

OTHER LEARNING RESOURCES:

1. https://www.youtube.com/watch?v=rl85jxktfms
2. https://www.slideshare.net/JavedIqbal15/presentation-on-vocabulary-building-14522369

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Create effective written communication for professional scenarios, incorporating engineering terminology and conventions.	1,2,3,4,5,10 and 12
2	Demonstrate proficient verbal communication skills, applying engineering vocabulary and technical language appropriately.	1,2,3,4,5,10 and 12
3	Evaluate and apply effective teamwork strategies in engineering contexts, fostering collaboration and innovation.	1,2,3,4,5,10 and 12
4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.	1,2,3,4,5,10 and 12
5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence**.**	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**Cos**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22UBPD214R	**ENGLISH FOR EMPLOYABILITY FOR ENGINEERS**	CO 1	1	1	1	1	1					3		2
		CO 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – III									
Course Title	**MOOCS II: HTML**								
Course code	**2MOCECS217R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Understand HTML syntax and structure. Create semantically meaningful web pages. Incorporate multimedia (images, audio, video). Implement forms for user data collection, applying accessibility and responsiveness best practices for well-rounded HTML design skills.								
CO1	Students will understand the basic syntax and structure of HTML								
CO2	To create well-structured and semantically meaningful web pages using HTML tags.								
CO3	To explore how to incorporate multimedia elements such as images, audio, and video into web pages.								
CO4	They will learn to implement forms and input elements to collect user data.								
CO5	They will be able to apply best practices for accessibility and responsiveness in HTML design.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to HTML: Overview of the World Wide Web and HTML, basic structure of an HTML document, understanding HTML tags and elements, creating headings, paragraphs, and line breaks, working with text formatting and styling	**8**	Understanding the World Wide Web and HTML, structuring HTML documents, using tags for headings, paragraphs, and line breaks, applying text formatting and styling, ensuring foundational skills in web content creation.	**1,2,3**
II	HTML Elements and Attributes: Semantic HTML elements, text-level semantic elements , understanding attributes and their usage, linking web pages with anchor tags , including images and multimedia content	**8**	Module focuses on using semantic and text-level elements effectively, mastering attributes for enhanced functionality, linking pages with anchor tags, and incorporating images and multimedia, ensuring comprehensive skills in web content	**3,4**

			creation.	
III	Forms with HTML: Introduction to HTML forms and their importance, Form structure using <form> tag, Input types for text, email, password, etc. , using radio buttons, checkboxes, and select lists, implementing form validation with HTML attributes	**10**	Forms with HTML teaches the importance and structure of HTML forms, utilizing <form> tag for form creation, incorporating input types like text, email, password, radio buttons, checkboxes, and select lists, and implementing form validation through HTML attributes, ensuring proficient form development skills.	**3,4**
IV	HTML5 Features and Advanced Techniques: Introduction to HTML5 and its new features ,semantic elements in HTML5 , incorporating geolocation and local storage, utilizing canvas for graphics and animations, working with responsive design and media queries	**10**	HTML5 Features and Advanced Techniques introduces HTML5's new features including semantic elements, geo location, local storage, canvas for graphics/animations, and responsive design with media queries, ensuring proficiency in modern web development practices and enhanced user experience.	**4**
V	Accessibility and Best Practices : Importance of web accessibility , semantic markup for improved accessibility, implementing ARIA roles and attributes, testing and validating HTML code, applying best practices for cross-browser compatibility and performance optimization	**9**	Accessibility and Best Practices module emphasizes the importance of web accessibility, using semantic markup for improved accessibility, implementing ARIA roles and attributes, testing and validating HTML code for compliance, and applying best practices for cross-browser compatibility and performance optimization, ensuring inclusive and efficient web development skills.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: **"HTML and CSS: Design and Build Websites" by Jon Duckett**:

- Beginner-friendly book with visual examples and clear explanations of HTML and CSS concepts.

T2: **"Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins**:

- Comprehensive guide covering HTML basics and beyond, suitable for beginners.

REFERENCE BOOKS:
R1: "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
R2: "HTML5: Up and Running" by Mark Pilgrim

OTHER LEARNING RESOURCES:

1. **YouTube Tutorials**:

   Channels like Traversy Media, The Net Ninja, and Academind offer video tutorials on HTML for visual learners.

2. **HTML Cheat Sheets and Reference Cards**:

   Download and use cheat sheets for quick reference to HTML tags and attributes.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Students will understand the basic syntax and structure of HTML	1,2,3,4,5,10 and 12
2	To create well-structured and semantically meaningful web pages using HTML tags.	1,2,3,4,5,10 and 12
3	To explore how to incorporate multimedia elements such as images, audio, and video into web pages.	1,2,3,4,5,10 and 12
4	They will learn to implement forms and input elements to	1,2,3,4,5,10 and 12

	collect user data.	
5	They will be able to apply best practices for accessibility and responsiveness in HTML design.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
2MOCECS217R	MOOCS II: HTML	CO 1	2	2	2	2	3					2		2
		CO 2	2	3	3	2	3					2		2
		CO 3	2	2	2	2	3					2		2
		CO 4	2	2	2	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – III									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Actively engage in diverse club activities (dance, music, photography, drama, literacy) to foster personal development. Participate enthusiastically in workshops and competitions, enhancing practical skills and competitive spirit. Develop proficiency to represent ADTU effectively in inter-university and national competitions, showcasing leadership and teamwork. Gain insights and skills from industry experts through workshops, enhancing professional competence and career readiness.								
CO1	Engage actively in diverse club activities such as dance, music, photography, drama, and literacy, fostering personal interests and skills development.								
CO2	Participate enthusiastically in workshops and competitions aligned with individual hobbies and interests, enhancing practical learning and competitive spirit.								
CO3	Gain proficiency to represent ADTU effectively in inter-university, state, and national level competitions, demonstrating leadership and teamwork.								
CO4	Benefit from workshops conducted by industry experts, gaining valuable insights and skills applicable to their respective fields of interest.								
CO5	Experience a 360-degree learning approach that integrates academic growth with holistic development, nurturing well-rounded personalities capable of thriving in various professional and social contexts.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended tomeet learner's interest, These activities are aimed to develop the social and soft skills and promote aholisticdevelopmentofthelearners,Keeping in mind the 360 degree learning methodology the studentsare engaged in different activities headed under different clubs viz. Dance, music, photography, drama,literary etc.,The students are encouraged to participate inregular club activities, workshops, competitions as per		**10**		Students at AdtU develop social and soft skills through diverse club activities like dance, music, photography, and drama. They participate in workshops, competitions, and expert-led sessions, preparing them for inter-university and				**4,5**

	their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		national level events.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Engage actively in diverse club activities such as dance, music, photography, drama, and literacy, fostering personal interests and skills development.	1,2,3,4,5,6,10 and 12
2	Participate enthusiastically in workshops and competitions aligned with individual hobbies and interests, enhancing practical learning and competitive spirit.	1,2,3,4,5,6,10 and 12
3	Gain proficiency to represent ADTU effectively in inter-university, state, and national level competitions, demonstrating leadership and teamwork.	1,2,3,4,5,6,10 and 12
4	Benefit from workshops conducted by industry experts, gaining valuable insights and skills applicable to their respective fields of interest.	1,2,3,4,5,6,10 and 12
5	Experience a 360-degree learning approach that integrates academic growth with holistic development, nurturing well-rounded personalities capable of thriving in various professional and social contexts.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	**Course Name**	**Cos**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22UBCC211	**CO-CURRICULAR ACTIVITIES**	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2

		CO 5	1	1	1	1	2	1				1		3

SEMESTER – III									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC211**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Develop effective planning skills to contribute meaningfully, maintain commitment, and manage time and priorities. Cultivate leadership qualities and passion for diverse interests beyond academics. Engage in co-curricular activities for holistic personality development. Demonstrate clear expression, in-depth evaluation, and analytical skills in chosen topics, integrating transferable learning experiences.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are	**10**	AdtU fosters holistic development through extracurricular activities like dance, music, photography, and more. Students engage in club activities, workshops, and competitions, enhancing social skills and learning from industry experts, preparing them for national-level competitions.	**4,5**

	encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			
Practical Component				

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10 and 12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10 and 12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10 and 12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10 and 12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12
22UBEC211	EXTRA CURRICULAR ACTIVITIES	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**Computer Organization & Architecture**								
Course code	**22BTCS221R**	**Total credits: 3** **Total hours: 42T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3
Pre-requisite	**Programming For Problem Solving**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Discuss the organization and architecture of computer systems and electronic computers. 2. Analyze the basic components of computer systems besides the computer arithmetic. 3. Discuss input-output organization, memory organization and management, and pipelining.								
CO1	Understand the interaction of the components of a computer system with the instruction set architecture of a CPU and addressing modes.								
CO2	Analyse the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers.								
CO3	Analyse the control unit design approaches, memory design technologies and I/O transfers.								
CO4	Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory. .								
CO5	Summarize the concepts of memory organization with mapping functions and replacement algorithms.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.	**8**	Understanding the key functional blocks of a computer, including CPU, memory, input/output devices, and their interrelationships and operations	1,2, 3
II	**Data representation:** signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	**8**	Understand how computers represent data using binary, hexadecimal, and ASCII systems. Learn conversion methods between these formats and comprehend their significance in computer operations and programming.	3, 4

	Introduction to x86 architecture..			
III	**CPU control unit design:** hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB	**10**	Understand the architecture and function of the CPU control unit, including instruction decoding, control signal generation, and execution sequencing. Learn to design control units using both hardwired and microprogrammed approaches, and comprehend their role in overall CPU performance.	3, 4
IV	**Pipelining**: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	**8**	Understand the concept and implementation of pipelining in CPU architecture to improve instruction throughput. Learn about various stages of pipeline execution, potential hazards (data, control, structural), and techniques for hazard mitigation. Gain insight into the impact of pipelining on overall system performance and efficiency.	4
V	**Memory organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	**8**	Understand the structure and organization of computer memory, including hierarchical levels (cache, primary, secondary storage), memory addressing, and data access methods. Learn about memory management techniques, such as paging and segmentation, and comprehend their impact	4

			on system performance and resource allocation.	

TEXT BOOKS:

T1:"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

REFERENCE BOOKS:

R1: "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

R2: "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.

R3: "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the interaction of the components of a computer system with the instruction set architecture of a CPU and addressing modes.	1, 2, 3, 10, 12
2	Analyse the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers.	1, 2, 3, 4, 5, 10, 12
3	Analyse the control unit design approaches, memory design technologies and I/O transfers.	1, 2, 3, 10, 12
4	Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory.	1, 2, 3, 4, 10, 12
5	Summarize the concepts of memory organization with mapping functions and replacement algorithms.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
22BTCS221R	Computer Organization & Architecture	CO 1	2	3	1							1		3
		CO 2	3	3	3	2	2					1		3
		CO 3	2	2	2							1		3
		CO 4	2	2	3	2						1		3
		CO 5	2	2	2	2	1					1		3

SEMESTER – IV									
Course Title	**Operating Systems**								
Course code	**22BTCS222R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 42T+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	4. To learn the mechanisms of OS to handle processes and threads and their communication and the mechanisms involved in memory management in contemporary OS. 5. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 6. To know the components and management aspects of concurrency management.								
CO1	Analyze operating system evolution, types, services, and structures including UNIX and WINDOWS.								
CO2	Analyze process concepts, relationships, and states, examine thread advantages, and appraise CPU scheduling objectives, algorithms, and criteria. .								
CO3	Evaluate IPC mechanisms and solutions for classical problems; assess deadlock conditions and use prevention, avoidance, detection, and recovery techniques.								
CO4	Evaluate memory management concepts, including mapping, allocation strategies, paging, virtual memory principles, and analyse page fault/replacement algorithms.								
CO5	Analyze I/O hardware, device controllers, DMA principles, and I/O software, secondary-storage structures, disk scheduling algorithms, file management concepts, allocation methods, and directory implementations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.	7	Understand the fundamental concepts and evolution of operating systems, different OS types, services, and system calls. Learn the structural models of operating systems—layered, monolithic, microkernel—and grasp the concept and benefits of virtual machines.	2
II	Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context	8	Understand processes, their relationships, states, state transitions, and the Process Control Block (PCB). Learn about	2, 4

	switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling.		threads, their states, benefits, and types, including multithreading. Grasp process scheduling foundations, objectives, types of schedulers, scheduling criteria, and algorithms like FCFS, SJF, RR, including pre-emptive and non-pre-emptive methods, and multiprocessor scheduling.	
III	Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker‘s algorithm, Deadlock detection and Recovery.	8	Understand inter-process communication, focusing on critical sections, race conditions, and mutual exclusion, including hardware solutions. Learn about deadlocks, including their definition, necessary and sufficient conditions, prevention, avoidance using the Banker's algorithm, and methods for detection and recovery. Gain insight into ensuring robust and efficient process synchronization.	2, 4
IV	Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	8	Understand memory management concepts, including logical and physical address mapping, contiguous memory allocation with fixed and variable partitions, internal and external fragmentation, and compaction. Learn about paging, virtual memory basics, control structures, locality of reference, demand paging, and page replacement algorithms like Optimal, FIFO, SC,	2, 4, 5

			NRU, and LRU for efficient memory utilization and management.	
V	I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure.. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management. Disk Management: Disk structure, Disk scheduling, Disk reliability, Disk formatting, Boot-block, Bad blocks.	8	Gain understanding of I/O hardware, including devices, controllers, and principles of direct memory access (DMA). Explore I/O software goals, including interrupt handlers, device drivers, and device-independent I/O software. Learn file management concepts, access methods, types, operations, directory and file system structures, allocation methods, and free-space management. Understand disk management encompassing structure, scheduling, reliability, formatting, boot-block, and handling bad blocks for efficient storage and retrieval operations.	2, 4, 5
Practical	**1. Write Shell Script for followings** a. To find the global complete path for any file. b. To broadcast a message to a specified user or a group of users logged on any terminal. c. To copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the directories. d. To compare identically named files in two different directories and if they are same, copy one of them in a third directory e. To delete zero sized files from a given directory (and all its sub-directories). f. To display the name of those files (in the given directory) which are having multiple links.	**20**	Upon completion of these shell scripting tasks, learners will gain proficiency in file path retrieval, user message broadcasting, selective file copying based on timestamp, file comparison and copying, zero-sized file deletion, identifying files with multiple links, listing executable files, displaying formatted date/time with a greeting, and sorting directories by file size in descending order.	1,2,3,4

	g. To display the name of all executable files in the given directory. h. Write a script to display the date, time and a welcome message (like Good Morning etc.). The time should be displayed with "a.m." or "p.m." and not in 24 hours notation. i. Write a script to display the directory in the descending order of the size of each file			
	2. Implementation of FCFS (First Come First Serve) CPU Scheduling. 3. Implementation of SJF (Shortest Job First) CPU Scheduling. 4. Implementation of Round Robin (RR) CPU Scheduling. 5. Implementation of Priority CPU Scheduling Algorithm.	**20**	Upon implementing FCFS, SJF, Round Robin, and Priority CPU scheduling algorithms, learners will achieve proficiency in understanding and simulating these fundamental scheduling techniques, gaining insight into their respective advantages, limitations, and practical applications in optimizing CPU resource allocation and system performance.	2,3,4, 5
	6. Implementation of FIFO Replacement Algorithm. 7. Implementation of Optimal Page Replacement Algorithm. 8. Implementation of LRU Page Replacement Algorithm by Stack method 9. Implement the producer-consumer problem using threads	**20**	Through implementing FIFO, Optimal, and LRU page replacement algorithms, as well as the producer-consumer problem using threads, learners will develop a deep understanding of memory management strategies, gaining practical experience in simulating and evaluating these techniques to optimize resource allocation, enhance system performance, and mitigate concurrency issues in computer systems.	2,3,4,5,6

TEXT BOOKS:

T1: Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

T2: Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

REFERENCE BOOKS:

R1: Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.

R2: Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley

R3: Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

R4: Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze operating system evolution, types, services, and structures including UNIX and WINDOWS	1, 2,3, 4, 5, 10, 12
2	Analyze process concepts, relationships, and states, examine thread advantages, and appraise CPU scheduling objectives, algorithms, and criteria.	1, 2,3, 4, 5, 10, 12
3	Evaluate IPC mechanisms and solutions for classical problems; assess deadlock conditions and use prevention, avoidance, detection, and recovery techniques.	1, 2,3, 4, 5, 10, 12
4	Evaluate memory management concepts, including mapping, allocation strategies, paging, virtual memory principles, and analyse page fault/replacement algorithms.	1, 2,3, 4, 5, 10, 12
5	Analyze I/O hardware, device controllers, DMA principles, and I/O software, secondary-storage structures, disk scheduling algorithms, file management concepts, allocation methods, and directory implementations.	1, 2,3, 4, 5, 10, 12

MAPPING TABLE

Course code	**Course Name**	**CO**	**PO1***	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
22BTCS222R	**Operating Systems**	CO1	3	2	2	3	2					3		2
		CO2	3	2	2	2	2					2		1
		CO3	3	3	3	3	2					3		1
		CO4	2	2	3	2	3					2		2
		CO5	2	2	2	3	2					3		1

SEMESTER – IV									
Course Title	**Design & Analysis of Algorithms**								
Course code	**22BTCS223R**	**Total credits: 3 Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Data Structures**	**Co-requisite**	**C / C++ Programming**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Analyze the asymptotic performance of algorithms. 2. Demonstrate a familiarity with major algorithms and data structures. 3. Apply important algorithmic design paradigms and methods of analysis.								
CO1	Analyze algorithms, apply asymptotic notations, solve mathematical analyses, showing proficiency in problem-solving.								
CO2	Apply sorting and searching algorithms, matrix multiplication, using brute force and divide-and-conquer strategies.								
CO3	Apply greedy approaches and dynamic programming to optimize problems, showcasing expertise in algorithmic design.								
CO4	Apply strategies to solve problems like the N-Queen, knapsack, and traveling salesperson problems.								
CO5	Evaluate decision tree lower bounds, grasp P, NP, and NP-Complete complexity classes, showing understanding of lower bound theory's algorithmic implications..								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction:** Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.	10	Upon completing this study, learners will understand algorithm characteristics, analyze complexity using best, average, and worst-case scenarios, measure algorithmic performance considering time and space trade-offs, and effectively analyze recursive algorithms using methods like substitution, recursion tree, and the Master's theorem for efficiency evaluation.	1,2, 3
II	**Fundamental Algorithmic Strategies:**Brute-Force, Greedy, Dynamic	8	Upon completion, learners will proficiently apply fundamental	3, 4

	Programming		algorithmic strategies—Brute-Force, Greedy, and Dynamic Programming—to solve computational problems efficiently and optimally.	
III	**Advanced Algorithmic Strategies:** Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.	10	Upon completion, learners will master advanced algorithmic strategies such as Branch and Bound, Backtracking, and heuristics, applying them to solve complex computational problems like Bin Packing, Knapsack, and Traveling Salesman Problem (TSP), enhancing problem-solving skills across diverse application domains.	3, 4,
IV	**Graph and Tree Algorithms**: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.	10	Upon mastering graph and tree algorithms including DFS, BFS, shortest path, transitive closure, MST, topological sorting, and network flow algorithms, learners will effectively analyze and solve problems using graph structures, enhancing their proficiency in algorithm design and application across diverse computational domains.	3, 4
V	**Tractable and Intractable Problems:** Computability of Algorithms, Computability classes – P,NP, and NPhard, Approximation algorithms, Randomized algorithms	7	Upon completion, learners will understand the fundamental concepts of computability in algorithms, distinguish between tractable (P) and intractable (NP,	4

			NP-complete, NP-hard) problems, comprehend Cook's theorem, identify standard NP-complete problems, and apply reduction techniques to solve complex computational challenges effectively.	

TEXT BOOKS:

T1:Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.

T2: Fundamentals of Algorithms – E. Horowitz et al.

REFERENCE BOOKS:

R1: Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.

R2: Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.

R3: Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze algorithms, apply asymptotic notations, solve mathematical analyses, showing proficiency in problem-solving.	1, 2, 3, 4, 11, 12
2	Apply sorting and searching algorithms, matrix multiplication, using brute force and divide-and-conquer strategies.	1, 2, 3, 4, 11, 12
3	Apply greedy approaches and dynamic programming to optimize problems, showcasing expertise in algorithmic design.	1, 2, 3, 4, 9, 10, 11, 12
4	Apply strategies to solve problems like the N-Queen, knapsack, and traveling salesperson problems.	1, 2, 3, 4, 9, 10, 11, 12
5	Evaluate decision tree lower bounds, grasp P, NP, and NP-Complete complexity classes, showing understanding of lower bound theory's algorithmic implications.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS223R	Design & Analysis of Algorithms	CO1	2	2	2	2							3	2
		CO2	2	2	2	2							2	2
		CO3	2	2	3	3					1	1	2	2
		CO4	2	3	2	2					1	1	2	2
		CO5	1	2	1	2	2				1	1	1	2

SEMESTER – IV									
Course Title	**Discrete Mathematics**								
Course code	**22BTCS224R**	**Total credits: 4 Total hours: 52T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Programming For Problem Solving**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. To provide students with an overview of discrete mathematics. 2. Students will learn about topics such as logic and proofs, sets and functions. 3. Students will also learn probability, recursion, graph theory, matrices, Boolean algebra and other important discrete math concepts.								
CO1	Understand the concepts of relation, function and partially ordered set.								
CO2	Enable to solve logical problems using truth table.								
CO3	Understand the concept of algebraic structures and it's relevant theorems.								
CO4	Understand the basic counting techniques.. .								
CO5	Understand the concepts of graphs and their basic properties.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	***Sets, relations and functions*:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	**12**	Upon completion, learners will understand and manipulate sets through basic operations and Cartesian products, comprehend various types of relations including compositions and inverses, and analyze different functions with their compositions and inverses. They will also grasp the concepts of complete partial ordering, lattices (chain, complete, distributive, modular, complemented), Boolean and pseudo-Boolean lattices.	1,2, 3
II	**Propositional Logic:** Syntax and semantics, proof systems, satisfiability, validity,	**10**	Upon completion, learners will grasp the syntax and semantics of propositional	2, 3, 4

	soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.		logic, proficiency in proof systems, evaluation of satisfiability and validity, understanding of soundness and completeness, application of the deduction theorem, and introduction to first-order logic and its theory.	
III	**Algebraic Structures:** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	**12**	Upon completion, learners will understand algebraic structures like semigroups, monoids, groups, rings, integral domains, fields, and Boolean algebra, with applications in coding theory and quotient structures.	2, 3, 4
IV	**Introduction to Counting:** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	**10**	Upon completion, learners will proficiently apply basic counting techniques, including inclusion-exclusion, pigeonhole principle, permutation, combination, summations, and understand introductory concepts of recurrence relations and generating functions.	1, 2, 3
V	**Introduction to Graphs:** Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	**8**	Upon completion, learners will understand fundamental graph theory concepts such as degrees, paths, cycles, subgraphs, isomorphism, Eulerian and Hamiltonian paths, and trees.	2, 3, 4

TEXT BOOKS:

T1:C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
T2:K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

R1: R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concepts of relation, function and partially ordered set	1, 2, 3, 4, 12
2	Enable to solve logical problems using truth table.	1, 2, 3, 4, 12
3	Understand the concept of algebraic structures and it's relevant theorems.	1, 2, 3, 4, 12
4	Understand the basic counting techniques.	1, 2, 3, 4, 12
5	Understand the concepts of graphs and their basic properties.	1, 2, 3, 4, 12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS224R	Discrete Mathematics	CO1	3	3	2	2								2
		CO2	3	2	3	2								2
		CO3	3	3	2	2								2
		CO4	3	2	3	2								2
		CO5	3	3	2	2								2

SEMESTER – IV									
Course Title	**Environmental Science**								
Course code	**22BTCS226R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 52T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite		**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Understanding Ecological Systems and Processes 2. Analyzing Environmental Issues and Solutions 3. Promoting Environmental Stewardship and Sustainable Practices.								
CO1	Understand the relationships between natural and man-made systems.								
CO2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development								
CO3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.								
CO4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment .								
CO5	Analyse various aspects of human population, and the impact of the population growth on the environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Environment:** Definition and scope, components of environment, atmosphere, hydrosphere, lithosphere and biosphere, structure and composition, Life systems, pro and eukaryotic organizations, Metabolic principles; types of plants and animals. Producers, consumers and decomposers.	**12**	Upon completion, learners will understand the fundamental concepts of the environment, encompassing its scope, components (atmosphere, hydrosphere, lithosphere, biosphere), life systems (prokaryotic and eukaryotic), metabolic principles, plant and animal classifications, and ecological roles of producers, consumers, and decomposers in ecosystems.	1,2, 3
II	**Ecology:** Terminology and approach, ecosystem, types of ecosystems; structure and function, mineral cycling, energy flow and trophic chains. Development and evolution.	**10**	. Upon completion, learners will grasp ecological concepts including terminology, ecosystem types, structure, function, mineral cycling, energy flow, trophic chains, and understand ecosystem	2, 3, 4

			development and evolution, enabling them to analyze and interpret ecological systems and their dynamics effectively.	
III	**Environmental Pollution**: Sources, causes, assessment, effect, prevention and control of water pollution, air pollution noise and land pollution. Strategies of management, concept of sustainability. Energy, e n v i r o n m e n t , and their relationship with human activities. Water Resources and utilization, forest resources.	**12**	Upon completion, learners will comprehend the sources, causes, assessment, effects, prevention, and control of water, air, noise, and land pollution. They will understand management strategies, sustainability concepts, and the interrelationship between energy, environment, and human activities, including the utilization of water and forest resources.	2, 3, 4
IV	**Global Environmental Problems:** Human health, settlements, management of rivers, lakes, forests, wild life and catchments. Role of society, NGO and Govt. agencies. Concept of urbanization and green cities Global Warming, greenhouse causes and effects, carbon Sequestration**.**	**10**	Upon completion, learners will understand global environmental issues including human health impacts, sustainable settlement management, conservation of rivers, lakes, forests, and wildlife. They will grasp the roles of society, NGOs, and government agencies in environmental stewardship, and comprehend concepts related to urbanization, green cities, global warming, greenhouse gas causes and effects, and carbon sequestration.	12, 3, 4
V	**International agreements and protocols**, National forest policy and Environmental laws and acts. EIA.	**8**	Upon completion, learners will grasp international agreements and protocols concerning environmental conservation, understand national forest policies, environmental laws, and acts governing sustainable practices. They will also comprehend Environmental Impact	2, 3, 4

			Assessment (EIA) processes, enabling them to contribute effectively to environmental management and policy implementation.	

TEXT BOOKS:

T11. Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the relationships between natural and man-made systems.	1,2,3,4,7,12
2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development	1,2,3,4,7,12
3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.	2,7,12
4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment .	2,3,7
5	Analyse various aspects of human population, and the impact of the population growth on the environment.	1,2,3,4,7,12

MAPPING TABLE

Course code	**Course Name**	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS226R	**Environmental Science**	CO1	1	2	2	2			3					3
		CO2	2	2	2	2			3					3
		CO3		3					3					3
		CO4		1	2				3					
		CO5	1	2	2	2			3					3

SEMESTER – IV									
Course Title	**Techno Professional Skills III**								
Course code	**22BTCS225R**	**Total credits: 1 Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Develop advanced technical skills and knowledge relevant to the specific professional field or industry. 2. Enhance communication skills for effective interaction with clients, colleagues, and stakeholders in both technical and non-technical contexts. 3. Prepare students for successful entry into and advancement within their chosen profession through practical experience, problem-solving abilities, and ethical decision-making.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking. .								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming:** Programming constructs, Control Statements, Looping, Arrays, Strings.	**6**	Upon completion, learners will understand fundamental C programming constructs, including control statements, looping mechanisms, arrays, and string manipulation, enabling them to write, debug, and optimize basic to intermediate-level C programs efficiently.	2
II	**Advanced C Programming**: Functions, Pointers, Structures and Unions, File Handling.	**6**	Upon completion, learners will master advanced C programming concepts, including the use of functions, pointers, structures, unions, and file handling techniques, enabling them to develop	3, 4

			more complex and efficient C programs with enhanced functionality and data management capabilities.	
III	**Analog Electronic Circuits:**	**6**	Upon completion, learners will understand the principles and design of analog electronic circuits, including amplifiers, oscillators, filters, and their applications, enabling them to analyze and build analog systems effectively.	2
IV	**Digital electronic Circuits**	**6**	Upon completion, learners will understand the design and operation of digital electronic circuits, including logic gates, flip-flops, counters, and memory devices, enabling them to analyze, design, and implement digital systems effectively.	2
V	**Data Structure and Algorithms**	**6**	Understand and implement data structures and algorithms to solve computational problems efficiently and optimize program performance.	2

TEXT BOOKS:

T1:Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

T2:Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,9,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,9,10,12

3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,9,10,12
4	Encourage the students towards Non-traditional thinking. .	1,2,3,4,5,9,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,9,10,12

MAPPING TABLE

Course code	**Course Name**	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS225R	Techno Professional Skills III	CO1	2	2	3	2	2				3	2	3	3
		CO2	3	2	3	2	2				2	2	3	3
		CO3	3	2	3	3	3				3	2	3	2
		CO4	3	2	3	1	3				2	2	3	2
		CO5	3	2	3	3	3				2	2	2	2

SEMESTER – IV									
Course Title	**ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD223R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36P	0	0	**4**	0	0	0	**2**
Pre-requisite	**English for Employability for Engineers**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	7. To enhance the writing skills in different areas including Paragraph writing and letter writing. 8. To understand and enhance the Self-management skills. 9. To familiarize students with the use of Contextual vocabulary and Use of phrasal verbs and idioms in a conversation								
CO1	Demonstrate effective written communication skills in English, employing proper grammar and vocabulary.								
CO2	Analyze technical texts, extracting relevant information, and summarizing it with clarity and coherence.								
CO3	Apply English language proficiency in oral communication, including presentations and discussions in engineering contexts.								
CO4	Evaluate and synthesize complex technical information, demonstrating advanced comprehension and expression in English.								
CO5	Construct and critique engineering-related documents, such as reports and manuals, using precise language and appropriate conventions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Writing Skills **i.** Paragraph Writing & Narratives **ii.** Letter Writing **iii.** Technical Writing Pipe and cistern i.Introduction of pipes and cistern iii.Solving different types of questions	**7**	Upon completion, learners will enhance their writing skills through paragraph writing, narratives, letter writing, and technical writing. They will also understand the basics of pipes and cisterns, and develop proficiency in solving various related problems effectively.	1,2, 3
II	Self- Management Skills **i.** SWOT Analysis **ii.** Goal Setting and Personal Hygiene Mixture allegation and Clock i.Introduction of basics ii.Solving questions on mixture	**7**	Upon completion, learners will develop self-management skills through SWOT analysis, goal setting, and personal hygiene practices. They will also understand the basics of mixtures, allegations, and clocks, gaining proficiency in	1,2, 3

			solving related problems effectively.	
III	Vocabulary Development i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus Statement and Course of action i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement	**7**	Develop vocabulary through understanding word usage, learning strategies, contextual learning, phrasal verbs, idioms, and effective dictionary/thesaurus use. Analyze statements and actions.	1,2, 3
IV	Interview Skills & Dress Code Ethics i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session Sitting arrangement (puzzle) i.Linear arrangement puzzle ii.Circular arrangement puzzle Matrix	**11**	Upon completion, learners will master interview skills for various formats, answering strategies for common questions, and dress code ethics. They will also enhance problem-solving abilities through mock interviews and practice with linear and circular arrangement puzzles and matrix-based puzzles.	1,2, 3
V	Grammar (Flipped Classroom) i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt)	**4**	Upon completion, learners will enhance grammar skills through word-stress and syllable practice, addressing common errors. They will also master concepts of profit, loss, and discount, including basic principles and problem-solving	1,2, 3

	Profit loss and discount i. Introduction to basics ii. Introduction to discount iii. Probems related on the topic		techniques related to these financial calculations.	

TEXT BOOKS:

T1: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.

T2: • McDowell, Gayle Laakmann.2008.Cracking the Coding Interview (Indian Edition)

REFERENCE BOOKS:

R1: Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction Harper Perennial

R2: Taylor J. and Wright, J., IELTS Advantage Reading Skills: A step-by-step guide to a high IELTS reading score, Delta Publishing by Klett

R3: Murphy, Raymond,.(2012) English Grammar in Use Book with Answers: A Self- Study and Practice Book for Intermediate Learners of English, Cambridge University Press

R4: Job Interview Skills , Paige Labert, Publisher:DiDio Calderone Giuseppina

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate effective written communication skills in English, employing proper grammar and vocabulary.	2,3,7,8,10,12
2	Analyze technical texts, extracting relevant information, and summarizing it with clarity and coherence.	1,2,3,4,10,12
3	Apply English language proficiency in oral communication, including presentations and discussions in engineering contexts.	10,12
4	Evaluate and synthesize complex technical information, demonstrating advanced comprehension and expression in English.	1,2,3,4,10,12
5	Construct and critique engineering-related documents, such as reports and manuals, using precise language and appropriate conventions.	1,2,3,4,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD223R	ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS	CO1		1	1				1	2		3		1
		CO2	2	2	2	2						2		2
		CO3										3		1
		CO4	2	2	2	1						2		2
		CO5	3	2	2	2						3		3

SEMESTER – IV									
Course Title	MOOCS III: Web Application Development with Java Script and Mongo DB								
Course code	**22MOCS221R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Discuss the organization and architecture of computer systems and electronic computers. 2. Analyze the basic components of computer systems besides the computer arithmetic. 3. Discuss input-output organization, memory organization and management, and pipelining.								
CO1	Grasp the core principles of web development.								
CO2	Become proficient in writing clean, efficient, and maintainable JavaScript code.								
CO3	Leverage JavaScript libraries and frameworks like jQuery or React to create dynamic and user-friendly web interfaces with interactive elements and animations.								
CO4	Implement client-server communication.								
CO5	Grasp the concepts of NoSQL databases and explore MongoDB for data storage and retrieval.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to Web Development Fundamentals The Web Development Landscape: Understanding the building blocks of the web, including HTTP requests and responses, client-server architecture, and the role of HTML, CSS, and JavaScript. Client-Side vs. Server-Side Scripting: Differentiating between front-end and back-end functionalities and how JavaScript interacts with both sides. Browser Developer Tools: Introduction to browser developer tools for inspecting elements, debugging code, and analyzing network requests. HTML and CSS Refresher: Reviewing basic HTML syntax and structure, along with fundamental CSS concepts for styling web pages. Introduction to JavaScript: Learning	**3**	Upon completion, learners will understand web development fundamentals, including client-server architecture, HTML, CSS, JavaScript, and their interactions. They will gain skills in using browser developer tools, differentiating client-side and server-side scripting, and mastering core JavaScript syntax and concepts.	3

	the core syntax of JavaScript, including variables, data types, operators, control flow statements, and functions.			
II	Mastering JavaScript Programming DOM Manipulation: Understanding the Document Object Model (DOM) and using JavaScript to manipulate elements, attributes, and styles. Event Handling: Learning to respond to user interactions like clicks, scrolls, and form submissions using event listeners. Working with Functions and Objects: Creating reusable functions, understanding object-oriented programming concepts, and working with built-in JavaScript objects. Asynchronous Programming: Exploring asynchronous programming techniques like callbacks, promises, and async/await to handle asynchronous operations effectively. JavaScript Libraries and Frameworks: Introducing popular JavaScript libraries like jQuery or React for simplifying common tasks and building more complex web interfaces.	**3**	Upon completion, learners will master JavaScript programming, including DOM manipulation, event handling, reusable functions, object-oriented programming, and asynchronous techniques (callbacks, promises, async/await). They will also be introduced to popular JavaScript libraries and frameworks like jQuery and React for advanced web development.	3
III	**Building Interactive Web Interfaces** Interactive Elements and User Experience: Focusing on creating engaging user experiences with interactive elements like forms, animations, and dynamic content. Form Validation and Error Handling: Implementing JavaScript-based form validation to ensure user input accuracy and handling potential errors gracefully. Introduction to Web APIs: Exploring web APIs for accessing data and functionalities from external sources like weather APIs	**3**	Upon completion, learners will create engaging web interfaces using interactive elements, implement form validation and error handling, explore web APIs for external data access, understand single-page applications (SPAs) with frameworks like React or Angular, and learn web application deployment strategies.	3

	or social media APIs. Building Single-Page Applications (SPAs): Understanding the concept of SPAs and learning how JavaScript frameworks like React or Angular can be used to build them. Deployment Strategies: Learning how to deploy your web applications to a web server for public access			
IV	Server-Side Development with Node.js Introduction to Node.js: Understanding Node.js as a server-side JavaScript runtime environment and its role in web development. Building a Simple Web Server: Creating a basic web server using Node.js to handle HTTP requests and respond with HTML content. RESTful APIs: Learning the principles of RESTful APIs for designing communication protocols between the front-end and back-end of web applications. Routing and Handlers: Implementing routing mechanisms in Node.js to handle different URL paths and associated functionalities. Databases and Data Persistence: Understanding the need for data persistence in web applications and how Node.js can interact with databases.	**3**	Upon completion, learners will understand Node.js as a server-side runtime, create simple web servers, design RESTful APIs for front-end and back-end communication, implement routing mechanisms, and interact with databases for data persistence in web applications.	3
V	Data Management with MongoDB Introduction to NoSQL Databases: Exploring the concepts of NoSQL databases and their advantages compared to traditional relational databases. MongoDB Fundamentals: Learning about MongoDB as a popular	**3**	Upon completion, learners will understand NoSQL databases, focusing on MongoDB's document-based structure. They will perform CRUD operations, design efficient data models, and utilize advanced	3

	NoSQL document database and its core data structures (documents and collections). CRUD Operations: Performing Create, Read, Update, Delete (CRUD) operations on MongoDB data using its query language and drivers for Node.js. Data Modeling for MongoDB: Learning how to design efficient data models for your web applications using MongoDB's document structure. Advanced Features: Exploring advanced functionalities of MongoDB such as querying with complex filters, sorting, and data aggregation		MongoDB features like complex queries, sorting, and data aggregation for robust data management in web applications	

TEXT BOOKS:

T1:Haverbeke, Marijn. Eloquent javascript: A modern introduction to programming. No Starch Press, 2018.

T2: Chodorow, C. "Introduction to mongodb." In Free and Open Source Software Developers European Meeting (FOSDEM), vol. 18, pp. 80-83. 2010.

REFERENCE BOOKS:

R1: 1. Robson, Elisabeth, and Eric Freeman. Head First Html With CSS & XHTML. " O'Reilly Media, Inc.", 2005.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Grasp the core principles of web development.	1,2,3,4,5,10,12
2	Become proficient in writing clean, efficient, and maintainable JavaScript code.	1,2,3,4,5,10,12
3	Leverage JavaScript libraries and frameworks like jQuery or React to create dynamic and user-friendly web interfaces with interactive elements and animations.	1,2,3,4,5,10,12
4	Implement client-server communication.	1,2,3,4,5,10,12
5	Grasp the concepts of NoSQL databases and explore	1,2,3,4,5,10,12

	MongoDB for data storage and retrieval.	

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22MOCS221R	MOOCS III: Web Application Development with Java Script and Mongo DB	CO1	2	2	2	2	3					2		2
		CO2	2	3	3	2	3					2		2
		CO3	2	2	2	2	3					2		2
		CO4	2	2	2	3	3					2		2
		CO5	3	3	3	3	3					2		2

SEMESTER – IV									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions,	**30**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC221	CO CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Enhance students' practical skills, teamwork, and leadership abilities through engaging activities that complement academic learning and promote personal growth. 2. Foster physical, emotional, social, and cultural development by providing diverse opportunities for creative expression, athletic participation, and community involvement. 3. Encourage active participation in community service and social initiatives, cultivating a sense of responsibility, empathy, and civic engagement among students.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and	**30**	Upon completion, students will develop practical skills, teamwork, and leadership abilities, experience holistic growth through creative, athletic, and social activities, and gain a sense of responsibility and civic engagement through active participation in community service and social initiatives.	3

	national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC221	EXTRA CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**BASIC ACCLIMATIZING SKILLS (BAS)**								
Course code	**23UULS221R**	**Total credits: 1 Total hours: 30 P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	2	0	0	0	1
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. To impart knowledge of the fundamentals of Hospitality industry and its applications. 2. Students will be able to familiarize with the cooking equipment's & Utensils. 3. Students will be able to handle different modes of reservations.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	"Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Accommodation Management** ● Telephone handling technique ● Organizing of Rooms. ● Cleaning equipment's and uses. ● Bed making Process.	6	Upon completion, learners will efficiently manage accommodation facilities, demonstrating proficiency in telephone handling, room organization, cleaning equipment utilization, and bed making processes.	1,2, 3

II	**Fundamental of Cooking** ● Uses of basic cooking equipment's ● Uses of fire & Fuel ● Different cuts of vegetables ● Uses of herbs & spices Regional Food Habits	6	Upon completion, learners will demonstrate competency in using cooking equipment, managing fire and fuel, preparing vegetable cuts, utilizing herbs and spices, and understanding regional food habits.	2, 3, 4
III	**Food and Beverage skills** ● Introduction to catering industry ● Types menus and beverages ● Identifications of Cutlery, crockery & glassware ● Table etiquettes or manners ● Customer handling skills or Situation Handling	6	Upon completion, learners will master the catering industry, understand menu and beverage types, identify cutlery, crockery, and glassware, practice table etiquette, and develop customer handling and situation management skills.	2, 3, 4
IV	**Travel management** ● Travel Documentation (Types) ● Application of passport & Visa ● Tourism products (UNESCO sites) ● Types of logistics in travel and tourism management	6	Upon completion, learners will effectively manage travel logistics, handle travel documentation including passports and visas, understand tourism products like UNESCO sites, and apply various types of logistics in travel and tourism management.	1, 2, 3
V	**Basic Hospitality Skills** ● Various Egg Preparations ● Canapés preparations ● Mock tail & Shakes Preparations ● Butter Rice / Lemon	6	Upon completion, learners will proficiently prepare a variety of dishes including eggs, canapés, mocktails, shakes, rice dishes, lentils, and both vegetarian and non-vegetarian dishes in basic	2, 3, 4

	Rice ● Various Lentils Preparations ● 1 non-veg preparation/ 1 veg preparation		hospitality settings.	

TEXT BOOKS:

T1:Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt ltd-New Delhi.

T2: Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restauranteur, Guides.

REFERENCE BOOKS:

R1: Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	1,2,3,4,7,10,12
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	1,2,3,4,7,10,12
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	1,2,3,4,7,10,12
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	1,2,3,4,7,10,12
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges	1,2,3,4,7,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
23UULS111R	BASIC ACCLIMATIZIG SKILLS (BAS)	CO1	1	1	2	2			3			1		2
		CO2	1	1	2	2			3			1		2
		CO3	1	2	3	2			3			1		2
		CO4	2	3	2	3			3			1		2
		CO5	3	3	3	3			3			1		2

SEMESTER – V									
Course Title	**Signals and Systems**								
Course code	**22BTCS311R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	10. Introduces students for an intermediate level of fluency with signals and systems in both continuous time and discrete time. 11. Prepares students for more advanced subjects in digital signal processing (including audio, image and video processing). 12. Prepares students in communication theory, and system theory, control and robotics.								
CO1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.								
CO2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.								
CO3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.								
CO4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.								
CO5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Signal and System:** signal and system as seen in everyday life, signal properties, periodicity, determinism and stochastic characteristics, special signal, system properties.	**7**	To Explain different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2
II	**Behaviour of continuous and discrete time LTI system:** Impulse response, step response, convolution, input-output behaviour, Characterization of causality and stability of LTI system.	**8**	Classifications of the standard forms of Signals with respect to systems based on their properties	1,2
III	**Laplace Transform:** Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros.	**10**	Analysing the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2
IV	**Fourier Analysis of Continuous**	**12**	Analyzation of the	1,2

	and discrete Time Signals and Systems: Fourier Series, Fourier Transform and properties, Parseval‟s theorem, Frequency response of LTI systems. Sampling Theorem.		concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	
V	**Z-Transform:** Z-Transform and its inverse: Definition, Existence Region of convergence and properties. Application of Z-Transform for the analysis of Discrete time LTI systems, Significance of poles and zeros.	**8**	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2

TEXT BOOKS:

T1: Oppenheim Alan, V., Willsky Alan. S., and Nawab, H., “Signals and Systems‟, Prentice Hall, 1997.

REFERENCE BOOKS:

R1: Haykin Simon, “Communication Systems”, 3rd Edition, John Wiley, 1995.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2,3,4,5,10,12
2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.	1,2,3,4,10,12
3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,10,12
4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,10,12
5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2,3,4,5,10,12

MAPPING TABLE

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12

22BTCS311R	Signals and Systems	CO 1	3	2	3	2	1					2		3
		CO 2	3	3	3	3						3		3
		CO 3	3	3	3	3						3		3
		CO 4	3	2	3	2	1					2		3
		CO 5	3	2	3	2	1					2		3

SEMESTER – V									
Course Title	**Database Management Systems**								
Course code	**22BTCS312R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 35T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**File Systems**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To understand and use data manipulation language to query, update, and manage a database. 2. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency. 3. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.								
CO1	Understand the fundamental concepts of database management systems with DBMS languages and data models.								
CO2	Apply the concepts of query languages such as DDL and DML for designing a relational database.								
CO3	Apply the ACID properties and concurrency control schemes to perform transaction processing with database recovery.								
CO4	Apply security to the database by checking for authentication and authorization.								
CO5	Apply advanced topics of data warehousing and data mining, distributed databases and web databases.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	**6**	Analyzing data system architecture and the data models.	1,2
II	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.	**10**	Analyzing Relational Query languages, database design and query processing and optimization.	1,2

	Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.			
III	**Transaction processing:** Concurrency control, ACID property, Serializability ofscheduling, Locking and timestamp based schedulers, Multi-version and optimistic, Concurrency Control schemes, Database recovery.	**8**	Analysing the concepts of Transaction Processing.	1,2
IV	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	**6**	Analyzation of the concepts of Database Security.	1,2
V	**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	**5**	Analyzation of Advanced topics of Object oriented and object relational databases.	1,2
Practical	10. **Database Design and Modeling:** Introduction to Database Systems, Data Abstraction and Data Models, Entity-Relationship (ER) Modeling, Relational Model and Schema Design, Case Studies and Lab Exercises: Creating ER Diagrams and Converting ER Models to Relational Schemas.	**6**	Describe, illustrate, and explain the creation of ER Diagrams and Converting ER Models to Relational Schemas.	1,2,3,4
	11. SQL Querying and Data Manipulation: Introduction to SQL, Data Definition Language (DDL), Data Manipulation Language (DML), Data Query Language (DQL), Advanced SQL Queries: Joins, Subqueries, and Views, Case Studies and Lab Exercises: Writing and Executing SQL Queries.	**6**	Describe, illustrate, and explain the creation of Writing and Executing SQL Queries.	1,2,3,4
	12. Transaction Management and Concurrency Control: Introduction to Transactions, ACID Properties (Atomicity, Consistency, Isolation, Durability), Concurrency Control Mechanisms, Isolation	**6**	Describe, illustrate, and explain and creation of Transaction Management and Concurrency Control	1,2,3,4

	Levels and Locking, Case Studies and Lab Exercises: Implementing Transactions and Concurrency Control.			
	13. Database Security and Authorization: Introduction to Database Security, User Authentication and Roles, Access Control and Authorization, SQL Injection and Security Best Practices, Case Studies and Lab Exercises: Securing Databases	**6**	Describe, illustrate, and explain Database Security and Authorization	1,2,3,4
	14. Advanced topics: Object-Oriented Databases, Distributed Databases, Data Warehousing and OLAP, NoSQL Databases, Case Studies and Lab Exercises: Implementing Advanced Database Solutions.	**6**	Describe, illustrate, and explain the Implementation of Advanced Database Solutions.	1,2,3,4

TEXT BOOKS:

T1: "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

REFERENCE BOOKS:

R1: "Principles of Database and Knowledge–Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
R2: "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
R3: "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the fundamental concepts of database management systems with DBMS languages and data models.	1,2,3,4,5,9,11,12
2	Apply the concepts of query languages such as DDL and DML for designing a relational database.	1,2,3,4,5,9,11,12
3	Apply the ACID properties and concurrency control schemes to perform transaction processing with database recovery.	1,2,3,4,5,9,11,12

4	Apply security to the database by checking for authentication and authorization.	1,2,3,4,5,9,11,12
5	Apply advanced topics of data warehousing and data mining, distributed databases and web databases.	1,2,3,4,5,9,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS312R	Database Management Systems	CO1	2	2	3	2	2				3		3	3
		CO2	3	2	3	2	2				2		3	3
		CO3	3	2	3	3	3				3		3	2
		CO4	3	2	3	1	3				2		3	2
		CO5	3	2	3	3	3				2		2	2

SEMESTER – V									
Course Title	**Formal Language & Automata Theory**								
Course code	**22BTCS313R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Knowledge in Mathematics and Data Structure and Algorithm**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To provide an introduction to some of the central ideas of theoretical computer science from the perspective of formal languages. 2. To introduce the fundamental concepts of formal languages, grammar, and automata theory. 3. To develop problem-solving abilities using deterministic and non-deterministic machines.								
CO1	Understand the fundamental characteristics of formal languages and formal grammar.								
CO2	Understand the similarity between deterministic and non-deterministic finite automata								
CO3	Understand the minimization of deterministic and nondeterministic finite automata.								
CO4	Analyze the similarity between non-deterministic push-down automata and context-free grammars.								
CO5	Analyze the fundamental characteristics of Turing machines and how they are used in computing.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Finite Automata:** Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition.	8	Describe, illustrate, and explain the central concepts of Automata Theory.	1,2
II	**Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata – Pumping Lemma.	8	Describe, illustrate, and explain regular expressions and languages.	1,2
III	**Context Free Grammars and Languages:** Definition, Leftmost and rightmost grammars, Parse	6	Describe, illustrate, and explain context Free Grammars and Languages.	1,2

	trees, Ambiguity: Ambiguous grammar, Removing ambiguity, Normal forms, Applications of context free grammars: Parsers			
IV	**Pushdown automata (PDA) and context free languages (CFL):** Definition & representation of pushdown automata, Acceptance by PDA: By final state, By empty stack, Deterministic PDA, Equivalence of PDA and CFL, Pumping lemma for CFL Closure properties of CFL.	8	Describe, illustrate, and explain the representation of pushdown automata and context free languages.	1,2
V	**Turing machines:** Definition, Language of a Turing machine, Programming Turing machines, The Church-Turing thesis, A simple programming language, Extensions of the basic Turing machine.	6	Describe, illustrate, and explain the basic Turing machine.	1,2

TEXT BOOKS:

T1: Theory of Computer Science : Automata, Languages and Computation – K.L.P. Mishra and N. Chandrasekaran, PHI.

T2: Introduction to Languages and Theory of Computations – Martin J. C., TMH.

REFERENCE BOOKS:

R1: Introduction to Automata Theory, Languages and Computation – Hopcroft, Ullman, Pearson Education.

R2: Elements of the Theory of Computation – Papadimitrou, C. and Lewis, C.L, PH.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the fundamental characteristics of formal languages and formal grammar.	1,2,3,10,12
2	Understand the similarity between deterministic and non-deterministic finite automata	1,2,3,4,5,10,12
3	Understand the minimization of deterministic and nondeterministic finite automata.	1,2,3,4,5,10,12
4	Analyze the similarity between non-deterministic push-down	1,2,3,4,5,10,12

	automata and context-free grammars.	
5	Analyze the fundamental characteristics of Turing machines and how they are used in computing.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS313R	Formal Language & Automata Theory	CO1	2	2	1							1		1
		CO2	3	3	2	2	1					1		2
		CO3	3	3	3	1	1					1		2
		CO4	3	3	2	2	1					1		2
		CO5	3	3	2	2	1					1		2

SEMESTER – V									
Course Title	**Object-Oriented Programming**								
Course code	**22BTCS314R**	**Total credits: 5**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 39T+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**File Systems**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To enable students to understand the basic object-oriented programming concepts and apply them in problem solving. 2. To illustrate among students the inheritance concepts for reusing the program. 3. To enable students to develop GUI-based applications using AWT, Swing and Event handling.								
CO1	Understand object-oriented programming concepts and implement in java.								
CO2	Understand and apply building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.								
CO3	Understand and apply concepts like multithreading, exception handling etc. in object-oriented programs.								
CO4	Apply exception-handling methods in programming.								
CO5	Create interactive as well as GUI-based java applications in project-based learning.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Java Overview:** Java Introduction, Platform Independence, JVM & JDK, Data types, Operators, If, else statement, Switch condition, while, do-while, for loop, break and continue statement. Array and String: Single Array & Multidimensional Array, Library Classes-String, String Buffer & Wrapper Class, Command line arguments and Various String Operations.	**7**	Analyzing Java and its properties, and also array and string.	1,2
II	**Classes, Objects and Methods:** Class and Object, Object reference, Constructor: Constructor Overloading, Method: Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Import statement, Static import, Access control, Nested class, Inner class,	**8**	Analyzing classes, objects, and methods.	1,2

	Anonymous inner class.			
III	**Inheritance and Interfaces in Java:** Overview of Inheritance, inheritance in constructor, Inheriting Data members and Methods, Multilevel Inheritance – method overriding Handle multilevel constructors super keyword, Stop Inheritance, final keyword. Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Abstract class, Comparison between Abstract Class and interface, inside of System.out.println – statements.	**8**	Analyzing the concepts of Inheritance and Interfaces in Java.	1,2
IV	**Exception Handling in Java:** Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class. **JAVA File Handling:** Overview of Different Stream (Byte Stream, Character stream), Readers and Writers class, File Class, File Input Stream, File Output Stream, Input Stream Reader and Output Stream Writer class, File reader and writer class, File Writer, Buffered Reader class.	**8**	Analyzation of the concepts of Exception Handling in Java.	1,2
V	**Applet, AWT and Swing:** Applet: Applet Fundamental, Applet Architecture, Applet Skeleton, Requesting Repainting , Event Handling: various event handling mechanisms, various classes related to event sources and event listeners, AWT: window fundamentals, creating frames, Adding removing various controls, Layout managers, Introduction To Swing.	**8**	Analyzation of fundamentals of Applet, AWT and Swing.	1,2

Practical	1. Hands-on Introduction to Object-Oriented Programming: Practical exercises on creating classes and objects, Implementing encapsulation through practical examples, Coding exercises on constructors and destructors, Applying access modifiers (public, private, protected) in practical scenarios.	**12**	Describe, illustrate and explain coding exercises on constructors and destructors, applying access modifiers in practical scenarios.	1,2,3,4
	2. Practical Inheritance and Polymorphism: Coding exercises on implementing different types of inheritance (single, multi-level, and multiple), Practical examples of method overriding, Creating and using abstract classes and interfaces, Implementing static and dynamic binding through practical examples.	**12**	Describe, illustrate and explain practical examples of method overriding, Creating and using abstract classes and interfaces, Implementing static and dynamic binding through practical examples,	1,2,3,4
	3. Advanced OOP Concepts in Practice: Practical exercises on creating and using packages and namespaces, Implementing exception handling in real-world scenarios, Creating and managing multithreaded applications, Practical exercises on generics and collections.	**12**	Describe, illustrate and explain creation and managing multithreaded applications, Practical exercises on generics and collections.	1,2,3,4
	4. Software Design and Development in Action: Hands-on Object-Oriented Analysis and Design (OOAD) exercises, Implementing design patterns (e.g., Singleton, Factory, Observer) in practical scenarios, Software testing and debugging exercises, Code optimization and refactoring practical sessions.	**12**	Describe, illustrate and explain Software testing and debugging exercises, Code optimization and refactoring practical sessions.	1,2,3,4
	5. Project-Based Learning and GUI Development: Practical exercises on building Graphical User Interfaces (GUI), Implementing event handling in GUI applications, Developing interactive and GUI-based applications using Swing/JavaFX/Qt, Project-based	**12**	Describe, illustrate and explain development of a real-world application using OOP concepts and GUI.	1,2,3,4

	learning: Developing a real-world application using OOP concepts and GUI.			

TEXT BOOKS:

T1: Herbert Schildt and Dale Skrien, ”Java Fundamentals – A comprehensive Introduction”, McGraw Hill.
T2: Herbert Schildt, “Java the complete reference”, McGraw Hill, Osborne.
T3: T. Budd, “Understanding Object- Oriented Programming with Java”, Pearson Education.

REFERENCE BOOKS:

R1: P.J.Dietel and H.M.Dietel , “Java How to program”, Prentice Hall.
R2: P.Radha Krishna , “Object Oriented programming through Java”, CRC Press.
R3: S.Malhotra and S. Choudhary, “Programming in Java”, Oxford University Press.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand object-oriented programming concepts and implement in java.	1,2,3,4,5,10,12
2	Understand and apply building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.	1,2,3,4,5,10,12
3	Understand and apply concepts like multithreading, exception handling etc.in object-oriented programs.	1,2,3,4,5,10,12
4	Apply exception-handling methods in programming.	1,2,3,4,5,10,12
5	Create interactive as well as GUI-based java applications in project-based learning.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS314R	Object-Oriented Programming	CO1	2	2	3	1	1							1
		CO2	2	1	3	1	1							1
		CO3	2	1	2	1	1							1
		CO4	2	1	2	1	1							1
		CO5	2	2	2	1	1							1

SEMESTER – V									
Course Title	**PE-1 : Foundations of Data Science**								
Course code	**22BTCS316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1.To provide fundamental knowledge on data science with querying and analytics required for the field of data science. 2.To understand the process of handling heterogeneous data, pre-process and visualize them for better understanding. 3.To gain the fundamental knowledge of data science tools and gain basic skill set to solve real-time data science problems.								
CO1	Acquire foundational knowledge in data science.								
CO2	Understand and apply various data analytics techniques.								
CO3	Apply advanced tools to work on dimensionality reduction and mathematical operations.								
CO4	Manage diverse data types and employ programming for knowledge representation through visualization.								
CO5	Demonstrate numerous open-source data science tools to solve real-world problems through industrial case studies.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction** NeedforDataScience– WhatisDataScience - Data Science Process – BusinessIntelligenceandDataScience– Prerequisites for a Data Scientist – ToolsandSkillsrequired.	**5**	To acquire foundational knowledge in data science.	1,2
II	**Exploratory Data Analysis (EDA) and Basic Statistical Interface:** Exploratory Data Analysis (EDA), statistical measures, Basic tools (plots, graphs and summary statistics) of EDA,Data Analytics Lifecycle, Discovery, Developing Initial Hypotheses, Identifying Potential Data Sources, EDA case study,testing hypotheses on means, proportions and variances, Errormetrics	**7**	To understand Exploratory Data Analysis (EDA) and Basic Statistical Interface.	1,2
III	**Data Science Methodology:** Analytics for Data Science–Examples of Data Analytics, Data Discovery, Data Preparation, Model Planning, Model Building,	**6**	To apply various algorithms of Data Science	1,2

	Communicate Results, Data cleaning -Data integration-Data Reduction-Data Transformation and Data Discretization, Feature Generation and Feature Selection, Feature Selection algorithms:Filters-Wrappers			
IV	**Basic Machine Learning Algorithms :**Classifiers-Decision tree-Naïve Bayes-k-Nearest Neighbors(k-NN),k-means–SVM,AssociationRulemining–Ensemblemethods	**6**	Analyzation of the concepts of Basic Machine Learning Algorithms.	1,2
V	**Platform for Data Science:** PythonforDataScience – PythonLibraries –Data Frame Manipulation with numpyand pandas – Exploration Data Analysis –Time Series Dataset – Clustering with Python–Dimensionality Reduction .Python integrated Development Environments(IDE) for Data Science.	**6**	Analyzation of Python integrated Development Environments(IDE) for Data Science.	1,2

TEXTBOOKS:

T1Sanjeev Wagh, Manisha Bhende, Anuradha Thakare, 'Fundamentals of Data Science, CRCPress,1st Edition, 2022

T2Datasciencefromscratch-FirstprincipleswithPython,JoelGrus,OâReily,2015.

REFERENCEBOOKS:

R1 Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt,O'Reilly(2014).

R2AvrimBlum,JohnHopcroft,Ravindran Kannan, "FoundationsofDataScience",Cambridge UniversityPress, First Edition, 2020.

R3 Data Mining: Concepts and Techniques", Third Edition, 2 Jiawei Han, MichelineKamberand Jian Pei,ISBN 0123814790 (2011).

R4BigDataandBusiness Analytics, JayLiebowitz, CRC press (2013)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Acquire foundational knowledge in data science.	1,2,3,4,10,12
2	Understand and apply various data analytics techniques.	1,2,3,4,10,12
3	Apply advanced tools to work on dimensionality reduction and mathematical operations.	1,2,3,4,5,10,12
4	Manage diverse data types and employ programming for knowledge representation through visualization.	1,2,3,4,10,12
5	Demonstrate numerous open-source data science tools to solve real-world problems through industrial case studies.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS316R	Foundations of Data Science	CO1	2	2	1	3						1		2
		CO2	2	2	1	3						1		2
		CO3	3	3	3	3	3					1		3
		CO4	3	3	3	3						1		3
		CO5	3	3	3	3	3					1		3

SEMESTER – V									
Course Title	**PE-1 : Neural Networks**								
Course code	**22BTCS316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To understand, analyze, and apply various Artificial Neural Network architectures. 2. To train algorithms for a range of applications in machine learning and deep learning.								
CO1	Understand the historical developments and potential applications of Artificial Neural Networks (ANN).								
CO2	Analyse Artificial Neural Network architectures based on connectivity and learning strategies.								
CO3	Apply training algorithms for discrete and continuous Perceptron networks in Feed Forward Networks.								
CO4	Apply backpropagation training and explore the architecture of Convolutional Neural Networks in Deep Learning.								
CO5	Evaluate the architecture and training algorithms of Bidirectional Associative Memory (BAM) and Hopfield Network in Associative Memories.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Neural Networks** Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.	**5**	To acquire foundational knowledge in Neural Networks.	1,2
II	**Essentials of Artificial Neural Networks** Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN– Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.	**7**	To understand Essentials of Artificial Neural Networks.	1,2
III	**Feed Forward Networks** Introduction, Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and		To apply various algorithms of Neural Networks.	1,2

	Continuous Perceptron Networks, ADALINE, MADALINE.	**6**		
IV	**Deep Learning** Introduction, Perceptron, Multilayer Perceptron, Delta Rule, Backpropagation Training, Learning Algorithm, Normalization, Limitations of the Perceptron Model, Convolutional Neural Network, Recurrent NN.	**6**	Analyzation of the concepts of Deep Learning.	1,2
V	**Associative Memories** General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm. Architecture of Hopfield Network.	**6**	Analyzation of BAM Training Algorithms.	1,2

TEXTBOOKS:

T1Simon Haykin,―Neural Networks–A Comprehensive Foundation, Macmillan Publishing Co., New York.

T2Neural Networks-James A Freeman David MSK, Pearson Publication

REFERENCEBOOKS:

R1 Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House

R2K. Mahrotra, C.K. Mohan and Sanjay Ranka,―Elements of Artificial Neural Networks, MIT Press

R3 S. Rajasekharanand G. A. Vijayalakshmipai,―Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications, PHI Publication.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the historical developments and potential applications of Artificial Neural Networks (ANN).	1,2,3,4,11,12
2	Analyse Artificial Neural Network architectures based on connectivity and learning strategies.	1,2,3,4,5,11,12
3	Apply training algorithms for discrete and continuous Perceptron networks in Feed Forward Networks.	1,2,3,4,5,9,10,11,12
4	Apply backpropagation training and explore the architecture of Convolutional Neural Networks in Deep Learning.	1,2,3,4,5,9,10,11,12

5	Evaluate the architecture and training algorithms of Bidirectional Associative Memory (BAM) and Hopfield Network in Associative Memories.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS316R	Neural Networks	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – V									
Course Title	**Techno Professional Skills IV**								
Course code	**22BTCS315R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	**1.** To have a detailed revision of Computer Science & Engineering concepts learned so far. 2. To become confident in Computer Science & Engineering concepts to solve problems in real-life situations.								
CO1	Develop highly skilled and knowledgeable development professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming	**7**	Develop basic skills of C programming	1,2
II	Analog and Digital Electronic Circuits	**8**	Develop analytical and research ability of Analog and Digital Electronic Circuits	1,2
III	Data Structure and Algorithms	**10**	Gather knowledge about various development concepts od Data Structure and Algorithms	1,2
IV	Computer Organization and Architecture	**12**	Analyzation of the concepts of Computer Organization and Architecture	1,2
V	Operating Systems	**8**	Analyzation of basic concepts of Operating systems	1,2

TEXT BOOKS/REFERENCE BOOKS:

T1: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

T2: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

T3: Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.
T4: M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
T5: Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.
T6: S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.
T7: Stallings, Computer Organization & Architecture, Pearson.
T8: Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2,3,4,5,9,10,11,12
2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.	1,2,3,4,5,9,10,11,12
3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,9,10,11,12
4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,9,10,11,12
5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS315R	Techno Professional Skills IV	CO1	2	2	3	2	2				3	2	3	3
		CO2	3	2	3	2	2				2	2	3	3
		CO3	3	2	3	3	3				3	2	3	2
		CO4	3	2	3	1	3				2	2	3	2
		CO5	3	2	3	3	3				2	2	2	2

SEMESTER – V									
Course Title	**COMPETENT ENGLISH FOR ENGINEERS**								
Course code	**22UBPD314R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Build a strong foundation in technical vocabulary related to engineering disciplines such as mechanical, electrical, civil, etc. 2. Improve written and spoken communication skills necessary for professional interactions, including emails, reports, presentations, and meetings. 3. Enhance the ability to understand and interpret technical documents, research papers, manuals, and industry-specific literature.								
CO1	Demonstrate proficient usage of English language skills in technical communication and documentation.								
CO2	Evaluate and critique engineering texts, extracting essential information and synthesizing complex ideas.								
CO3	Generate clear and effective technical reports, presentations, and documentation in English.								
CO4	Assess and refine oral communication skills for effective participation in engineering discussions and presentations.								
CO5	Comprehend advanced technical vocabulary and language structures necessary for engineering discourse and professional communication.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Email Etiquette i. Different parts of emails and usage of Magic Words & Wonder Phrases ii. Effective Email Communication, Responding effectively to a client's expectations	**8**	Develop basic skills of C programming	1,2
II	Time-Management Skills i. Introduction to Time Management, Purpose and Importance of Time Management ii. Time Management Matrix, Basic Tips to Maintain Time.	**8**	Develop analytical and research ability of Analog and Digital Electronic Circuits	1,2

	Practice Session: Preparing time management matrix			
III	Interview Skills i. Preparation before the interview ii. Non-verbal cues for interview skills, Interview dos and don'ts iii. Handling difficult questions in Interview	**10**	Gather knowledge about various development concepts od Data Structure and Algorithms	1,2
IV	Conflict Management i. Introduction to Conflict Management ii. Conflict Management Strategies	**10**	Analyzation of the concepts of Computer Organization and Architecture	1,2
V	Practice Sessions	**9**	Analyzation of basic concepts of Operating systems	1,2

TEXT BOOKS:

T1: Wren, P.C and Martin, H. 1995. High School English Grammar and Composition, S Chand Publishing.

T2: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press

REFERENCE BOOKS:

T1: Mccarthy. (2008) English Vocabulary in Use Upper - Intermediate with CD ROM, Cambridge University Press

T2: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate proficient usage of English language skills in technical communication and documentation.	1,2,3,4,5,10,12

2	Evaluate and critique engineering texts, extracting essential information and synthesizing complex ideas.	1,2,3,4,5,10,12
3	Generate clear and effective technical reports, presentations, and documentation in English.	1,2,3,4,5,10,12
4	Assess and refine oral communication skills for effective participation in engineering discussions and presentations.	1,2,3,4,5,10,12
5	Comprehend advanced technical vocabulary and language structures necessary for engineering discourse and professional communication.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD314R	Competent English for Engineers	CO1	1	1	1	1	1					3		2
		CO2	1	1	1	1	1					3		2
		CO3	1	1	1	1	1					3		2
		CO4	1	1	1	1	1					3		2
		CO5	1	1	1	1	1					3		2

SEMESTER – V									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC311R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions,	**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC221	CO CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – V									
Course Title	**EXTRA-CURRICULAR**								
Course code	**22UBEC311R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 3. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and	**8**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	2,3

	national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC311R	Extra-Curricular	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – VI									
Course Title	**Compiler Design**								
Course code	**22BTCS321R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Theory of Computation**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	20. Discuss the process of translating a high-level language to machine code required for compiler construction. 21. Analyze the software tools and techniques used in compiler construction such as lexical analyser and parser generators 22. Discuss the data structures used in compiler construction such as abstract syntax trees, symbol tables, three address code and stack machines.								
CO1	Understand different phases of a compiler and explain lexical analysis principles.								
CO2	Apply parsing techniques to build a language-specific syntax analyser.								
CO3	Analyse syntax-directed translations, evaluation order, and type checking.								
CO4	Understand the association of runtime storage allocation with control flow and procedure calls.								
CO5	Apply code optimization on intermediate code for target code generation.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Compiler structure:** Analysis-synthesis model of compilation, Various phases of a compiler, Tool based approach to compiler construction. Lexical analysis: Interface with input, Parser and symbol table, Token, Lexeme and patterns, Regular definition, Transition diagrams, LEX.	**8**	Understand the analysis-synthesis model of compilation and the role of lexical analysis in converting source code into tokens using tools like LEX.	**1,2,3**
II	**Syntax analysis:** CFG's, Ambiguity, Associativity, Precedence, Top-down parsing, Recursive descend parsing, Transformation on the grammars, Predictive parsing, Bottom-up parsing, Operator precedence grammars, LR parsers (SLR, Canonical, LALR), YACC	**8**	Grasp the concepts of context-free grammars (CFGs) and develop skills in various parsing techniques including top-down and bottom-up parsing methods, utilizing tools like YACC.	**3,4**
III	**Syntax directed translation:** Inherited and synthesized attributes, Dependency graph, Evaluation order,Bottom up evaluation of S-attributed definitions L- attributed definitions and top down translation of attributes Type checking: Type	**10**	Learn to design and implement syntax-directed translation schemes, focusing on attribute grammars and type checking mechanisms, and understand the differences	**3,4**

	system, Type expressions, Structural and name equivalence of types, Type conversion.		between structural and name equivalence of types.	
IV	**Run time environments:** Storage organization, Storage-allocation strategies, Access to nonlocal names, Activation tree, Activation record, Parameter passing, Symbol table and dynamic storage allocation Intermediate code generation: Intermediate representations, Translation of declarations, Assignments, Control flow, Boolean expressions and procedure calls.	**10**	Comprehend the organization and management of run-time storage, including activation records and parameter passing techniques, and learn the principles of intermediate code generation.	**4**
V	**Code generation:** Issues in the design of a code generator, Basic blocks and flow graphs, Next use information, Register allocation, Code generation algorithm, Dag representation of programs, Code generation from dags, Peephole optimization and code generator generators.	**9**	Acquire knowledge on the design and implementation of a code generator, emphasizing optimization techniques, basic blocks, flow graphs, and register allocation strategies.	**4**
Practical Component				
Practical 1	Design a lexical analyser for a simple programming language using LEX.	2	Understand the basics of lexical analysis and the use of tools like LEX to create lexical analysers.	3
Practical 2	Implement a program to identify different tokens, lexemes, and patterns in a given source code.	2	Ability to recognize and classify tokens, lexemes, and patterns within a source code.	2
Practical 3	Create a transition diagram for a given regular expression and simulate its working.	2	Comprehend the conversion of regular expressions to transition diagrams and their usage in lexical analysis.	2
Practical 4	Write a recursive descent parser for a given context-free grammar (CFG).	2	Develop and implement top-down parsing techniques using recursive descent methodology.	3
Practical 5	Implement an SLR parser for a specified grammar and test it with various input strings.	2	Understand and apply bottom-up parsing techniques, specifically SLR parsing.	3
Practical 6	Using YACC, create a parser for a small language and demonstrate its usage with sample inputs.	2	Gain practical experience with parser generators like YACC and their	3

			integration with lexical analysers.	
Practical 7	Construct a dependency graph for a given annotated parse tree and determine the order of attribute evaluation.	2	Understand the relationship between parse trees and attribute evaluation orders.	4
Practical 8	Develop an attribute grammar for a simple language construct and implement its evaluation using synthesized and inherited attributes.	2	Understand and implement syntax-directed translation using attribute grammars.	3
Practical 9	Write a type checker for a language that includes basic types, type expressions, and type conversions.	2	Implement type checking mechanisms and understand type systems and conversions.	3
Practical 10	Simulate the activation record creation and management for a simple recursive function.	2	Understand the structure and management of activation records in a runtime environment.	3
Practical 11	Implement intermediate code generation for a given set of language constructs (e.g., if-else, loops).	2	Develop skills in generating intermediate representations of high-level language constructs.	3
Practical 12	Create a symbol table management system that handles scope and lifetime of variables.	2	Design and implement a symbol table for managing variable scopes and lifetimes.	3
Practical 13	Design and implement a basic block and flow graph generator for a given intermediate code.	2	Understand the concepts of basic blocks and control flow graphs in code generation.	3
Practical 14	Develop a register allocation algorithm using graph coloring techniques.	2	Apply graph coloring techniques for efficient register allocation during code generation.	3
Practical 15	Implement a peephole optimization technique for a given intermediate code and demonstrate its effectiveness.	2	Understand and apply optimization techniques at the code generation level.	3

TEXT BOOKS:

T9: A.V. Aho, R. Sethi, J.D. Ullman, "Compilers: Principles, Techniques and Tools", Addison – Wesley.

T10: Steven S. Muchnick, "Advanced Compiler Design and Implementation", Elsevier

REFERENCE BOOKS:

R6: W. Appel, "Modern Compiler Implementation in C: Basic design", Cambridge Press

R7: Fraser and Hanson, "A Retargetable C Compiler: Design and Implementation", Addison-Wesley
R8: Dhamdhere, "Compiler Construction", McMillan

OTHER LEARNING RESOURCES:

1. www.vssut.ac.in/lecture_notes/lecture1422914957.pdf
2. 2.http://csenote.weebly.com/principles-of-compiler-design.html
3. http://www.faadooengineers.com/threads/32857,Compiler-Design-Notes-full-book-pdf-download
4. https://www.vidyarthiplus.com/vp/thread,37033.html#.WF0PhlMrLD

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different phases of a compiler and explain lexical analysis principles.	1,2,3,4,5,10,12
2	Apply parsing techniques to build a language-specific syntax analyser.	1,2,3,4,5,10,12
3	Analyse syntax-directed translations, evaluation order, and type checking.	1,2,3,4,5,10,12
4	Understand the association of runtime storage allocation with control flow and procedure calls.	1,2,3,4,5,10,12
5	Apply code optimization on intermediate code for target code generation.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCS321R	**Compiler Design**	CO 1	**3**	**2**	**1**	**2**	**2**					**2**		**3**
		CO 2	**3**	**3**	**3**	**3**	**2**					**2**		**3**
		CO 3	**3**	**3**	**3**	**3**	**2**					**2**		**3**
		CO 4	**3**	**1**	**2**	**2**	**2**					**2**		**3**
		CO 5	**3**	**3**	**3**	**3**	**2**					**2**		**3**

SEMESTER – VI									
Course Title	**Computer Networks**								
Course code	**22BTCS322R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Programming Skills**	**Co-requisite**	**Linux**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	23. Understand the fundamentals of data communications principles of media access, switching, routing and flow control. 24. Understand the basics of network protocol design and analysis. 25. Be familiar with the TCP/IP protocol suite and with application layer protocols. 26. Be able to write network-capable programs using the socket libraries. 27. Understand the structure of client-server systems and be able to build client-server programs.								
CO1	Understand the basics of data communication, networking, internet, physical layer techniques, and circuit switching.								
CO2	Analyze data link layer techniques, flow control, and error protocols.								
CO3	Analyse network layer protocols along with routing issues.								
CO4	Summarize transport and application layer operations and protocols along with QoS services.								
CO5	Design and execute computer network programming projects, showcasing advanced skills in network application development.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction to networks, internet, protocols and standards, the OSI model, layers in OSI model, TCP/IP suite, Addressing, Analog and digital signals. Physical Layer: digital transmission, multiplexing, transmission media, circuit switched networks, Datagram networks, virtual circuit networks, switch and Telephone network.	**8**	Understand the OSI model, TCP/IP suite, and basic concepts of addressing, signals, and transmission media.	**2**
II	Data link layer: Introduction, Block coding, cyclic codes, checksum, framing, flow and error control, Noiseless channels, noisy channels, HDLC, point to point protocols	**8**	Learn error detection and correction techniques, framing, and protocols like HDLC and point-to-point protocols.	**2,3**
III	Network Layer: Logical addressing, internetworking, tunnelling, address mapping, ICMP, IGMP, forwarding, uni-cast routing protocols, multicast routing protocols.	**10**	Gain knowledge on logical addressing, routing protocols, and address mapping techniques.	**2,4**

IV	Transport Layer: Process to process delivery, UDP and TCP protocols, SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks.	**10**	Comprehend the fundamentals of process-to-process delivery, TCP/UDP protocols, and congestion control mechanisms.	**2,3**
V	Application Layer – Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multi-media, network security	**9**	Understand domain name space, DNS operations, email protocols, FTP, HTTP, and basics of network security.	**2**
Practical 1	Configure a simple network consisting of multiple devices such as routers, switches, and computers. Test connectivity and troubleshoot any issues encountered.	**2**	Demonstrate the ability to configure basic network settings and troubleshoot connectivity problems.	**3**
Practical 2	Use network analysis tools like Wireshark to capture and analyze network traffic. Identify different protocols, their headers, and their roles in the OSI model.	**2**	Gain proficiency in protocol analysis and understanding of the OSI model layers.	**4**
Practical 3	Use oscilloscopes or signal analysers to examine analog and digital signals transmitted over the network. Interpret signal characteristics and identify any anomalies.	**2**	Understand the fundamentals of analog and digital signals in networking and their analysis	**2**
Practical 4	Implement a block coding technique such as Hamming codes to detect and correct errors in transmitted data frames. Analyse its effectiveness in error detection and correction.	**2**	Gain hands-on experience in implementing error detection and correction mechanisms in the data link layer.	**3**
Practical 5	Implement CRC error detection mechanism in a data link layer protocol such as Ethernet. Calculate CRC values for given data frames and verify error detection capability.	**2**	Understand the theory and practical implementation of CRC for error detection.	**3**
Practical 6	Implement and analyze flow control mechanisms such as Stop-and-Wait and Sliding Window protocols. Measure throughput and efficiency under different network conditions.	**2**	Understand the concepts of flow control and error control in data link layer protocols.	4
Practical 7	Configure IP addresses using both IPv4 and IPv6 addressing schemes for a network topology. Verify connectivity and troubleshoot addressing conflicts.	**2**	Demonstrate proficiency in configuring logical addresses andunderstanding IP addressing schemes.	**3**

Practical 8	Implement and compare different routing protocols such as RIP, OSPF, and BGP in a simulated network environment. Analyze routing tables and convergence times.	**2**	Understand the operation of routing protocols and their impact on network performance.	**4**
Practical 9	Configure Address Resolution Protocol (ARP) and Neighbor Discovery Protocol (NDP) for mapping network layer addresses to data link layer addresses. Verify mappings and troubleshoot resolution issues.	**2**	Gain practical experience in address resolution and mapping techniques.	**3**
Practical 10	Capture and analyse UDP and TCP traffic using packet analysis tools. Compare their characteristics, such as connection establishment, reliability, and overhead.	**2**	Understand the differences between UDP and TCP protocols and their suitability for different applications.	**4**
Practical 11	Configure QoS mechanisms such as traffic prioritization, traffic shaping, and congestion management in a network. Measure and analyze QoS metrics under different traffic loads.	**2**	Understand the importance of QoS in ensuring reliable and efficient network performance.	**5**
Practical 12	Implement and evaluate congestion control algorithms such as TCP's congestion avoidance and congestion control mechanisms. Measure throughput and packet loss under congested conditions.	**2**	Gain practical insights into congestion control mechanisms and their impact on network performance.	**4**
Practical 13	Configure and troubleshoot DNS servers and clients. Analyze DNS queries and responses using network diagnostic tools.	**2**	Understand the operation of DNS and its role in translating domain names to IP addresses.	**3**
Practical 14	Set up email servers (SMTP, IMAP) and FTP servers. Demonstrate the exchange of emails and file transfers between clients and servers. Implement security measures such as encryption and authentication.	**2**	Gain practical experience in configuring and securing email and FTP services.	**3**
Practical 15	Deploy web servers (HTTP, HTTPS) and web applications. Implement security measures such as SSL/TLS encryption, HTTPS, and web application firewalls to protect against common attacks.	**2**	Understand the principles of web service security and implement security measures to protect against threats.	**3**

TEXT BOOKS:

T11: Data Communications and Networking–Behrouz A. Forouzan, Fourth EditionTMH,2006.

T12: Computer Networks—Andrew S Tanenbaum, 4th Edition, Pearson Education.

REFERENCE BOOKS:

R9: An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
R10: UnderstandingcommunicationsandNetworks,3rd Edition, W.A. Shay, Cengage Learning.
R11: Computer and Communication Networks, Nader F. Mir, Pearson Education
R12: Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross,3rd Edition, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the basics of data communication, networking, internet, physical layer techniques, and circuit switching.	1,2,3,4,5,12
2	Analyze data link layer techniques, flow control, and error protocols.	1,2,3,4,5,12
3	Analyse network layer protocols along with routing issues.	1,2,3,4,5,12
4	Summarize transport and application layer operations and protocols along with QoS services.	1,2,3,4,5,12
5	Design and execute computer network programming projects, showcasing advanced skills in network application development.	1,2,3,4,5,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
22BTCS322R	**Computer Networks**	CO 1	3	1	2	1	1							3
		CO 2	3	2	3	1	1							3
		CO 3	3	2	3	1	1							3
		CO 4	3	2	3	1	2							3
		CO 5	3	3	3	3	2					1		3

SEMESTER – VI									
Course Title	**Professional Elective-II: Data Mining**								
Course code	**22BTCS317R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Learn the basics of data mining, including its applications, challenges, and various types of data attributes. 2. Gain proficiency in association rule mining techniques, such as frequent itemset generation and association rule extraction algorithms. 3. Study clustering, prediction, and classification methods, including algorithms, evaluation metrics, and ensemble methods.								
CO1	Understand diverse real-life data, mastering statistical foundations, and identifying challenges in data mining.								
CO2	Utilize Association Rule Mining to address practical problems, demonstrating understanding and proficiency in application.								
CO3	Apply Cluster analysis in unsupervised learning to real-world datasets, showcasing competence in data clustering techniques.								
CO4	Implement popular methodologies for prediction using Data Mining techniques, demonstrating practical application skills.								
CO5	Apply Classification techniques in supervised learning for Machine Learning applications, showcasing proficiency in categorizing and classifying data.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Data Mining:** What is data mining, applications of data mining, issues and challenges faced in data mining, types of data attributes – nominal, binary, ordinal, numeric, discrete and continuous, basic statistical descriptions of data – measures of central tendency and dispersion, major tasks in data pre-processing	**8**	Understand data mining concepts, types of data attributes, and basic statistical descriptions.	**2**
II	**Association Rule Mining:** Definitions of frequent itemset, maximal frequent itemset, closed frequent itemset, association rules, Frequent itemset generation – Apriori algorithm, DIC algorithm and FP-growth algorithm, Generating association rules from frequent item sets	**8**	Comprehend frequent itemset generation algorithms like Apriori, DIC, and FP-growth, and association rule generation.	**2,3**
III	**Clustering:**	**10**	Grasp cluster analysis	**2,4**

	what is cluster analysis, need for cluster analysis, data matrix, dissimilarity matrix, proximity and dissimilarity measures for different data attribute types, partitioning based clustering methods, density-based clustering methods and hierarchical clustering methods, measuring cluster quality		concepts, dissimilarity measures, and various clustering methods including partitioning, density-based, and hierarchical.	
IV	**Prediction**: What is prediction, application areas of prediction, Simple linear regression, Multiple linear regression, Predictor Error measures, Common techniques for assessing accuracy – holdout, random sampling, cross-validation, bootstrap	**10**	Understand prediction concepts, regression techniques, predictor error measures, and methods for assessing accuracy.	**2,3**
V	**Classification**: what is classification, differences between classification and prediction, applications of classification, Some classification algorithms - Decision Trees, Naïve Bayes Classification, Logistic Regression and K-nearest Neighbour Classification, Confusion matrix and metrics for evaluating classifier performance, Overview of ensemble methods – Bagging and Boosting, Ensemble-based classifier - Random Forest	**9**	Understand classification vs. prediction, classification algorithms like decision trees, Naïve Bayes, logistic regression, and evaluation metrics.	**2,4**

TEXT BOOKS:

T13: Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, India

T14: AK Pujari, Data Mining Techniques, University Press, India

REFERENCE BOOKS:

R13: Han, Manilla and Smyth, Principles of Data Mining, PHI, India

R14: Tan, Steinbach,Vipin Kumar, Introduction to Data Mining, Pearson Education Inc.

OTHER LEARNING RESOURCES:

1. https://www.geeksforgeeks.org/data-mining/
2. https://www.javatpoint.com/data-mining
3. https://www.tutorialspoint.com/data_mining/index.htm

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand diverse real-life data, mastering statistical foundations, and identifying challenges in data mining.	1,2,3,4,10,12
2	Utilize Association Rule Mining to address practical problems, demonstrating understanding and proficiency in application.	1,2,3,4,10,12
3	Apply Cluster analysis in unsupervised learning to real-world datasets, showcasing competence in data clustering techniques.	1,2,3,4,5,10,12
4	Implement popular methodologies for prediction using Data Mining techniques, demonstrating practical application skills.	1,2,3,4,10,12
5	Apply Classification techniques in supervised learning for Machine Learning applications, showcasing proficiency in categorizing and classifying data.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS317R	**Data Mining**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**Professional Elective-II: Artificial Intelligence**								
Course code	**22BTCS317R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills, Data structures**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Describe the field of AI and its subfields machine learning, NLP and computer vision 2. Learn and implement key NLP algorithms and models, such as virtual agents, chatbots, sentiment classifiers, and language translators, to solve a variety of natural language understanding tasks. 3. Explore Practical Applications of Computer Vision,Investigate real-world applications of computer vision in various fields, including autonomous vehicles, surveillance systems, medical imaging, and augmented reality.								
CO1	Remember and understand relevance of AI in today's world.								
CO2	Gain an idea about Machine Learning application in real world problem.								
CO3	Develop an understanding deep learning concept in AI.								
CO4	Apply and Analyze data by applying various machine learning algorithms.								
CO5	Enhance problem-solving abilities with IBM Cloud service.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Artificial Intelligence:**Overview of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL), Natural Language Processing (NLP), Computer Vision. Describe the types of AI,Explain what the main focus of AI is,List of practical applications of AI,Describe the eras of computing,Explain the difference between deterministic and probabilistic systems, Road Map of AI.	**8**	Understand the types of AI, the main focus of AI, practical applications, computing eras, deterministic vs. probabilistic systems, and the road map of AI.	**2,4,5**
II	**Introduction to Machine Learning:** Introduction to Machine Learning, Supervised Learning & Unsupervised Learning. Supervised Learning Algorithms: Linear Regression, Logistic Regression, Suppor Vector Machine, Decision Tree,Random Forest, KNN.	**8**	Grasp the concepts of supervised and unsupervised learning, and understand and implement various supervised and unsupervised learning algorithms.	**2,3**

	Unsupervised Learning Algorithms: K-Means Clustering, Hierarchical Clustering.			
III	**Introduction to Deep Learning:** Introduction to Deep Learning: Neural Networks, Layers, and Activation Functions, Back Propagation, Optimizers, Deep Learning Algorithm: ANN, CNN, RNN, LSTM with Tensor flow and Keras, Introduction to Autoencoders, Generative Adversarial Networks (GANs), Restricted Boltzmann Machines (RBMs) and Applications.	**10**	Understand the basics of neural networks, activation functions, backpropagation, and deep learning algorithms like ANN, CNN, RNN, LSTM, GANs, and RBMs.	**2,3**
IV	**Introduction to Natural Language Processing and Computer Vision:** Introduction to Natural Language Processing, NLP application in real world, components of NLP, Vartual Agents overview, Chatbot and its parts, Tokenization, Stemming & Lemmatization in NLP, BagofWords,TF-IDF,Word2Vec, Word Embedding in NLP. Introduction to Computer Vision, Image Classification and Object Recognition, Feature Detection and Description algorithms with Open CV.	**10**	Understand the components and applications of NLP, and grasp the basics of computer vision, image classification, and object recognition.	**2,3**
V	**Evolution from DeepQA to Watson services on IBM Cloud:** Explain the DeepQA architecture was;Explain why IBM decided to commercialize Watson and Describe the evolution of Watson services from the original DeepQA architecture to the present. Introduction to IBM Watson: explore Watson Studio, IBM's integrated environment for data scientists, developers, and domain experts, to build and deploy ML models.	**9**	Understand the evolution of Watson services from DeepQA architecture, explore IBM Watson services, and create chatbots using Watson Assistant.	**2,3**

	Creating Chatbots using Watson Assistant: learn the basics of Watson Assistant, including intents, entities, dialog flows, and integration capabilities. Natural Language Understanding (NLU), Language Translator, Text to Speech, Speech to Text on IBM Cloud.			

TEXT BOOKS:

T15: Introduction to Data Science: B.UmaMaheswari& R. Sujata.

T16: Deep Learning with TensorFlow and Keras by Amita Kapoor, Antonio Gulli& Sujit pal.

T17: Artificial Intelligence by Stuart J. Russell & Peter Norvig.

T18: Hands-On Artificial Intelligence for IBM Watson: Explore the Power of AI to Innovate and Transform Business Processes" by Dr. Harish Garg.

REFERENCE BOOKS:

R15: Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence" by Jon Krohn, Grant Beyleveld, and AglaéBassens.

R16: Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth.

R17: Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow :AurelienGeron.

OTHER LEARNING RESOURCES:

Python & Machine Learning -https://www.w3schools.com/python/python_ml_getting_started.asp

1. AI with IBM - https://developer.ibm.com/technologies/artificial-intelligence/
2. IBM Cloud - https://cloud.ibm.com/docs

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Remember and understand relevance of AI in today's world.	1,2,3,4,10,12
2	Gain an idea about Machine Learning application in real world problem.	1,2,3,4,10,12
3	Develop an understanding deep learning concept in AI.	1,2,3,4,5,10,12

4	Apply and Analyze data by applying various machine learning algorithms.	1,2,3,4,10,12
5	Enhance problem-solving abilities with IBM Cloud service.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS317R	**Artificial Intelligence**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**PE-III: Machine Learning**								
Course code	**22BTCS318R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To provide fundamental theoretical foundations knowledge of various learning algorithms 2. Apply suitable machine learning techniques for data handling and knowledge extraction 3. To gain the fundamental knowledge and understand the context of supervised and unsupervised learning through real-life examples.								
CO1	Recognize the characteristics of machine learning strategies								
CO2	Demonstrate proficiency in data analytics and apply advanced tools to work on dimensionality reduction and mathematical operations.								
CO3	Analyze and Apply the suitable supervised learning and unsupervised learning methods for real-world problems and for handling unknown patterns.								
CO4	Understand the concept of ensemble learning and its applications.								
CO5	Evaluate the performance of various algorithms.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**IntroductiontoMachineLearning** WhatisMachineLearning?,Typesof Machine Learning: Supervised,Unsupervised,andReinforcementLearning,ApplicationsofMachineLearningin Various Fields.	**8**	Understand the concept of machine learning, its types (supervised, unsupervised, reinforcement learning), and applications in various fields.	**2**
II	**Data Preprocessing and Exploratory DataAnalysis** DataCollectionandCleaning,HandlingMissingValues,FeatureScalingandNormalization,DataVisualizationTechniques,ExploratoryDataAnalysis (EDA),statisticalmeasures,Basictools(plots,graphsandsummarystatistics)of EDA.	**8**	Gain skills in data collection, cleaning, handling missing values, feature scaling, normalization, and visualization techniques for exploratory data analysis (EDA).	**2,3**
III	**SupervisedLearningandUnsupervisedLearning** LinearandNon-Linearexamples– Multi–Class & Multi-Label Support,Clusteringbasics(Partitioned,HierarchicalandDensitybased)-K-Meanslustering–KModeclustering–	**10**	Learn various supervised and unsupervised learning algorithms including linear regression, decision trees, k-NN, logistic regression, clustering basics, and principal component	**2,4**

	Self organizing maps , Expectationmaximization – Principalomponent Analysis		analysis.	
IV	**EnsembleLearning** Bagging-CommitteeMachinesandStacking-Boosting-Ranking	**10**	Understand ensemble learning techniques such as bagging, boosting, stacking, and ranking-based aggregation for improving model performance.	**2,3**
V	**ModelEvaluationandOptimization** ModelValidationTechniques:Train/TestSplit,Cross-Validation,PerformanceMetrics,ConfusionMatrix,Accuracy,Precision, Recall, F1-Score	**9**	Learn model validation techniques including train/test split, cross-validation, and performance metrics like confusion matrix, accuracy, precision, recall, and F1-score.	**2,5**

TEXT BOOKS:

T19: T1 S. Shalev-Shwartz, S.Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

T20: T2 EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India,

REFERENCE BOOKS:

R18: MehryarMohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.

R19: Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997..

R20: Data Mining: Concepts and Techniques", Third Edition, 2 Jiawei Han, Micheline Kamber and Jian Pei, ISBN 0123814790,(2011).

R21: Duda, Richard, Peter Hart, and David Stork, "Pattern Classification," 2 nd Edition, John Wiley & Sons, Hoboken, 2000.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Recognize the characteristics of machine learning strategies	1,2,3,4,10,12

2	Demonstrate proficiency in data analytics and apply advanced tools to work on dimensionality reduction and mathematical operations.	1,2,3,4,10,12
3	Analyze and Apply the suitable supervised learning and unsupervised learning methods for real-world problems and for handling unknown patterns.	1,2,3,4,5,10,12
4	Understand the concept of ensemble learning and its applications.	1,2,3,4,10,12
5	Evaluate the performance of various algorithms.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS318R	**Machine Learning**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		Co3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**PE-III: Big Data Analytics**								
Course code	**22BTCS318R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**DBMS**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	4. Gain foundational knowledge of Big Data, including its characteristics, technologies, and real-world applications across various domains. 5. Learn the architecture and components of Hadoop and Spark, and develop practical skills in data ingestion, processing, and management. 6. Develop the ability to perform analytics on Big Data, apply machine learning techniques, and utilize visualization tools for insightful data representation.								
CO1	Understand the characteristics and real-world applications of Big Data, differentiating it from traditional data.								
CO2	Demonstrate the use of Hadoop and Spark frameworks by executing basic data processing tasks.								
CO3	Analyze and compare various NoSQL databases and their suitability for different types of Big Data storage requirements.								
CO4	Evaluate different data preprocessing techniques and machine learning tools for effective Big Data analytics.								
CO5	Design a real-time Big Data analytics pipeline using cloud-based solutions and ensuring data security and privacy.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Big Data:** Overview of Big Data: Definition and characteristics of Big Data (Volume, Velocity, Variety, Veracity, and Value), Differences between traditional data and Big Data. Big Data in the Real World: Applications in various domains (healthcare, finance, social media, e-commerce, etc.), Case studies of Big Data applications. Big Data Technologies: Introduction to Hadoop ecosystem, NoSQL databases overview (e.g., MongoDB, Cassandra). Big Data Challenges: Data storage and management issues, Privacy and ethical considerations in Big Data. Data Generation Sources: Structured vs. Unstructured data, Data from sensors, social media, and other digital platforms.	**8**	Understand the definition, characteristics, and real-world applications of Big Data, as well as the technologies and challenges associated with it.	**2,4**

II	**Big Data Processing Frameworks:** Hadoop Fundamentals: Architecture of Hadoop, Hadoop Distributed File System (HDFS), MapReduce programming model. Hadoop Ecosystem Components: Introduction to Pig, Hive, HBase, and other related tools, Use cases and applications of each component. Data Ingestion Tools: Overview of Sqoop and Flume, Real-time data processing with Apache Kafka. Spark Framework: Introduction to Apache Spark, Spark vs. Hadoop MapReduce, Spark RDDs (Resilient Distributed Datasets). Hands-On Exercises: Basic HDFS commands, Writing and running a simple MapReduce program.	**8**	Grasp the fundamentals of Hadoop ecosystem, including HDFS, MapReduce, and related tools, as well as Spark framework and its comparison with Hadoop.	**2,3**
III	**Data Storage and Management:** NoSQL Databases: Types of NoSQL databases: Document, Key-Value, Column Family, Graph, CAP theorem and BASE properties. MongoDB: Features and architecture of MongoDB, CRUD operations in MongoDB, Indexing and aggregation. Cassandra: Features and architecture of Cassandra, Data modeling in Cassandra, Querying in Cassandra using CQL. HBase: Introduction to HBase and its architecture, HBase data model and operations, Integration of HBase with Hadoop. Data Warehousing Solutions: Introduction to Big Data warehousing solutions like Amazon Redshift and Google BigQuery.	**10**	Gain knowledge of NoSQL databases, focusing on MongoDB, Cassandra, HBase, and Big Data warehousing solutions, and their features, architecture, and operations.	**2,3**
IV	**Big Data Analytics and Tools:** Introduction to Big Data Analytics: Importance of analytics in Big Data, Types of analytics: Descriptive, Diagnostic, Predictive, Prescriptive. Data Pre-processing Techniques: Data cleaning, transformation, and reduction, Handling missing data and outliers. Machine Learning with Big Data:	**10**	Understand the importance of analytics in Big Data, pre-processing techniques, machine learning algorithms, and data visualization tools.	**2,3,5**

	Overview of machine learning algorithms used in Big Data, Introduction to scalable machine learning tools like MLlib. Big Data Visualization: Importance of data visualization, Tools for Big Data visualization (e.g., Tableau, D3.js).			
V	**Advanced Topics in Big Data Analytics:** Real-Time Big Data Analytics: Stream processing with Apache Storm and Spark Streaming, Real-time data pipelines and architectures. Big Data Security and Privacy: Security challenges in Big Data, Techniques and tools for securing Big Data, Cloud-Based Big Data Solutions: Overview of Big Data solutions on AWS, Azure, and Google Cloud, Case studies on cloud-based Big Data implementations. Future Trends in Big Data: Emerging technologies and trends in Big Data, The impact of AI and IoT on Big Data.	**9**	Explore real-time Big Data analytics, security and privacy challenges, cloud-based Big Data solutions, and future trends in Big Data technologies.	**2,4,5**

TEXT BOOKS:

T21: "Big Data: Principles and Best Practices of Scalable Realtime Data Systems" by Nathan Marz, James Warren, Manning Publications.

T22: "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost, Tom Fawcett, O'Reilly Media.

T23: "Big Data: A Revolution That Will Transform How We Live, Work, and Think" by Viktor Mayer-Schönberger, Kenneth Cukier, Eamon Dolan/Mariner Books.

REFERENCE BOOKS:

R22: "Hadoop: The Definitive Guide" by Tom White, O'Reilly Media.

R23: "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems" by Martin Kleppmann, O'Reilly Media.

R24: "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" by Pramod J. Sadalage, Martin Fowler, Addison-Wesley.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the characteristics and real-world applications of Big Data, differentiating it from traditional data.	1,2,3,4,10,12
2	Demonstrate the use of Hadoop and Spark frameworks by executing basic data processing tasks.	1,2,3,4,10,12
3	Analyze and compare various NoSQL databases and their suitability for different types of Big Data storage requirements.	1,2,3,4,5,10,12
4	Evaluate different data preprocessing techniques and machine learning tools for effective Big Data analytics.	1,2,3,4,10,12
5	Design a real-time Big Data analytics pipeline using cloud-based solutions and ensuring data security and privacy.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS318R	**Big Data Analytics**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

<table>
<tr><th colspan="9">SEMESTER – VI</th></tr>
<tr><td>Course Title</td><td colspan="8">Project I</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTCS323R</td><td rowspan="2">Total credits: 4
Total hours: 120P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>8</td><td>0</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>Pre-requisite</td><td colspan="2">NIL</td><td>Co-requisite</td><td colspan="6">NIL</td></tr>
<tr><td>Programme</td><td colspan="8">Bachelor of Technology in Computer Science & Engineering</td></tr>
<tr><td>Semester</td><td colspan="8">Winter/ II semester of the third year of the program</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="8">1. Develop advanced technical skills through individual or group project work in engineering domains.
2. Enhance project management abilities, including workload management and meeting project deadlines effectively.
3. Improve presentation skills through seminar presentations and public demonstrations of project outcomes.</td></tr>
<tr><td>CO1</td><td colspan="8">Apply IT principles to solve real-world problems.</td></tr>
<tr><td>CO2</td><td colspan="8">Contribute to complex projects as a team member.</td></tr>
<tr><td>CO3</td><td colspan="8">Apply programming languages and platforms to develop software and hardware solutions.</td></tr>
<tr><td>CO4</td><td colspan="8">Demonstrate personal and team management skills in software development.</td></tr>
<tr><td>CO5</td><td colspan="8">Cultivate employability skills and professionalism commitment.</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to:
1. Perform a literature search to review current knowledge and developments in the chosen technical area;
2. Undertake detailed technical work in the chosen area using one or more of:
a. theoretical studies
b. computer simulations
c. hardware construction;
3. Produce progress reports or maintain a professional journal to establish work</td><td>120</td><td colspan="3">Demonstrate proficiency in conducting literature reviews, performing technical work, maintaining progress reports, delivering seminars, preparing formal reports, and presenting project outcomes effectively.</td><td>2,3,4,5,6</td></tr>
</table>

	completed, and to schedule additional work within the time frame specified for the project; 4. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 5. Prepare a formal report describing the work undertaken and results obtained so far; and 6. Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.			

REFERENCE BOOKS:

R25: "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams

R26: "Doing Your Research Project: A Guide for First-Time Researchers" by Judith Bell and Stephen Waters

R27: "How to Write a Thesis" by Umberto Eco

R28: "Effective Project Management: Traditional, Agile, Extreme" by Robert K. Wysocki

R29: "Writing for Computer Science" by Justin Zobel

R30: "The Elements of Style" by William Strunk Jr. and E.B. White

R31: "Python Crash Course" by Eric Matthes (if applicable for coding projects)

R32: "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett (if applicable for data science projects).

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply IT principles to solve real-world problems.	1,2,3,4,5,6,7,8,9,10,11,12
2	Contribute to complex projects as a team member.	1,2,3,4,5,6,7,8,9,10,11,12

3	Apply programming languages and platforms to develop software and hardware solutions.	1,2,3,4,5,6,7,8,9,10,11,12
4	Demonstrate personal and team management skills in software development.	1,2,3,4,5,6,7,8,9,10,11,12
5	Cultivate employability skills and professionalism commitment.	1,2,3,4,5,6,7,8,9,10,11,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS323R	**Project**	CO1	3	3	2	3	2	1	1	2	3	2	2	3
		CO2	3	3	3	3	2	1	1	2	3	2	2	3
		CO3	3	2	3	2	3	1	1	2	3	3	2	3
		CO4	3	2	2	2	2	1	1	2	3	3	3	3
		CO5	3	3	3	3	3	1	3	2	3	3	2	3

SEMESTER – VI									
Course Title	**Techno Professional Skills V**								
Course code	**22BTCS324R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To reinforce fundamental Computer Science & Engineering concepts ensuring a strong foundation in core concepts. 2. To enhance problem-solving skills through practical exercises and applications. 3. To foster critical thinking and creativity, promoting analytical and research abilities.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming, Data Structure and Algorithms.	**6**	Develop proficiency in implementing algorithms and data structures in C programming language, enhancing problem-solving skills.	**2,3**
II	Analog and Digital Electronic Circuits.	**6**	Gain understanding of analog and digital electronic circuits, their design principles, and practical applications.	**2,4**
III	Computer Organization and Architecture, Operating Systems.	**6**	Comprehend the organization and architecture of computers, including CPU, memory, and I/O devices, as well as the fundamentals of operating systems.	**2,4**
IV	Database Management Systems, Object Oriented Programming.	**6**	Acquire knowledge of database management systems, object-oriented programming principles, and their integration in software development.	**2,3**
V	Formal Language and Automata.	**6**	Understand formal languages, automata theory, and their applications in computer science, enhancing theoretical understanding.	**2,4**

REFERENCE BOOKS:

R33: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

R34: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

R35: Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.

R36: M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.

R37: Horowitz andSahni, Fundamentals of Data Structures in C, University Press.

R38: S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.

R39: Stallings, Computer Organization & Architecture, Pearson.

R40: Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.

R41: C. K. Nagpal, Formal Languages and Automata Theory, Oxford University Press.

R42: Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, McGraw Hill.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,9,10,11,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,9,10,11,12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,9,10,11,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,9,10,11,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCS32 4R	**Techno Professio nal Skills V**	CO 1	2	2	3	2	2				3	2	3	3
		CO 2	3	2	3	2	2				2	2	3	3
		CO 3	3	2	3	3	3				3	2	3	2
		CO 4	3	2	3	1	3				2	2	3	2
		CO 5	3	2	3	3	3				2	2	2	2

<table>
<tr><th colspan="10">SEMESTER – VI</th></tr>
<tr><td>Course Title</td><td colspan="9">CORPORATE PROFICIENCY FOR ENGINEERS
(Communicative English & Soft Skills)</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UBPD324R</td><td rowspan="2">Total credits: 2
Total hours: 60P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>4</td><td>0</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Pre-requisite</td><td>22UBPD314R Competent English For Engineers</td><td>Co-requisite</td><td colspan="7">NIL</td></tr>
<tr><td>Programme</td><td colspan="9">B.Tech in Civil Engineering/B.Tech in Mechanical Engineering/B.Tech in Computer Science and Engineering/ B.Tech in Computer Science and Engineering (B)/ B.Tech in Mechanical Engineering (B)/ B.Tech in Civil Engineering (B)/ B.Tech in Computer Science and Engineering on Cloud Technology and Information Security</td></tr>
<tr><td>Semester</td><td colspan="9">Winter/ II semester of the third year of the program</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. To introduce students with the various tools of effective presentation.
2. To instruct, influence, engage, educate, or entertain the listeners.
3. Students will be having corrected resumes &will be having a better knowledge about how to upload data in social media also how to promote self.
4. To find new, innovative ways of developing and managing people.
5. To prepare the students for the campus drives & walking interviews.
6. To gain confidence with the chance to reflect on their non-verbal and verbal communication abilities.</td></tr>
<tr><td>CO1</td><td colspan="9">Construct coherent and concise technical reports, demonstrating advanced written communication skills in English.</td></tr>
<tr><td>CO2</td><td colspan="9">Apply effective verbal communication strategies in professional settings, such as meetings and presentations.</td></tr>
<tr><td>CO3</td><td colspan="9">Evaluate and analyze complex technical documents, showcasing a high level of English language comprehension.</td></tr>
<tr><td>CO4</td><td colspan="9">Demonstrate proficiency in using appropriate corporate English vocabulary and language conventions in engineering contexts.</td></tr>
<tr><td>CO5</td><td colspan="9">Synthesize and communicate engineering concepts clearly and persuasively in English, fostering effective collaboration in a corporate environment.</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="4">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">Presentation Skills
i. Introduction
ii. Essential characteristics of a good presentation
iii. Preparation of a good presentation</td><td>12</td><td colspan="4">Develop the ability to prepare and deliver effective presentations by understanding essential characteristics and techniques.</td><td>2,3</td></tr>
</table>

II	**Leadership & Management Skills** i. Concepts of Leadership, ii. Leadership Styles, iii. Manager VS Leader, iv. How to be an Effective Leader, v. Mock/ Practice Session, vi. Doubt Clearing Session.	**12**	Gain insights into leadership concepts, styles, and the differences between managers and leaders, and learn how to be an effective leader.	**2,3,4**
III	LinkedIn Profile	**12**	Understand the importance of a professional LinkedIn profile and learn how to optimize it to enhance career opportunities.	**2**
IV	Emotional Intelligence	**12**	Develop emotional intelligence by recognizing and managing emotions effectively, leading to improved interpersonal relationships.	**2,3**
V	Mock Screening	**12**	Gain practical experience and feedback through mock screening sessions, enhancing interview skills and confidence.	**3,5**

TEXT BOOKS:

T1: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.
T2: McDowell, Gayle Laakmann. 2008. Cracking the Coding Interview (IndianEdition)
T3: Adair, John.(2013)Develop Your Leadership Skills (Creating Success, 134), KoganPage

REFERENCE BOOKS:

R43: Picardi, Dr. Carrie. (2021) Leadership Essentials You Always Wanted to Know , Vibrant Publishers
R44: Whetten D. (2011) Developing Management Skills, Prentice Hall India Learning Private Limited

OTHER LEARNING RESOURCES:

1. https://youtu.be/4vetoRA3WUA
2. https://youtu.be/bgFNTuRYtKE

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Construct coherent and concise technical reports, demonstrating advanced written communication skills in English.	1,2,3,4,5,10,12
2	Apply effective verbal communication strategies in professional settings, such as meetings and presentations.	1,2,3,4,5,10,12
3	Evaluate and analyze complex technical documents, showcasing a high level of English language comprehension.	1,2,3,4,5,10,12
4	Demonstrate proficiency in using appropriate corporate English vocabulary and language conventions in engineering contexts.	1,2,3,4,5,10,12
5	Synthesize and communicate engineering concepts clearly and persuasively in English, fostering effective collaboration in a corporate environment.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UBPD324R	**Corporate Proficiency For Engineers**	CO 1	1	1	1	1	1					3		2
		Co 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – VI									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC321**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**All UG Programmes**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Foster social and soft skills: Develop interpersonal abilities and enhance communication and collaboration among learners. 2. Promote holistic development: Encourage overall growth by engaging students in diverse extracurricular activities and experiences. 3. Cultivate 360-degree learning: Implement a comprehensive approach to education that integrates academics with practical experiences and skill development.								
CO1	Active participation in club activities: Students engage in various clubs like dance, music, and photography, fostering their interests and talents.								
CO2	Representation in competitions: Students represent the institution at inter-university, state, and national competitions, showcasing their skills.								
CO3	Exposure to expert guidance: Learners benefit from workshops conducted by renowned personalities, enhancing their knowledge and skills.								
CO4	Skill development through workshops: Students gain practical insights and expertise in their fields of interest through hands-on workshops.								
CO5	Overall growth and development: The course facilitates the holistic development of students, nurturing their talents and capabilities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the	**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Active participation in club activities: Students engage in various clubs like dance, music, and photography, fostering their interests and talents.	1,2,3,4,5,6,10,12
2	Representation in competitions: Students represent the institution at inter-university, state, and national competitions, showcasing their skills.	1,2,3,4,5,6,10,12
3	Exposure to expert guidance: Learners benefit from workshops conducted by renowned personalities, enhancing their knowledge and skills.	1,2,3,4,5,6,10,12
4	Skill development through workshops: Students gain practical insights and expertise in their fields of interest through hands-on workshops.	1,2,3,4,5,6,10,12
5	Overall growth and development: The course facilitates the holistic development of students, nurturing their talents and capabilities.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC321	**CO CURRICULAR ACTIVITIES**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – VI									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC321**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**All UG Programmes**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	4. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 5. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 6. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**60**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	**2,3**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC321	**EXTRA CURRICULAR ACTIVITIES**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – VII									
Course Title	**Software Engineering**								
Course code	**22BTCS411R**	**Total credits: 3** **Total hours: 43** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Computer Science**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To help students to understand theories,methods, and technologies applied for professional software development. 2.To discussthe concepts of software products and software processes. 3. To make proper documentation for Software development work								
CO1	Demonstrate ethical software development practices								
CO2	Apply systems development lifecycle phases effectively.								
CO3	Elicit, analyze, and specify software requirements collaboratively								
CO4	Create and evaluate standard procedures and documentation.								
CO5	Collaborate productively in interdisciplinary software project teams.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction: Lifecyclemodels Function oriented software design: Structured analysis and structured design.	**13**	Compare and contrast various software development life cycle models and structured design techniques.	1,2
II	Software requirements, analysis and specification: Informal and formal specification.	**12**	Analyze and document software requirements using informal and formal specification methods.	1,2
III	ObjectOrientedDesign: User interface design, GUI design primitives, Window management system and the XWindows system Coding and Testing: Codingstandardandunit testing.	**7**	Design object-oriented systems, develop user interfaces, apply coding standards, and conduct unit testing.	1,2
IV	Projectmanagement: Estimation, scheduling, risk management and configuration management.	**6**	Estimate resources, create schedules, manage risks, and implement configuration management in projects.	1,2
V	Softwarereliabilityandqualityassurance Reliability metrics and growth modelling, ISO-9000,SEIand CMM.	**5**	Apply reliability metrics, growth models, and quality assurance standards like ISO-9000	1,2

			and CMM.	

TEXT BOOKS:

T1. An IntegratedApproachtoSoftwareEngineeringbyJalote.NarosaPublishingHouse.

T2. SoftwareEngineeringbyR.Mall,PHI.

REFERENCE BOOKS:

R1. SoftwareEngineeringbyR.S.Pressman, McGraw Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate ethical software development practices	1,2,3,4,5,9,11 and 12
2	Apply systems development lifecycle phases effectively.	1,2,3,4,5,9,11 and 12
3	Elicit, analyze, and specify software requirements collaboratively	1,2,3,4,5,9,11 and 12
4	Create and evaluate standard procedures and documentation.	1,2,3,4,5,9,11 and 12
5	Collaborate productively in interdisciplinary software project teams.	1,2,3,4,5,9,11 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS411R	**Software Engineering**	CO 1	2	2	3	2	2				3		3	3
		CO 2	3	2	3	2	2				2		3	3
		CO 3	3	2	3	3	3				3		3	2
		CO 4	3	2	3	1	3				2		3	2
		CO 5	3	2	3	3	3				2		2	2

SEMESTER – VII									
Course Title	**PE- IV: Data Handling and Visualization**								
Course code	**22BTCS414R**	**Total credits: 5** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. Gain understanding of the significance of data visualization in IT applications. 2. Develop proficiency in using R programming and Python for data analysis and visualization. 3. Learn to utilize data visualization libraries such as ggplot2 (R) and Matplotlib (Python).								
CO1	Understand the importance of data visualization in IT applications and its role in decision-making processes.								
CO2	Demonstrate proficiency in using R programming and Python for data analysis and visualization tasks.								
CO3	Utilize data visualization libraries like ggplot2 (R) and Matplotlib (Python) to create customized visualizations.								
CO4	Design clear and persuasive visualizations using principles of effective data presentation and storytelling..								
CO5	Utilize interactive data visualization tools like Cognos to create dynamic visualizations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Data Visualization and R Programming:** Understanding the importance of data visualization in IT applications. Overview of R programming for data analysis and visualization. Introduction to data visualization libraries: ggplot2 (R) and Matplotlib (Python). Basic plotting techniques and data representation in R and Python. Hands-on exercises with simple plots and data visualization	**12**	Understand the importance of data visualization, and basic plotting techniques using R and Python.	1,2 and 3

	examples.			
II	**Advanced Data Visualization Techniques:** Advanced Features of ggplot2 for Customized Plots in R. Customizing Plot Aesthetics and Themes in ggplot2.. Introduction to Interactive Data Visualization Tools: Cognos. Creating Interactive Visualizations using Cognos. Hands-on Exercises: Advanced Plotting Techniques and Interactive Visualizations.	**12**	Utilize advanced features of ggplot2 and interactive tools like Cognos for customized and interactive visualizations.	3
III	**Maps, Geospatial Data Visualization, Export Features:** Introduction to Folium. Maps with Markers, Choropleth Maps. Export Feature – Data Visualization. Generating a PNG picture. Generating PDF documents Multiple graphs plotting and export. Inserting subfigure Hypothesis and Gradient Descent. Understanding Hypothesis. Implementation of hypothesis in Python. Gradient Descent Implementation	**8**	Create geospatial visualizations using Folium and export visualizations as images and documents.	1,2,3
IV	**Visualization by using Seaborn Library:** Relational plot: Dist Plot, Line Plot, Lmplot . Categorical plot: Stripplot, Swarmplot,Barplot, Countplot, Boxplot, Violinplot, Stripplot Distribution plot: Joinplot, Distpot, Pairplot, Rugplot. Regression plot: Simple Linear plot with additional parameters (hue and markers), Setting size and color of the plot, Displaying multiple plots, Size and aspect ratio of plots. Matrix plot: Heatmaps, Cluster Maps. Style and Color: Set the background to be white, Set the background to be ticks, Set the background to be darkgrid, Set the background to be	**4**	Implement various types of plots and customize visualizations using Seaborn in Python.	1,2,3,4

	whitegrid. Remove axes spine: Despine Size and aspect: Non grid plot, Grid type plot Scale and Context: Poster, paper, notebook and talk			
V	**Application of Data Visualization in Engineering:** Case studies demonstrating data visualization . Visualizing datasets & Creating dashboards for analysis Real-world applications and projects.	**4**	Apply data visualization techniques to real-world engineering problems and create dashboards for data analysis.	3,5,6

TEXT BOOKS:

T1: Data Visualization with R" by Carson Sievert and Chris Parmer

T2: Python Data Visualization Cookbook" by Igor Milovanović

REFERENCE BOOKS:

R1: Interactive Data Visualization for the Web" by Scott Murray

R2: Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole NussbaumerKnaflic.

OTHER LEARNING RESOURCES:

1. IBM Cognos Analytics
2. R Programming Tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the importance of data visualization in IT applications and its role in decision-making processes.	1,2,3,4,10 and 12
2	Demonstrate proficiency in using R programming and Python for data analysis and visualization tasks.	1,2,3,4,10 and 12

3	Utilize data visualization libraries like ggplot2 (R) and Matplotlib (Python) to create customized visualizations.	1,2,3,4,5,10 and 12
4	Design clear and persuasive visualizations using principles of effective data presentation and storytelling..	1,2,3,4,10 and 12
5	Utilize interactive data visualization tools like Cognos to create dynamic visualizations.	1,2,3,4,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS414R	**PE- IV: Data Handling and Visualization**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VII									
Course Title	**Professional Elective-IV: Computer Vision**								
Course code	**22BTCS414R**	**Total credits: 5** **Total hours: 45** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. Introduce the fundamental problems of Computer Vision and image formation. 2. Provide understanding of techniques, mathematical concepts and algorithms used in computer vision to facilitate further study in this area. 3. Provide pointers into the literature and exercise a project based on a literature search and one or more research papers.								
CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.								
CO2	Describe known principles of human visual system and computer vision system.								
CO3	Describe methods of computer vision related to multi-scale representation, edge detection and detection of other primitive.								
CO4	Use computer vision algorithm for 3D construction, stereo, motion and object recognition.								
CO5	Develop proficiency in object recognition principles, applying machine learning for detection, training deep learning models, evaluating performance metrics, and utilizing relevant frameworks for practical computer vision applications.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction: Image Processing & Computer Vision, What is Computer Vision - Low-level, Mid-level, High-level. Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.	**7**	Understand the fundamentals of computer vision and explore diverse applications such as object recognition and medical image analysis.	1
II	Image Formation Models: Monocular imaging system, Orthographic & Perspective	**10**	Describe image formation models including monocular and binocular	1,2

	Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Depth from Defocus, Construction of 3D model from images.		systems, camera calibration, and 3D model construction from images.	
III	Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Edge detection. Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.	**10**	Implement image preprocessing techniques, edge detection, and motion estimation methods like optical flow and stereo vision.	2,3
IV	Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis	**8**	Apply various shape representation and segmentation techniques including contour-based, region-based, and deformable models like snakes and level sets.	2,3
V	This unit covers principles and techniques of object recognition and the application of machine learning in computer vision. Topics include feature extraction methods for object detection, classification algorithms, and training of recognition models. Students will explore supervised and unsupervised learning techniques, neural networks, and deep learning architectures specifically designed for image analysis. The unit also addresses the evaluation of model performance using various metrics and validation techniques, providing hands-on experience with popular machine learning frameworks and libraries.	**10**	Understand and apply object recognition techniques and machine learning algorithms in computer vision applications.	1,2,3,4

TEXT BOOKS:

T1:Szeliski R., “Computer Vision: Algorithms and Applications”, Springer, 2010.

T2. Richard Szeliksy., “Computer Vision: Algorithms and Applications”, Springer, 2020.

T3. Davies, E.Roy., “Computer and machine vision: theory, algorithms, practicalities” Academic Press, 2017.

REFERENCE BOOKS:

R1: "Concise computer vision" by R. Klette, Reinhard, Springer, London, 2014.

R2. "Digital Image Processing", by R. Gonzalez and R. Woods, 4th edition, Pearson, 2017.

R3. "Computer Vision: Advanced Techniques and Applications" , by S. Holden, CLANRYE International, 2019.

OTHER LEARNING RESOURCES:

1. https://nptel.ac.in/courses/117105079
2. https://nptel.ac.in/courses/106105216/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.	1,2,3,4,5,10 and 12
2	Describe known principles of human visual system and computer vision system.	1,2,3,4,5,10 and 12
3	Describe methods of computer vision related to multi-scale representation, edge detection and detection of other primitive.	1,2,3,4,5,10 and 12
4	Use computer vision algorithm for 3D construction, stereo, motion and object recognition.	1,2,3,4,5,10 and 12
5	Develop proficiency in object recognition principles, applying machine learning for detection, training deep learning models, evaluating performance metrics, and utilizing relevant frameworks for practical computer vision applications.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS414R	**Professional Elective-IV: Computer Vision**	CO 1	3	3	3	2	3					1		3
		CO 2	2	2	2	2	2					1		2
		CO 3	3	2	3	2	3					1		3
		CO 4	3	3	3	2	3					1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VII									
Course Title	**PE-V: Predictive Analysis**								
Course code	**22BTCS416R**	**Total credits: 5** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To familiarize the students with various Statistical Data Analysis tools 2. Tools that can be used for effective decision making. 3. To make student handle data with various meters								
CO1	Understand and critically apply the concepts and methods of Predictive analytics.								
CO2	Understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.								
CO3	Applying and analysing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.								
CO4	Get exposed to the testing of hypothesis and solving assumptions								
CO5	Understanding of IBM Watson Studio with Machine Learning Model.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**ANALYTICS OVERVIEW** What is Predictive Analysis, how predictive model works, why predictive modeling, what are the models in Predictive Analysis. How Predictive analytics: Transforming data into future insights, Analytics trends: Past, Present & Future, Towards a Predictive enterprise.	**8**	Understand predictive analysis principles, predictive models, and their application in transforming data into future insights.	1,2
II	**Statistical Analysis** Define Statistics and its types, Measures of Central Value; Mean, Median and Mode, Measures of Dispersion: Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness,	**8**	Define statistics, its types, and key measures such as mean, median, mode, and various measures of dispersion.	1,2

	Kurtosis.			
III	**DATA MINING** What is a Data Mining applications? Strategy for data mining: CRISP-DM, Steps of Data Mining, Stages and tasks in CRISP-DM, Life Cycle of a Data Mining Project, Skills Needed for Data Mining. Identify nodes and streams, The framework of a Data – mining project, Brief the unit of analysis, Explain the type of dialog box.	**8**	Explain data mining applications, strategy using CRISP-DM, stages in a data mining project, and required skills.	2,3
IV	**UNIT OF ANALYSIS** Concepts of Unit of analysis (Distinct, Aggregate, SetToFlag), Integrate data, CLEM Expression, Role of Relationship between two fields, Identifying the modeling objective.	**8**	Define unit of analysis concepts (distinct, aggregate, SetToFlag), integrate data using CLEM Expression, and identify modeling objectives.	2,3
V	**PREDICTIVE ANALYTICS WITH IBM WATSON STUDIO** Understanding of IBM Cloud, IBM Watson Studio, Watson studio Components, Creating a Machine Learning Model, Data preparation, Watson Machine learning, Data Refinery, Watson Studio Neural Network Modeler, IBM Watson Studio jobs, Use case with AutoAI.	**8**	Utilize IBM Watson Studio for machine learning model creation, data preparation, Watson Machine Learning, Data Refinery, Neural Network Modeler, and AutoAI use cases.	1,2,5,6

TEXT BOOKS:

T1: Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL

REFERENCE BOOKS:

R1: "Applied Predictive Modeling" by Max Kuhn and KjellJohnsonDatabase Management Systems
R2: "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
R3: "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" by Eric Siegel

OTHER LEARNING RESOURCES:

1. https://www.ibm.com/topics/predictive-analytics

2. https://www.simplilearn.com/what-is-predictive-analytics-article
3. https://www.ibm.com/products/watson-studio

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand and critically apply the concepts and methods of Predictive analytics.	1,2,3,4,5,10 and 12
2	Understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.	1,2,3,4,5,10 and 12
3	Applying and analysing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.	1,2,3,4,5,10 and 12
4	Get exposed to the testing of hypothesis and solving assumptions	1,2,3,4,5,10 and 12
5	Understanding of IBM Watson Studio with Machine Learning Model.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS41 6R	**PE-V: Predictive Analysis**	CO 1	2	2	1	1	1					1		2
		CO 2	3	3	3	3	2					2		3
		CO 3	3	2	3	3	3					2		3
		CO 4	2	2	2	2	2					2		2
		CO 5	2	2	3	2	2					2		3

SEMESTER – VII									
Course Title	**PE-V: Social Network Analysis**								
Course code	**22BTCS416R**	**Total credits: 3** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To understand the concept of semantic web and related applications. 2. To learn knowledge representation using ontology. 3. To understand human behavior in social web and related communities. 4. To learn visualization of social networks. 5. To have access to a variety of descriptive measures for networks and software to calculate them, and have the ability to interpret the results.								
CO1	Understand the limitations of the current web and the rationale behind the development of the Semantic Web and Social Web.								
CO2	Demonstrate proficiency in ontology-based knowledge representation for the Semantic Web, using ontology languages such as RDF and OWL.								
CO3	Extract and analyze the evolution of web communities from web archives, apply community detection algorithms, and evaluate community structures in dynamic social networks.								
CO4	Analyze and predict human behavior within social communities, manage user data securely, and address privacy concerns.								
CO5	Apply graph theory, centrality measures, clustering techniques, and various visualization methods to analyze and interpret social networks.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**INTRODUCTION** Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.	**15**	Understand the evolution from the current web to the Semantic Web and Social Web, and apply key concepts in social network analysis to electronic discussion networks and online communities.	1

II	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION** Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.	**7**	Explain the role of ontology in the Semantic Web and apply ontology languages (RDF, OWL) for modeling social individuals and relationships, and advanced data representation techniques.	3
III	**EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS** Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities.	**6**	Extract and analyze web community evolution from archives, employ community detection algorithms, and evaluate community structures in dynamic social networks.	5
IV	**PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES** Understanding and predicting human behavior for social		Predict human behavior in social networks, manage user data, address privacy concerns, and implement trust models and security measures in online social	4

	communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and counter measures.	**6**	environments.	
V	**VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS** Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks..	**6**	Apply graph theory, centrality measures, and clustering techniques to visualize and interpret online social networks, using various visualization methods for collaboration, co-citation, and community welfare applications.	3

TEXT BOOKS:

T1 Peter Mika, ―Social Networks and the Semantic Web, First Edition, Springer 2007.

T2 BorkoFurht, ―Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010

REFERENCE BOOKS:

R1 Guandong Xu ,Yanchun Zhang and Lin Li,-Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.

R2 Dion Goh and Schubert Foo,-Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.

R3 Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.

R4John G. Breslin, Alexander Passant and Stefan Decker, -The Social Semantic Web, Springer, 2009.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the limitations of the current web and the rationale behind the development of the Semantic Web and Social Web.	1,2,3,4,5,6,10 and 12
2	Demonstrate proficiency in ontology-based knowledge representation for the Semantic Web, using ontology languages such as RDF and OWL.	1,2,3,4,5,6,10 and 12
3	Extract and analyze the evolution of web communities from web archives, apply community detection algorithms, and evaluate community structures in dynamic social networks.	1,2,3,4,5,6,10 and 12
4	Analyze and predict human behavior within social communities, manage user data securely, and address privacy concerns.	1,2,3,4,5,6,10 and 12
5	Apply graph theory, centrality measures, clustering techniques, and various visualization methods to analyze and interpret social networks.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS416 R	**PE-V: Social Network Analysis**	CO 1	2	2	1	1	1	2				1		2
		CO 2	3	3	3	3	2	2				2		3
		Co3	3	2	3	3	3	2				2		3
		CO 4	2	2	2	2	2	3				2		2
		Co5	2	2	3	2	2	2				2		3

SEMESTER – VII									
Course Title	**Project II**								
Course code	**22BTCS412R**	**Total credits: 6** **Total hours: 156** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**12**	**0**	**0**	**0**	**6**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech. CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To develop the knowledge, skills and attitudes of a professional Computer engineering professional. 2. To become confident in designing engineering solutions to complex software problems utilising a systems approach.								
CO1	Apply IT principles for real-world problem-solving using programming languages and network solutions.								
CO2	Contribute to complex projects as a team member, demonstrating effective personal and team management.								
CO3	Develop programming skills to create and assess software, hardware, and network solutions								
CO4	Apply personal and team management skills as a professional software developer.								
CO5	Cultivate employability skills and uphold professionalism in software development.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to: 1. Perform a literature search to review current knowledge and developments in the chosen technical area; 2. Undertake detailed technical work in the chosen area using one or more of: o theoretical studies o computer simulations o hardware construction; 3. Produce progress reports or	**156**	This course is designed as an individual or small group project under the guidance of academic staff. Students will embark on projects aligned with their and their supervisors' common interests and expertise. The course entails several key components: firstly, conducting a thorough literature search to review current knowledge and developments in their chosen technical area. Secondly, students will engage in detailed technical work, utilizing theoretical studies, computer simulations, or hardware construction techniques as appropriate	3,5 and 6

	maintain a professional journal to establish work completed, and to schedule additional work within the time frame specified for the project; 4. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 5. Prepare a formal report describing the work undertaken and results obtained so far; and Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.		to their project goals. Throughout the course, students will document their progress through regular progress reports or a professional journal, ensuring they stay on track within the project's specified timeframe. Furthermore, students will deliver a seminar presentation to communicate their understanding of the general area of work and highlight their specific contributions to the field. They will also prepare a formal report detailing the scope of their work, methods employed, and results obtained thus far. Finally, the course culminates in a forum where students will present their work through poster presentations and demonstrations, showcasing operational hardware and software developed or utilized during their project. This integrated approach equips students not only with technical skills but also with essential communication and presentation abilities necessary for effectively sharing their research findings in an academic and professional context.	

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply IT principles for real-world problem-solving using programming languages and network solutions.	1,2,3,4,5,6,7,8,9,10,11 and 12
2	Contribute to complex projects as a team member, demonstrating effective personal and team management.	1,2,3,4,5,6,7,8,9,10,11 and 12
3	Develop programming skills to create and assess software, hardware, and network solutions	1,2,3,4,5,6,7,8,9,10,11 and 12
4	Apply personal and team management skills as a professional software developer.	1,2,3,4,5,6,7,8,9,10,11 and 12
5	Cultivate employability skills and uphold professionalism in software development.	1,2,3,4,5,6,7,8,9,10,11 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS412R	**Project-II**	CO 1	3	3	2	3	2	1	1	2	3	2	2	3
		CO 2	3	3	3	3	2	1	1	2	3	2	2	3
		CO 3	3	2	3	2	3	1	1	2	3	3	2	3
		CO 4	3	2	2	2	2	1	1	2	3	3	3	3
		Co5	3	3	3	3	3	1	3	2	3	3	2	3

<table>
<tr><th colspan="10">SEMESTER – VII</th></tr>
<tr><td>Course Title</td><td colspan="9">Summer Internship</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTCS413R</td><td rowspan="2">Total credits: 3
Total hours:
45T+30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">B. Tech. CSE</td></tr>
<tr><td>Semester</td><td colspan="9">7TH SEMESTER OF FOURTH YEAR OF PROGRAM</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. Equip students with practical experience in their field of study, ensuring they are prepared to transition smoothly into industry roles by mastering modern tools, technologies, and industry-standard practices.
2. Enhance students' soft skills, including presentation, interpersonal communication, and documentation, as well as office etiquette, to ensure they can effectively navigate and contribute to professional environments.
3. Foster a deep understanding of professional and ethical responsibilities in engineering, encouraging students to adhere to industry best practices, processes, and regulations.
4. Promote the ability to work effectively in teams, especially within multidisciplinary contexts, emphasizing collaboration, communication, and the integration of diverse perspectives and expertise.
5. Cultivate a professional work ethic characterized by productivity, consistency, and punctuality, preparing students to meet the demands and expectations of the industry.</td></tr>
<tr><td>CO1</td><td colspan="9">Apply modern tools and technologies in real-world scenarios to solve complex engineering problems.</td></tr>
<tr><td>CO2</td><td colspan="9">Analyse industry-standard reporting methods to produce technical documents adhering to professional guidelines.</td></tr>
<tr><td>CO3</td><td colspan="9">Develop solutions using design, development, and testing practices aligned with current industry standards.</td></tr>
<tr><td>CO4</td><td colspan="9">Demonstrate effective communication, teamwork, and interpersonal skills in a multi-disciplinary team environment.</td></tr>
<tr><td>CO5</td><td colspan="9">Evaluate professional and ethical responsibilities to make informed decisions in engineering practices.</td></tr>
<tr><td>Unit-No.</td><td colspan="4">Content</td><td>Contact Hour</td><td colspan="2">Learning Outcome</td><td>KL</td></tr>
<tr><td>I</td><td colspan="4">• Summer internship shall be at least 90 hours during the summer vacation only.
• Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
• The student must fill up and get approved a Summer</td><td></td><td colspan="2"></td><td></td></tr>
</table>

	Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline. • Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed. • During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and also those of the University. • Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later. • The student shall submit two documents to the Coordinator for the evaluation of the summer internship: o Summer Internship Report o Summer Internship Assessment Form • Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted to the Coordinator by the first day of the new term. • The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in			

	this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester. • If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.			

TEXT BOOKS:

REFERENCE BOOKS:

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply modern tools and technologies in real-world scenarios to solve complex engineering problems.	1,2,3,4,5,6,9,10 and 12
2	Analyse industry-standard reporting methods to produce technical documents adhering to professional guidelines.	1,2,3,4,5,6,9,10 and 12
3	Develop solutions using design, development, and testing practices aligned with current industry standards.	1,2,3,4,5,6,9,10 and 12
4	Demonstrate effective communication, teamwork, and interpersonal skills in a multi-disciplinary team environment.	1,2,3,4,5,6,9,10 and 12
5	Evaluate professional and ethical responsibilities to make informed decisions in engineering practices.	1,2,3,4,5,6,8,9,10 and 12

MAPPING TABLE

Course code	Course Name		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS413R	Summer Internship	CO 1	3	3	3	3	3	3			2	1		2
		CO 2	2	2	3	3	2	2			2	1		2
		CO 3	2	2	3	2	2	2			2	1		2
		CO 4	3	3	3	3	3	3			2	3		2
		CO 5	2	2	2	2	2	2		3	2	1		2
		AVG	2.4	2.4	2.8	2.6	2.4	2.4		3	2	1.4		2

SEMESTER – VII									
Course Title	**Techno Professional Skills VI**								
Course code	**22BTCS125R**	**Total credits: 1** **Total hours: 26** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech. CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To have a detailed revision of Computer Science & Engineering concepts learnt so far. 2. To become confident in Computer Science & Engineering concepts to solve problems in real-life situations.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming, Data Structure and Algorithms	6	Students will become proficient in C programming, mastering advanced features like pointers and file handling, and implementing data structures such as arrays, linked lists, stacks, queues, trees, and graphs. They will also apply fundamental algorithms for sorting, searching, and hashing, enabling them to develop efficient and optimized programs.	2,3
II	Analog and Digital Electronic Circuits	4	Students will gain a thorough understanding of analog and digital electronics, learning the operation and design of fundamental analog components and circuits,	2,3

			as well as digital concepts like binary numbers, logic gates, and sequential logic circuits. This knowledge will equip them to analyze, design, and troubleshoot electronic systems.	
III	Computer Organization and Architecture, Operating Systems	6	Students will understand computer systems' structure and functioning, including the CPU, memory, and I/O devices, and will analyze instruction sets and performance optimization techniques. They will also explore operating system concepts like process and memory management, CPU scheduling, and storage management, equipping them to manage system resources efficiently.	2,3
IV	Database Management Systems, Object Oriented Programming	6	Students will develop a strong foundation in database design, SQL, and ensuring database integrity and security, while also gaining proficiency in object-oriented programming principles such as classes, inheritance, and polymorphism. This unit prepares them to design robust software systems and manage complex databases effectively.	2,3
V	Formal Language and Automata	4	Students will understand the theoretical foundations of computer science through formal languages, grammars, and automata theory, analyzing different types of automata such as finite automata and Turing machines. This knowledge provides a deep understanding of	2,3

			computation limits and the formal frameworks underpinning programming languages and algorithms.	

TEXT BOOKS:

REFERENCE BOOKS:

R1. "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

R2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

R3. Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.

R4. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.

R5. Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.

R6. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.

R7. Stallings, Computer Organization & Architecture, Pearson.

R8. Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.

R9. C. K. Nagpal, Formal Languages and Automata Theory, Oxford University Press.

R10. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, McGraw Hill.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses	1,2,3,4,5,6,7,8,9,10,11 and 12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice	1,2,3,4,5,6,7,8,9,10,11 and 12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,6,7,8,9,10,11 and 12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,6,7,8,9,10,11 and 12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,6,7,8,9,10,11 and 12

MAPPING TABLE

Course code	Course Name		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS125R	Techno Professional Skills VI	CO 1	3	3	3	2	3	1	1	1	1	1	1	1
		CO 2	2	2	2	2	2	1	1	1	1	1	1	1
		CO 3	3	2	3	2	3	1	1	1	1	1	1	1
		CO 4	3	3	3	2	3	1	1	1	1	1	1	1
		CO 5	3	3	3	3	3	1	1	1	1	1	1	1
		AVG	2.8	2.6	2.8	2.2	2.8	1	1	1	1	1	1	1

SEMESTER – 8									
Course Title	**PE-VI: Natural Language Processing**								
Course code	**22BTCS127R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Explore human language processing paradigms, NLP phases, and text representation in computers. 2. Learn to leverage linguistic resources like corpora, Tree Bank, and tools such as GATE and NLTK for NLP tasks. 3. Acquire proficiency in language modeling, parsing, semantics, and discourse analysis, applying them to real-world NLP applications.								
CO1	Define human languages and NLP paradigms, applying comprehension skills to identify text representation schemes.								
CO2	Evaluate linguistic resources, demonstrating XML management proficiency using GATE and NLTK.								
CO3	Construct word recognition systems using regular expressions and Finite State Automata, applying N-gram models with proficiency.								
CO4	Analyze natural language structures, employing context-free grammars for syntactic parsing								
CO5	Justify NLP applications, integrating semantic analysis and discourse resolution techniques for diverse tasks.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction to Natural Language Processing	12	Learn fundamentals of NLP, including text processing, language models, sentiment analysis, and machine learning applications for natural language understanding	2,3
II	Linguistic Resources and Tools	10	Master use of linguistic resources and tools for analyzing, processing, and understanding language data effectively and efficiently.	2, 3
III	Language Modeling and Analysis	8	Understand and apply techniques for building, evaluating, and utilizing language models for text analysis and generation.	3,4
IV	Syntax and Parsing	8	Learn principles of syntax and techniques for parsing sentences to analyze grammatical structure and dependencies.	2,4

V	Semantics, Discourse, and Applications	8	Explore semantic theories, discourse analysis, and their practical applications in natural language understanding and generation	4,5
Practical	NA	**30**		1,2, 3,4

TEXT BOOKS:

T1 Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009

REFERENCE BOOKS:

R1 James A.. Natural language Understanding 2e, Pearson Education, 1994

R2 Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000

R3 Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS127R	**NLP**	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – 8										
Course Title	**PE-VI: Speech and Video Processing**									
Course code	**22BTCS127R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Grasp the basics of speech production, perception, and digital signal processing techniques for analysis and synthesis. 2. Explore automatic speech recognition systems, including HMM and deep learning approaches, for accurate speech recognition and speaker identification. 3. Gain insights into video signal processing, including capture, compression, motion estimation, and advanced topics like object tracking, deep learning, and AR/VR applications.								
CO1	Analyze speech production and perception mechanisms, applying DSP fundamentals to process speech signals effectively.								
CO2	Implement speech coding techniques and synthesis systems, utilizing features like MFCC and LPC for efficient speech processing.								
CO3	Evaluate the performance of ASR systems, employing HMM and deep learning approaches for accurate speech recognition and speaker verification.								
CO4	Create video processing systems, incorporating knowledge of video signals, compression standards, and motion estimation for quality video representation and summarization.								
CO5	Apply advanced techniques such as object tracking, deep learning, and surveillance applications to analyze and enhance videos, paving the way for AR and VR innovations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Speech Processing:** Basics of Speech Production and Perception. Speech Signal Characteristics. Phonetics and Phonology. Digital Signal Processing Fundamentals for Speech. Time-Domain Methods for Speech Processing. Short-Time Fourier Transform, Wavelet Transform.	12	Understand fundamentals of speech processing, including speech recognition, synthesis, and signal analysis techniques.	2,3
II	**Speech Analysis and Synthesis:** Feature Extraction: MFCC, LPC, PLP. Speech Coding Techniques. Speech Enhancement and Noise Reduction. Text-to-Speech (TTS) Systems. Speech Synthesis Techniques: Formant Synthesis, Concatenative Synthesis, Parametric Synthesis.	10	Learn techniques for analysing and synthesizing speech signals, focusing on practical applications and tools.	3,4
III	**Speech Recognition and Speaker Identification:** Automatic Speech Recognition	8	Understand and implement techniques for automatic speech	3,4

	(ASR) Systems. Hidden Markov Models (HMM) for Speech Recognition. Deep Learning Approaches in ASR. Language Models and Acoustic Models. Speaker Identification and Verification. Applications of Speech Recognition in Industry.		recognition and speaker identification, focusing on accuracy and efficiency.	
IV	**B**asics of Video Signals and Systems. Video Capture and Representation. Color Spaces and Color Models. Video Compression Standards: H. **Introduction to Video Processing**264, HEVC. Motion Estimation and Compensation. Key Frame Extraction and Video Summarization.	8	Understand fundamentals of video signals including processing techniques and practical applications.	2,3
V	**Advanced Topics in Video Processing:**Video Segmentation and Object Tracking. Video Enhancement and Restoration. Deep Learning for Video Analysis. Action Recognition and Video Understanding. Video Surveillance and Security Applications. Introduction to Augmented Reality (AR) and Virtual Reality (VR) Applications	8	Master advanced video processing techniques, including segmentation, object tracking, enhancement, and restoration.	4,5
Practical	NA	**30**		1,2, 3,4

TEXT BOOKS:

T1Rabiner, L., & Schafer, R. (2007). *Introduction to Digital Speech Processing*. Foundations and Trends in Signal Processing.

T2 Gonzalez, R. C., & Woods, R. E. (2018). *Digital Image Processing*. Pearson.

T3 Gonzalez, R. C., & Woods, R. E. (2018). Digital Image Processing. Pearson.

REFERENCE BOOKS:

R1Jurafsky, D., & Martin, J. H. (2008). *Speech and Language Processing*. Pearson.

R2Szeliski, R. (2010). *Computer Vision: Algorithms and Applications*. Springer.

R3 Richardson, I. E. (2010). *The H.264 Advanced Video Compression Standard*. Wiley.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS127R	**Speech and Video Processing**	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – 8									
Course Title	**PE-VII: Advanced Data Mining**								
Course code	**22BTCS128R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Understand and apply supervised and unsupervised learning algorithms along with evaluation metrics and model selection. 2. Gain proficiency in graph mining algorithms, sentiment analysis, topic modeling, and web mining techniques. 3. Learn advanced data mining methods like deep learning, transfer learning, and address ethical concerns in data mining practices.								
CO1	Apply decision trees, SVMs, and neural networks in practical examples to understand how supervise d learning works.								
CO2	Evaluate K-means and DBSCAN clustering algorithms to learn about unsupervised data mining and how to interpret results effectively.								
CO3	Analyze network structures using graph theory principles and algorithms like PageRank to find important insights in graph data.								
CO4	Use sentiment analysis, topic modeling, and web mining techniques to extract and analyze information from text and web data.								
CO5	Evaluate time series data, use deep learning models, and consider ethical aspects to demonstrate advanced data mining skills in real-world scenarios.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Supervised Data Mining and Evaluation	12	Master supervised data mining methods and evaluate their effectiveness in solving predictive modeling and classification tasks.	4,5
II	Unsupervised Data Mining and Evaluation	10	Master unsupervised data mining techniques and evaluate their efficacy in clustering and pattern discovery tasks.	4, 5
III	Graph Data Mining	8	Utilize graph data mining techniques to analyze complex relationships and patterns in interconnected data structures.	4, 5
IV	Text and Web Mining	8	Apply text and web mining techniques to extract insights from unstructured data and online sources.	3, 4
V	Advanced Applications of Data Mining	8	Implement advanced data mining techniques for complex problem-solving, focusing on innovative	5, 6

			applications and methodologies.	
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1"Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei

REFERENCE BOOKS:

R1"Pattern Recognition and Machine Learning" by Christopher M. Bishop

R2 "Introduction to Data Mining" by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS128R	**Advanced Data Mining**	CO1	3	2	2	2	1					1		3
		CO2	3	3	3	3	1					1		3
		CO3	3	2	2	2	1					1		3
		CO4	3	2	2	2	1					1		3
		CO5	3	3	2	2	1					1		3

SEMESTER – 8									
Course Title	**PE-VII: Data Modelling and Simulation**								
Course code	**22BTCS128R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								

Course Objectives (Minimum 3)	1.Equip students with a comprehensive understanding of the fundamental principles of data modelling and simulation, including various model types and their applications. 2.Enable students to develop, validate, and assess mathematical and statistical models using real-world data, ensuring accuracy and reliability. 3.Provide practical experience in applying diverse simulation techniques and tools to solve complex engineering and industry-specific problems.
CO1	Understand the fundamental concepts of data modelling and simulation, including types of models and their applications, through analysis of case studies.
CO2	Develop and validate mathematical and statistical models using probability distributions, hypothesis testing, and regression analysis for real-world data scenarios.
CO3	Implement discrete-event, continuous, and Monte Carlo simulations using simulation software, ensuring accurate model building and output analysis.
CO4	Analyze complex systems using advanced simulation techniques such as system dynamics, agent-based modelling, and optimization methods like genetic algorithms.
CO5	Apply data modelling and simulation techniques to solve industry-specific problems, demonstrating ethical and practical considerations in real-world projects.

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Data Modelling and Simulation:** Overview of Data Modelling. Types of Models: Physical, Mathematical, Statistical, and Simulation Models. Introduction to Simulation: Definition and Importance. Steps in a Simulation Study. Applications of Modelling and Simulation in Engineering. Case Studies of Successful Modelling and Simulation Projects.	12	Understand fundamental concepts of data modeling and simulation for analysing and predicting complex systems.	2, 3
II	**Mathematical and Statistical Modelling:** Mathematical Modelling: Deterministic and Stochastic Models. Statistical Modelling: Probability Distributions, Hypothesis Testing, Regression Analysis. Model Development: Assumptions, Formulation, and Validation. Data Collection and Preparation for Modelling. Model Fitting and Parameter Estimation. Goodness-of-Fit Tests.	10	Apply mathematical and statistical modeling techniques to solve real-world problems and interpret data.	2, 3

III	**Simulation Techniques and Tools:** Types of Simulations: Discrete-Event, Continuous, and Monte Carlo Simulations. Simulation Methodologies: Time-Driven, Event-Driven, and Process-Oriented Approaches. Introduction to Simulation Software: MATLAB, Simulink, Arena, AnyLogic. Building Simulation Models: Entity, Attribute, Event, and Queue Concepts. Verification and Validation of Simulation Models. Output Analysis and Interpretation.	8	Learn to analyze data and data modelling algorithms though simulations	4, 5
IV	**Advanced Topics in Simulation:** System Dynamics and Agent-Based Modelling. Hybrid Simulation Techniques. Optimization in Simulation: Genetic Algorithms, Simulated Annealing. Simulation of Complex Systems: Supply Chains, Healthcare, Manufacturing Systems. Real-Time and Parallel Simulations. Case Studies of Advanced Simulations in Industry.	8	Learn to analyze data and data modelling algorithms through simulations	3, 4
V	**Real-world Applications:** Application of Data Modelling and Simulation in Real-World Scenarios. Industry-Specific Simulation Projects: Finance, Engineering, IT, Environmental Systems. End-to-End Modelling and Simulation of a Given Problem. Ethical and Practical Considerations in Data Modelling and Simulation.	8	Apply data modelling techniques and algorithms to solve real world problems	3, 4
Practical	NA	**30**		1,2, 3,4

TEXT BOOKS:

T1 Law, A. M., & Kelton, W. D. (2015). *Simulation Modeling and Analysis*. McGraw-Hill.

T2 Banks, J., Carson, J. S., Nelson, B. L., & Nicol, D. M. (2010). *Discrete-Event System Simulation*. Pearson.

REFERENCE BOOKS:

R1Ross, S. M. (2014). *Introduction to Probability Models*. Academic Press.

R2 Jain, R. (2010). *The Art of Computer Systems Performance Analysis*. Wiley.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOME

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS128R	**Data Modelling and Simulation**	CO1	3	2	2	2	1					1		3
		CO2	3	3	3	3	1					1		3
		CO3	3	2	2	2	1					1		3
		CO4	3	2	2	2	1					1		3
		CO5	3	3	2	2	1					1		3

SEMESTER – 8									
Course Title	**PE-VIII: Introduction to Virtual and Augmented Reality**								
Course code	**22BTCS129R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1.Understand core concepts, historical context, and hardware, preparing for practical development and application. 2. Acquire skills in environment setup, 3D modeling, and interaction design, using popular development tools like Unity or Unreal Engine. 3.Investigate diverse industry uses, ethical implications, and emerging trends, while delving into advanced development techniques and integration with AI.								
CO1	Understand key historical milestones and technological advancements in VR and AR evolution.								
CO2	Understand the fundamental principles of 3D modeling and interaction design for VR environments.								
CO3	Apply AR frameworks and design principles to create immersive AR experiences for mobile devices.								
CO4	Analyze the ethical implications and societal impacts of VR/AR applications across diverse industries.								
CO5	Design and develop an innovative VR/AR application integrating advanced techniques and technologies.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Foundations of Virtual and Augmented Reality	12	Understand the fundamental principles and technologies behind virtual and augmented reality applications.	2,3
II	Virtual Reality Development	10	Develop immersive virtual reality experiences using advanced tools and techniques for various applications.	3, 6
III	Augmented Reality Development	8	Create interactive augmented reality applications using advanced development tools and techniques for diverse real-world scenarios.	3,6
IV	Applications and Use Cases	8	Explore and implement practical applications of augmented reality across industries for enhancing	4, 5

			user experiences and functionality.	
V	Advanced Topics: AR/VR Development Techniques, social VR experiences	8	Master development techniques for creating immersive social VR experiences, integrating AR/VR technologies for interactive social interactions.	4,6
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1"Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer

REFERENCE BOOKS:

R1"Virtual Reality Technology" by Grigore C. Burdea and Philippe Coiffet

R2"Virtual Reality: Concepts and Technologies" edited by Giovanna Calogiuri

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS129R	**Introduction to Virtual and Augmented Reality**	CO1	2	2	1	1	1					1		2
		CO2	3	3	3	3	2					2		3
		CO3	3	2	3	3	3					2		3
		CO4	2	2	2	2	2					2		2
		CO5	2	2	3	2	2					2		3

SEMESTER – 8									
Course Title	**PE-VIII: Cryptography &Network Security**								
Course code	**22BTCS129R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1.To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures. 2.To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes. 3.To familiarize Digital Signature Standard and provide solutions for their issues. 4.To familiarize with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message.								
CO1	Identify basic security attacks and services.								
CO2	Use symmetric and asymmetric key algorithms for cryptography.								
CO3	Design a security solution for a given application.								
CO4	Analyze Key Management techniques and the importance of number Theory.								
CO5	Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions work.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	INTRODUCTION: Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography.	12	Understand foundational concepts of cryptography and information security for securing digital communications and data.	3, 4
II	BLOCK CIPHER AND DATA ENCRYPTION STANDARDS: Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles. ADVANCED ENCRYPTION STANDARDS: Evaluation Criteria for AES, the AES Cipher. MORE ON	10	Analyze and implement block cipher algorithms and encryption standards for secure data transmission and storage.	4,5

	SYMMETRIC CIPHERS: Multiple Encryption, Triple DES, Block Cipher Modes of Operation, Stream Cipher and RC4.			
III	PUBLIC KEY CRYPTOGRAPHY AND RSA: Principles Public key crypto Systems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, Elliptic Curve Arithmetic, Elliptic Curve Cryptography. MESSAGE AUTHENTICATION AND HASH FUNCTIONS: Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs. HASH AND MAC ALGORITHM: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. DIGITAL SIGNATURE: Digital Signature, Authentication Protocol, Digital Signature Standard.	8	Understand and apply public key cryptography principles, including RSA algorithm, for secure communication and encryption. Implement message authentication techniques and analyze hash functions for ensuring data integrity and security.	4, 5
IV	AUTHENTICATION APPLICATION: Kerberos, X.509Authentication Service, Public Key Infrastructure. EMAILSECURITY: Pretty Good Privacy (PGP) and S/MIME. IPSECURITY: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Pay load, Combining Security Associations and Key Management.	8	Develop and evaluate authentication methods for secure access control and identity verification in various applications.	4, 5
V	WEB SECURITY: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. FIREWALL: Firewall Design principles, Trusted Systems	8	Understand and apply web security measures to protect against vulnerabilities and threats in online environments.	2,3
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1 William Stallings (2006), Cryptography and Network Security: Principles and Practice,4th edition, Pearson Education, India.

T2 William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.

REFERENCE BOOKS:

R1 Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd edition, Prentice Hall of India, New Delhi.

R2 Atul Kahate (2008), Cryptography andNetworkSecurity,2nd edition, Tata McGraw hill, India.

Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata McGraw-Hill, India.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS129R	**Cryptography & Network Security**	CO1	2	2	1	1	1					1		2
		CO2	3	3	3	3	2					2		3
		CO3	3	2	3	3	3					2		3
		CO4	2	2	2	2	2					2		2
		CO5	2	2	3	2	2					2		3

SEMESTER – 8									
Course Title	**Project III**								
Course code	**22BTCS421R**	**Total credits: 7**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 156 P	**0**	**0**	**14**	**0**	**0**	**0**	**7**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Apply theoretical knowledge gained throughout the degree program to solve real-world problems or develop innovative solutions in computer science. 2. Demonstrate proficiency in project planning, execution, and management, including tasks such as requirement analysis, design, implementation, testing, and documentation. 3. Conduct independent research, explore new technologies or methodologies, and contribute to the advancement of knowledge in a specific area of computer science.								
CO1	Apply IT principles for real-world problem-solving using programming languages and network solutions.								
CO2	Manage complex projects as a team member, demonstrating effective personal and team management skills.								
CO3	Develop programming skills to create and assess software, hardware, and network solution.								
CO4	Apply personal and team management skills as a professional software developer.								
CO5	Cultivate employability skills and uphold professionalism in software development.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to: 6. Perform a literature search to review current knowledge and developments in the chosen technical area; 7. Undertake detailed technical work in the chosen area using one or more of: a) theoretical studies b) computer simulations c) hardware construction; 8. Produce progress reports or maintain a professional journal to	156	Independently conceive, design, implement, and present a significant computer science project, demonstrating advanced technical proficiency, problem-solving skills, and innovation.	5,6

	establish work completed, and to schedule additional work within the time frame specified for the project; 9. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 10. Prepare a formal report describing the work undertaken and results obtained so far; and Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.			
Practical	NA	**30**		1,2,3,4

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS421R	**Project III**	CO1	3	3	2	3	2	1	1	2	3	2	2	3
		CO2	3	3	3	3	2	1	1	2	3	2	2	3
		CO3	3	2	3	2	3	1	1	2	3	3	2	3
		CO4	3	2	2	2	2	1	1	2	3	3	3	3
		CO5												

Assam down town University

Curriculum and Syllabus

Bachelor of Technology
in
Computer Science and Engineering on Data Science and Artificial Intelligence

OUTCOME BASED EDUCATION FRAMEWORK
CHOICE BASED CREDIT SYSTEM
Version: 1.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, Dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators.

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

Programme Overview (not more than 100 words)

Bachelor of Technology in Computer Science and Engineering is an Under Graduate Degree awarded for the programme of Computer Science and Engineering. As one of the best computer engineering colleges, we intend to create a cohesive learning experience with the latest technological developments to that of industry demand.

I. Specific Features of the Curriculum

The B. Tech CSE curriculum, guided by the outlined Program Specific Outcomes (PSOs), emphasizes a comprehensive educational framework. It prepares students for competitive exams through updated and focused syllabi. It integrates advanced research principles with sustainable technology applications, ensuring graduates possess the necessary engineering and management skills for societal impact. The curriculum fosters effective communication, teamwork, and project management in multidisciplinary settings. Additionally, it incorporates contemporary industrial and research trends, encouraging innovation and entrepreneurial proficiency. This holistic approach equips students to develop novel software engineering solutions, addressing real-world problems with cutting-edge techniques and strategies.

II. Eligibility Criteria:

Minimum 45% with English, Physics & Mathematics in HS.

III. Program Educational Objectives (PEOs):

PEO 1: To produce graduates who have strong foundation of knowledge and skills in the field of Computer Science and Engineering.

PEO 2: To produce graduates who can provide solutions to challenging problems in their profession by applying Computer Engineering theory and practices.

PEO 3: To produce graduates who are employable in industries/public sector/research organizations or work as an entrepreneur, as well as can provide leadership and are effective in multidisciplinary environment.

IV. Program Specific Outcomes (PSOs):

PSO 1: Educational Advancement

Graduates will be prepared for state, national and international competitive examinations with focused and updated syllabi.

PSO 2: Advanced Research

Graduates will have a holistic comprehension of engineering and management principles

required for application of sustainable technologies for societal development, and also will be able to communicate effectively in oral, written, visual and graphic modes as a member and leader in a team, to manage projects in multidisciplinary environments.

PSO 3: Entrepreneurial Proficiency

Graduates will be acquainted with the contemporary trends in industrial/research environments and also will capable of innovating novel solutions to prevailing problems by applying software engineering techniques and strategies.

V. Program Outcome: (8-12)

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VI. Total Credits to be Earned: 176

VII. Career Prospects:

A B. Tech in Computer Science and Engineering (CSE) offers diverse and promising career prospects. Graduates can pursue roles such as software developers, data scientists, cybersecurity analysts, and AI/ML engineers in top tech firms. They are well-suited for positions in research and development, working on cutting-edge technologies. The curriculum also prepares them for competitive exams, enabling careers in public sector and government organizations. Additionally, the strong emphasis on entrepreneurial skills allows graduates to innovate and launch their own start-ups. With rapid advancements in technology, CSE graduates remain in high demand across various industries, ensuring robust career opportunities.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

A. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination)*	30
2.	In-Sem Exam – II (ISE-II) (Written Examination)*	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in the any of the component without any valid reason he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absent.

2. The report of evaluation of an activity towards the in-semester (sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

B. SEMESTER END EXAMINATION:

Time table for end semester examination is published at least 25 days prior to the start of Examination.

I. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

II. Admit Card:

Admit card for the examination may be downloaded through ERP where the system will generate a Unique ID Cards through online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

III. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.
Table

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.
3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyse	Classify, outline, categorize, analyze, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on basis of **all 6 knowledge levels.**

The format of the question paper across all the program follow a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl no	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

IV. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

V. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

VI. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the centre may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the exam with new answer sheet or may expel the student from appearing the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribe expulsion form. The student may not be allowed to write that examination.

VII. Instruction to the Students:

(i) The students shall not bring to the Examination Hall, any electronic gadget used as a means of communication or record except electronic calculator, if required.

(ii) The students shall not receive any book or printed or hand written or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

VIII. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

C. Credit Point:

It is the product of grade point and number of credits for a course, thus, CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades 'O' to 'P' shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in Table 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrolment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrolment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the ith completed Course and Ci is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

D. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a University appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or viva voce and wish to appear again may apply to be evaluated can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. Student- centric / Constructivist Approach:

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centric classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programme the student has to undergo project-based learning at least 4 months duration. This approach will help the student to think critically, evaluate, analyze, make decisions, collaborate, and more.

b. Inquiry-Based Learning: The teacher/ students are supposed to list at least five questions in each contact hour and student solve these question or search for answer which becomes the home work for the students "question-driven" learning approach. The teacher may look for the correctness of the solution or the best possible answer and discuss in the successive class. This will help in the preparation for various competitive examination and develop a habit for search for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watchvideo or lecture prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are more passive to an approach where students are active participants. As a result, this approach is also a student- centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

The teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework

Breakdown of Credits

Sl. No	Category	Total credits
1	University Core (UC)	13
2	University Elective (UE)	18
3	Program Core (PC)	123
4	Program Elective (PE)	24
5	Faculty Elective (FE)	7
		185

Breakdown by category of courses:

Sl no	Category	Credits	%
1	Science	22	11.89%
2	Engineering	128	69.18%
3	Commerce and Management	35	18.91%
Total		185	100%

B.Tech CSE (DS & AI) Curriculum 2022-26																
Semester I	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**Total Marks**
	1	Engineering Mathematics I	22BTCS111R	DSC (Minor) / PC	4	3	1	0	0	0	0	40	60	0	100
	2	Introduction to Basic Mathematics, Logic and Coding	22BTCS112R	DSC (Major) / PC	4	2	1	2	0	0	0	40	60	100	200
	3	Engineering Physics	22BTCS113R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	4	Basic Electrical Engineering	22BTCS114R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	5	Workshop / Manufacturing Practices	22BTCS115R	DSC (Minor) / PC	3	1	0	4	0	0	0	40	60	100	200
	6	Introductory English for Engineers	22UBPD114R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	7	Extra-Curricular	22UBEC111	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	Total Credit in 1st Semester				**22**	**10**	**4**	**14**	**4**	**0**	**0**	**200**	**300**	**600**	**1100**
Semester II	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Engineering Mathematics II	22BTCS121R	DSC (Minor) / PC	4	3	1	0	0	0	0	40	60	0	100

	2	Engineering Chemistry	22BTCS122R	DSC (Minor) / PC	4	2	1	2	0	0	0	40	60	100	200
	4	Programming for Problem Solving	22BTCS123R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	5	Engineering Graphics and Design	22BTCS124R	DSC (Minor) / PC	3	1	0	4	0	0	0	40	60	100	200
	6	Techno Professional Skills I	22BTCS125R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Effective English for Engineers	22UBPD124R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS I	22MOSY124R	AEC / CBCS / FE	1	0	0	0	0	0	0	0	0	100	100
	9	UHV+ Program Ethics	22UUHV101R	VAC / UC	2	1	0	2	0	0	0	40	60	0	100
	10	Computational Systems and Digital World	22UCDL103R	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	11	Co-Curricular	22UBCC121	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	12	Extra-Curricular	22UBEC121	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	Total Credit in 2nd Semester				**24**	**10**	**2**	**18**	**8**	**0**	**0**	**200**	**300**	**900**	**1400**
Semester III	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**

	1	Analog Electronic Circuits	22BTCS211R	DSC (Minor) / PC	4	3	0	2	0	0	0	40	60	100	200
	2	Digital Electronic Circuits	22BTCS212R	DSC (Minor) / PC	3	2	0	2	0	0	0	40	60	100	200
	3	Data Structure & Algorithms	22BTCS213R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	4	Biology for Engineers	22BTCS214R	DSC (Minor) / PC	2	2	0	0	0	0	0	40	60	0	100
	5	Mathematics III (Differential Calculus)	22BTCS215R	DSC (Minor) / PC	2	2	0	0	0	0	0	40	60	0	100
	6	Techno Professional Skills II	22BTCS216R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Basic Life Saving Skills	22UULS212R	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	8	Personal Financial Planning	22UUFL213R	MDC / UE	1	0	0	2	0	0	0	0	0	100	100
	9	English for Employability for Engineers	22UBPD214R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	10	MOOCS II	2MOCECS217R	MDC / FE	1	0	0	0	0	0	0	0	0	100	100
	11	Co-Curricular	22UBCC211	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	12	Extra-Curricular	22UBEC211	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	Total Credit in 3rd Semester				**23**	**12**	**0**	**16**	**8**	**0**	**0**	**200**	**300**	**1000**	**1500**
Semest	**Sl.N**	**Course**	**Course Code**	**Categor**	**Cred**	**L**	**T**	**P**	**S**	**R**	**O/**	**Max In-Sem**	**Max End-**	**Max End**	**TOTAL**

er IV	o	Title		y I	it						F	Marks [Theory]	Sem Marks [Theory]	Sem Practical Marks	Marks
	1	Computer Organization & Architecture	22BTCS221R	DSC (Major) / PC	3	2	1	0	0	0	0	40	60	0	100
	2	Operating Systems	22BTCS222R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	Design & Analysis of Algorithms	22BTCS223R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	Discrete Mathematics	22BTCS224R	DSC (Minor) / PC	4	3	1	0	0	0	0	40	60	0	100
	5	Techno Program Skills III	22BTCS225R	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	6	Environmental Science	22BTCS226R	SEC / PC	2	2	0	0	0	0	0	40	60	0	100
	7	English Language Proficiency for Engineers	22UBPD224R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS III	22MOCS221R	SEC / FE	1	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC221	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC221	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	Basic Acclimatizing Skills (BAS)	22UULS201R	MDC / UE	1	0	0	2	0	0	0	40	60	0	100
	Total Credit in 4th Semester				**23**	**13**	**2**	**10**	**8**	**0**	**0**	**240**	**360**	**600**	**1200**

Semester V	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Signals and Systems	22BTCS311R	DSC (Minor) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	Database Management Systems	22BTCS312R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	Formal Language and Automata Theory	22BTCS313R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	Object Oriented Programming	22BTCS314R	DSC (Major) / PC	5	3	0	4	0	0	0	40	60	100	200
	5	Program Elective I	22BTCS316R	PE	3	3	0	0	0	0	0	40	60	0	100
	6	Techno Program Skills IV	22BTCS315R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Competent English for Engineers	22UBPD314R	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS IV	MOOCSCECS4	MDC / FE	2	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC311	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC311	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	Predictive Analysis	22BTCS316R	DSC (Major) / PC	3	2	0	2	0	0	0	40	60	100	100

	Total Credit in 5th Semester				**28**	**17**	**0**	**14**	**8**	**0**	**0**	**240**	**360**	**800**	**1300**
Semester VI	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Compiler Design	22BTCS321R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	0	100
	2	Computer Networks	22BTCS322R	DSC (Major) / PC	4	3	0	2	0	0	0	40	60	100	200
	3	Program Elective II	22BTCS317R	PE	3	3	0	0	0	0	0	40	60	0	100
	4	Program Elective III	22BTCS318R	PE	3	3	0	0	0	0	0	40	60	0	100
	5	Project I	22BTCS323R	DSC (Major) / PC	4	0	0	8	0	0	0	0	0	100	100
	6	Techno Program Skills V	22BTCS324R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Corporate Proficiency for Engineers	22UBPD324R	VAC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	MOOCS V	MOOCSCECS6	MDC / FE	2	0	0	0	0	0	0	0	0	100	100
	9	Co-Curricular	22UBCC321	Co-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	10	Extra-Curricular	22UBEC321	Extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	Data Science	22BTCS325R	DSC (Major) / UC	3	2	0	2	0	0	0	40	60	100	100
	Total Credit in 6th Semester				**28**	**1**	**0**	**2**	**8**	**0**	**0**	**200**	**300**	**800**	**1200**

						4		**0**								
Semester VII	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Software Engineering	22BTCS411R	DSC (Major) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	Program Elective IV	22BTCS414R	PE	3	2	1	0	0	0	0	40	60	0	100
	3	Program Elective V	22BTCS416R	PE	3	2	1	0	0	0	0	40	60	0	100
	4	Project II	22BTCS412R	DSC (Major) / PC	6	0	0	12	0	0	0	0	0	100	100
	5	Summer Internship	22BTCS412R	Summer Internship / PC	2	0	0	0	0	0	0	0	0	100	100
	6	Techno Program Skills VI	22BTCS125R	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	Artificial Intelligence	22BTCS413R	DSC (Major) / UC	3	2	0	2	0	0	0	40	60	100	100
	Total Credit in 7th Semester				**21**	**9**	**2**	**16**	**0**	**0**	**0**	**160**	**240**	**400**	**700**
Semester VIII	**Sl.No**	**Course Title**	**Course Code**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
	1	Program Elective VI	22BTCS127R	PE	3	3	0	0	0	0	0	40	60	0	100
	2	Program Elective VII	22BTCS128R	PE	3	3	0	0	0	0	0	40	60	0	100
	3	Program Elective	22BTCS129R	PE	3	3	0	0	0	0	0	40	60	0	100

		VIII													
	4	Project III	22BTCS421R	DSC (Major) / PC	7	0	0	14	0	0	0	0	0	100	100
	Total Credit in 8th Semester				**16**	**9**	**0**	**14**	**0**	**0**	**0**	**120**	**180**	**100**	**400**

List of Program Electives (PE)Paper		
Semester	**Program Electives No.**	**Electives Name**
V	PE-I	1. Foundation of Data Science 2. Neural Network
VI	PE-II	1.Artifical Intelligence 2. Data Mining
VI	PE-III	1. Machine Learning 2. Big Data Analytics
VII	PE-IV	1. Data Handling and Visualization 2. Computer Vision
VII	PE-V	1. Predictive Analyis 2. Social Network Analysis
VIII	PE-VI	1. Natural Language Processing 2. Speech and Video Processing
	PE-VII	1. Advanced Data Mining 2. Data Modeling and Simulation
	PE-VIII	1. Introduction to Virtual and Augmented Reality 2. Cryptography and Network Security

Semester	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
1	**22**	**10**	**4**	**14**	**4**	**0**	**0**	200	300	600	1100
2	**24**	**10**	**2**	**18**	**8**	**0**	**0**	**200**	**300**	**900**	**1400**
3	**23**	**12**	**0**	**16**	**8**	**0**	**0**	**200**	**300**	**1000**	**1500**
4	**23**	**13**	**2**	**12**	**8**	**0**	**0**	**240**	**360**	**600**	**1200**
5	**28**	**17**	**0**	**13**	**8**	**0**	**0**	**240**	**360**	**800**	**1300**
6	**28**	**14**	**0**	**19**	**8**	**0**	**0**	**200**	**300**	**800**	**1200**
7	**21**	9	2	15	0	0	0	160	240	400	700
8	**16**	9	0	14	0	0	0	120	180	100	400
Total	185	94	10	121	44	0	0	1560	2340	5200	8800

List of MOOCS				
Sl. No	**MOOCS Course No**	**Name of the Course**	**Course Code**	**Semester**
1	MOOCS I	ENHANCING STUDY SKILLS	22MOSY124R	II
2		COMMUNITY ENGAGEMENT AND SOCIAL RESPONSIBILITY	22MOSY125R	
1	MOOCS II	HTML	2MOCECS217R	III
2		Foundation of Cybersecurity	2MOCECS218R	
1	MOOCS III	Writing, Running and Fixing Code in C	22MOCS221R	IV
2		Foundations of Digital Marketing and E-Commerce	22MOCS222R	
1	MOOCS IV	JAVASCRIPT, JQUERY, AND JSON	MOOCSCECS4	V
2		INTERMEDIATE POSTGRESQL	MOOCSCECS5	
1	MOOCS V	Mean Stack	MOOCSCECS6	V
2		Java Full Stack Developer	MOOCSCECS7	

SEMESTER – I									
Course Title	**Engineering Mathematics I**								
Course code	**22BTCS111R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 39T	**3**	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Mathematics**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To make understand to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma function must be introduced. To provide the application of differential and integral calculus. To make understand the convergence and divergence of sequence and series.								
CO1	Understand definite integrals and computation of surface areas and volumes, demonstrating proficiency in integration techniques.								
CO2	Utilize Rolle's Theorem and mean value theorems to analyze functions, ensuring conceptual mastery.								
CO3	Evaluate convergence of sequences and series, applying tests and constructing power series for functions.								
CO4	Analyze multivariable functions, determining limits, continuity, and extrema using partial derivatives and Lagrange multipliers.								
CO5	Demonstrate competence in matrix operations, eigenvalue computations, and orthogonal transformations, applying linear algebra principles.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Calculus:** Evaluates and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**8**	Evaluates definite and improper integrals, Beta and Gamma functions; applies integrals to calculate surface areas and volumes of revolutions.	**3, 5**
II	**Calculus:** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.	**12**	Understand and apply Rolle's Theorem, Mean Value Theorems, Taylor/Maclaurin series with remainders, L'Hospital's Rule, and techniques for finding maxima/minima.	**2, 3**
III	**Sequences and series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.	**8**	Grasp convergence of sequences/series, apply tests, analyze power/Taylor series, and study Fourier series, half-range expansions, and	**3, 4**

			Parseval's theorem.	
IV	**Multivariable Calculus(Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	**6**	Understand and apply limits, continuity, partial/directional/total derivatives, tangent planes, extrema, Lagrange multipliers, and gradient, curl, and divergence concepts.	**2, 3**
V	**Matrices:** Inverse and rank of a matrix, rank- nullity theorem; System of linear equations; Symmetric, skew-symmetric	**5**	Understand and apply matrix inverses, rank, rank-nullity theorem, solve linear systems, and analyze symmetric and skew-symmetric matrices.	**2, 3**

TEXT BOOKS:

T1: G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint,2002.

T2: Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

T3: Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

R1: N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

R2: B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.

OTHER LEARNING RESOURCES:

O1: https://archive.nptel.ac.in/courses/111/105/111105121/

O2: https://www.geeksforgeeks.org/engineering-mathematics-tutorials/

O3: https://www.udemy.com/course/mathematics-for-engineering/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand definite integrals and computation of surface areas and volumes, demonstrating proficiency in integration techniques.	1,2, 3, 4, 5, 10, 12
2	Utilize Rolle's Theorem and mean value theorems to analyze functions, ensuring conceptual mastery.	1,2, 3, 4, 5, 10, 12
3	Evaluate convergence of sequences and series, applying tests and constructing power series for functions.	1,2, 3, 4, 5, 10, 12
4	Analyze multivariable functions, determining limits, continuity, and extrema using partial derivatives and Lagrange multipliers.	1,2, 3, 4, 5, 10, 12
5	Demonstrate competence in matrix operations, eigenvalue computations, and orthogonal transformations, applying linear algebra principles.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS111R	**Engineering Mathematics I**	CO1	3	2	3	3	3					3		2
		CO2	2	2	2	2	2					3		2
		CO3	2	2	2	2	2					3		2
		CO4	3	3	3	3	3					3		2
		CO5	3	3	3	3	3					3		2

SEMESTER – I									
Course Title	**Introduction to Basic Mathematics, Logic and Coding**								
Course code	**22BTCS112R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To understand and be able to use the language, symbols and notation of mathematics To develop the ability to create a programmable model for a given problem. To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations								
CO1	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding								
CO2	Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.								
CO3	Solve and devise solutions to a range of elementary real-world problems in mathematics and programming								
CO4	Explore and apply key concepts in logical thinking to business problems.								
CO5	Enable students to critically analyse information in order to evaluate evidence and construct reasoned arguments.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Basics of Set Theory and Functions:** **Sets**: Basic definitions, cardinality of a set, principle of exclusion and inclusion, combination of sets: union, intersection, difference, complement etc., De Morgan laws, Venn Diagram **Cartesian Products and Relations:** Basic Definitions, binary relations – composition and inverse, binary relation on a set: properties – reflexive, irreflexive, symmetric, anti-symmetric, transitive, equivalence relations, partial order relations **Functions:** Basic definition, domain and co-domain, image and range, identity function, one-to-one and onto functions, bijections, characteristic function, composition of functions, inverse of a function, operations on sets: unary operators – idempotence, binary operators – associativity, commutativity	**10**	Understand sets, cardinality, operations (union, intersection), De Morgan laws, Venn diagrams, relations, functions, number systems, and basic operations.	**2, 3**

	Number systems: Natural numbers, whole numbers, integers, rational numbers, real numbers, operations on numbers: addition, subtraction, multiplication and division			
II	**Introduction to Mathematical Logic and Induction:** **Mathematical Logic:** Truth values of mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables **Propositional Logic:** Constants, variables, assignment of variables in a formula, tautology, contradiction and satisfiability, truth table of a formula, equivalence of formulas, proving formulas and equivalences by truth table method **Mathematical Induction:** Principle of mathematical induction – induction basis and induction step, examples	**8**	Learn truth values, logical operators, De Morgan laws, propositional logic concepts (constants, variables, tautology), and principles of mathematical induction.	**2, 3**
III	**Introduction to Logic and Reasoning:** Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order , Puzzle, Blood Relations , Analogy, Cube and Dice, Coding-Decoding	**10**	Master alphanumeric series, direction sense, logical reasoning, data sufficiency, ranking, puzzles, blood relations, analogies, cubes and dice, and coding-decoding.	**3, 4**
IV	**Introduction to Coding:** **C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. **Control Statements:** Decision Making using if statement, Types of if...else block, Switch case Block, GOTO statement. **Looping:**	**10**	Learn C programming basics: language types, program structure, debugging, tokens, data types, operators, control statements (if, switch), loops (for, while, do-while).	**2, 3**

	Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement			
V	**Introduction to Arrays, Strings and Functions** **Arrays:** One Dimensional Arrays, Two-Dimensional Arrays, Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.	**7**	Understand arrays (1D, 2D, multidimensional, dynamic), string implementation and functions (user-defined, system-defined, function parameters and passing mechanisms).	**2**
Practical Component				
Practical 1	Write a C program to find sum and average of three numbers. Write a C program to find the sum of individual digits of a given positive Write a C program to generate the first n terms of the Fibonacci sequence	**3**	Develop proficiency in C programming: calculate sums/averages, manipulate digits, generate Fibonacci sequence, using variables, loops, and arithmetic for problem-solving.	3
Practical 2	Write a C program to generate prime numbers between 1 to n. Write a C program to Check whether given number is Armstrong Number or Not.	**3**	Master C programming skills: generate prime numbers and verify Armstrong numbers, demonstrating proficiency in loops, conditionals, and mathematical operations.	3
Practical 3	Write a C program to evaluate algebraic expression (ax)/ (ax-b). Write a C program to check whether given number is perfect number or Not Write a C program to check whether given number is strong number or not.	**3**	Master C programming: evaluate algebraic expressions, verify perfect numbers, and determine strong numbers, applying arithmetic, loops, and conditional statements effectively.	3, 4
Practical 4	a) Write a C program to find the roots of a quadratic equation. b) Write a C program perform arithmetic operations using switch statement.	**3**	Achieve proficiency in C programming by solving quadratic equations for roots and performing arithmetic operations with switch statements	3

			effectively.	
Practical 5	Write a C program to find factorial of a given integer using non-recursive Function. Write a C program to find factorial of a given integer using recursive function.	**3**	Master factorial computation in C: implement non-recursive and recursive functions, demonstrating understanding of functions, loops, and recursion for problem-solving.	6
Practical 6	Write C program to find GCD of two integers by using recursive function. Write C program to find GCD of two integers using non-recursive function.	**3**	Achieve proficiency in C programming: compute GCD of integers using recursive and non-recursive functions, applying logical and iterative problem-solving techniques efficiently.	3
Practical 7	Write a C program to find both the largest and smallest number in a list of Integers Write a C Program to Sort the Array in an Ascending Order. Write a C Program to find whether given matrix is symmetric or not.	**3**	Master C programming: find largest/smallest numbers in a list, sort arrays in ascending order, and determine matrix symmetry accurately using logical operations.	3, 4
Practical 8	Write a C program to perform addition of two matrices. Write a C program that uses functions to perform Multiplication of Two Matrices.	**3**	Achieve proficiency in C programming: add two matrices and multiply matrices using functions, demonstrating mastery of matrix operations and function usage.	3
Practical 9	Write a C program to use function to insert a sub-string in to given main string from a given position. Write a C program that uses functions to delete n Characters from a give position in a given string.	**3**	Master C programming: insert a substring into a main string and delete characters from a specified position using functions effectively and accurately.	6
Practical 10	Write a C program using user defined functions to determine whether the given string is palindrome or not. Write a C program that displays the position or index in the main string S where the sub string T begins, or -	**3**	Achieve proficiency in C programming: determine palindrome strings and locate substring positions using user-defined functions effectively and accurately.	3

	1 if S doesn't contain T.			

TEXT BOOKS:

T1: Byron Gottfried, “Schaum's Outline of Programming with C”, Third Edition.
T2: E. Balaguruswamy, “Programming in ANSI C”, Eight Edition.
T3: Lipschitz, Lipsonand and Patil, “Discrete Mathematics”, Revised Third Edition
T4: Sastry and Nayak, “A Textbook on Discrete Mathematics”

REFERENCE BOOKS:

R1: R S Agarwal , “A Modern Approach To Verbal & Non Verbal Reasoning”, Revised Edition.
R2: Sijwali B S, “Analytical and Logical Reasoning”, Revised Edition.
R3: Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Second Edition.
R4: Lipschutz and Lipson, “2000 Solved Problems in Discrete Mathematics”.

OTHER LEARNING RESOURCES:

O1: https://www.javatpoint.com/discrete-mathematics-tutorial

O2: https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logical-reasoning--article
getting-started

O3:https://www.javatpoint.com/c-programming-language-tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding	1,2, 3, 4, 5, 10, 12
2	Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.	1,2, 3, 4, 5, 10, 12
3	Solve and devise solutions to a range of elementary real-world problems in mathematics and programming	1,2, 3, 4, 5, 10, 12
4	Explore and apply key concepts in logical thinking to business problems.	1,2, 3, 4, 5, 10, 12
5	Enable students to critically analyse information in order to evaluate evidence and construct reasoned arguments.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
2BTCS112R	**Introduction to Basic Mathematics, Logic and Coding**	CO 1	2	3	3	2	2					2		2
		CO 2	3	3	3	2	2					2		2
		CO 3	3	3	2	2	1					2		2
		CO 4	3	3	3	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – I									
Course Title	**Engineering Physics**								
Course code	**22BTCS113R**	**Total credits: 4** **Total hours: 40T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Basic knowledge of Physics**	**Co-requisite**	**Mathematics**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To understand the theories of physics To apply the concepts in practical problems To understand the physics of any process								
CO1	Apply electric field and potential calculations, Compute the vectors and scalar representation of forces and nature of forces.								
CO2	Analyze electrostatics in dielectric media, conservative and non-conservative forces, angular momentum and energy equations.								
CO3	Compute basics of non-inertial frames, harmonic oscillator and forced oscillations.								
CO4	Demonstrate understanding of magnetostatics in linear magnetic media, and the usage of common electrical measuring instruments.								
CO5	Understand the basic characteristics of transformers and electrical machines.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Electrostatics in vacuum	**8**	Study electrostatic phenomena in vacuum: Coulomb's law, electric field, potential, Gauss's law, and behaviour of charges and fields.	**2**
II	Magnetostatics	**8**	Learn magnetostatic principles: Biot-Savart law, magnetic field of currents, Ampère's law, magnetic materials, and applications in electromagnetism.	**2**
III	Faraday’s law	**8**	Understand Faraday's law: electromagnetic induction, induced electromotive force (emf), Lenz's law, applications in generators and transformers.	**2**
IV	Displacement current, Magnetic field due to time-dependent electric field and Maxwell’s equations	**8**	Explore displacement current, magnetic field from time-varying electric fields, and Maxwell's equations linking electricity, magnetism, and electromagnetic waves.	**4**

V	Electromagnetic waves	**8**	Study electromagnetic waves: properties, wave equations, propagation in vacuum and media, polarization, and applications in communication and technology.	**2**
Practical Component				
Practical 1	To verify the ohm's law and hence determine the unknown resistance of the given material of the wire.	**6**	Demonstrate understanding and application of Ohm's Law to determine unknown resistance of wire material through experimental verification and calculation.	3
Practical 2	To find the value of a given resistance by using meter bridge.	**3**	Achieve proficiency in using a meter bridge to accurately measure the resistance of a given material through experimental observation and calculation.	3
Practical 3	To convert the galvanometer in to voltmeter and hence calibrate it with a standard resistance and ammeter.	**6**	Master the process of converting a galvanometer into a voltmeter, calibrating it using a standard resistance, and verifying accuracy with an ammeter.	6
Practical 4	To determine the internal resistance of a cell by using potentiometer.	**6**	Achieve proficiency in determining the internal resistance of a cell using a potentiometer through accurate experimental measurements and calculation techniques.	3
Practical 5	To determine the frequency of a tuning fork by Melde's apparatus.	**3**	Achieve proficiency in determining the frequency of a tuning fork using Melde's apparatus through precise experimental setup and frequency measurement techniques.	3
Practical 6	To determine the moment of inertia of a body about an axis passing through its center of gravity and	**3**	Achieve proficiency in determining the moment of inertia of a body by	3

	perpendicular to its length.		accurately measuring its mass distribution and rotational properties experimentally.	
Practical 7	To determine the ECE of copper by using copper voltmeter and ammeter.	**3**	Achieve proficiency in determining the Electrical Conductivity (ECE) of copper using a copper voltmeter and ammeter through precise experimental measurements and calculations.	3

TEXT BOOKS:

T1: K G Mazumdar and B.Ghosh, "A Textbook on Practical Physics", Sreedhar Publishers, 209B, Kolkata.
T2: David Griffiths, "Introduction to Electrodynamics", Prentice Hall, Upper Saddle River, New Jersey, 07458
T3: IE IRODOV, "Basic Laws of Electromagnetism".
T4: C L Arora, "BSc Practical Physics", S. Chand Publishing, 2001.

REFERENCE BOOKS:

R1: P R Sasi Kumar, "Practical Physics", Phi Learning Private Ltd,2011.
R2: Sijwali B S, "Analytical and Logical Reasoning", Revised Edition.
R3: G. L. Squires, "Practical Physics", Cambridge.University Press, 30 Aug 2001.
R4: Resnick Halliday, "Principles of physics".

OTHER LEARNING RESOURCES:

O1:https://www.sciencedirect.com/science/article/pii/S0951832022005142

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply electric field and potential calculations, Compute the vectors and scalar representation of forces and nature of forces.	1,2, 3, 4, 5, 10, 12
2	Analyze electrostatics in dielectric media, conservative and non-conservative forces, angular momentum and energy equations.	1,2, 3, 4, 5, 10, 12
3	Compute basics of non-inertial frames, harmonic oscillator and forced oscillations.	1,2, 3, 4, 5, 10, 12
4	Demonstrate understanding of magnetostatics in linear magnetic media, and the usage of common electrical measuring instruments.	1,2, 3, 4, 5, 10, 12

5	Understand the basic characteristics of transformers and electrical machines.	1,2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS113R	**Engineering Physics**	CO1	3	3	3	2	1					2		3
		CO2	3	3	3	2	2					2		3
		CO3	3	3	3	2	1					2		3
		CO4	3	3	3	2	2					2		3
		CO5	3	3	3	2	2					2		3

SEMESTER – I									
Course Title	**Basic Electrical Engineering**								
Course code	**22BTCS114R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T+30P	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	Explain operative principle of transformer with background of magnetic circuits. Classify and compare different types of Electrical machines**.**								
CO1	Analyze and apply basic electric and magnetic circuits.								
CO2	Understand the working principles of electrical machines and power converters.								
CO3	Understand the components of low-voltage electrical installations.								
CO4	Understand the usage of common electrical measuring instruments.								
CO5	Understand the working and basic characteristics of transformers and electrical machines.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**DC Circuits:** Electrical circuit elements (R,L,C), voltage and current source, Kirchoff's current and voltage law, analysis of simple circuit, Thevenin, Norton and Superposition theorem	**5**	Learn DC circuit fundamentals: resistors, inductors, capacitors, voltage/current sources, Kirchhoff's laws, circuit analysis methods (Thevenin, Norton, Superposition).	**2**
II	**AC Circuit**: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single phase accircuits consisting of R,L,C.RL,RC,RLC combination(series and parallel), voltage and current relationship in star and delta connection	**7**	Learn AC circuit essentials: sinusoidal waveforms, phasor representation, power calculations (real, reactive, apparent), and analysis of R, L, C components in various configurations.	**2**
III	**Transformer:** Magnetic materials, ideal and practical transformer, equivalent circuit, losses in transformer, regulation and efficiency, auto transformer, three phase transformer connection	**6**	Understand transformers: magnetic materials, ideal vs. practical models, losses, regulation, efficiency, auto transformers, and three-phase connections for power distribution systems.	**2**

IV	**Electrical Machines:** Generation of rotating magnetic fields, construction and working of three phase induction motor, torque-slip characteristics, losses and efficiency, Single phase induction motor, working of synchronous Generator	**6**	Study electrical machines: rotating magnetic field generation, three-phase induction motors, torque-slip characteristics, losses, efficiency, single-phase induction motors, and synchronous generator operation.	**2**
V	**Power converter and electrical installation:** DC-DC buck and boost converter, single phase and three phase voltage source inverter, Fuse, MCB, ELCB, MCCB Earthing, wires and cables, types of batteries	**6**	Learn power converters: DC-DC buck and boost converters, single-phase and three-phase voltage source inverters, electrical installations including fuses, breakers, earthing, cables, and batteries.	**2**
Practical Component				
Practical 1	To Study specification and uses of instruments	**3**	Understand and apply knowledge of instrument specifications and uses, ensuring accurate selection and utilization for various technical applications.	2
Practical 2	To Study Ohm's Law for DC Circuits	**3**	Understand and apply Ohm's Law to analyze and solve problems in DC circuits through experimental verification and calculations.	2
Practical 3	To verify KCL and KVL Circuits	**3**	Verify Kirchhoff's Current and Voltage Laws (KCL and KVL) through practical circuit analysis, enhancing understanding of electrical network behaviour.	4
Practical 4	To verify The venin's Theorem	**3**	Verify Thevenin's Theorem through circuit experiments, demonstrating the ability to simplify complex circuits into equivalent single-source representations.	4
Practical 5	To verify Norton's Theorem	**3**	Verify Norton's Theorem by conducting circuit	4

			experiments, demonstrating proficiency in converting complex circuits into equivalent current-source models.	
Practical 6	To verify Maximum Power Transfer Theorem	**3**	Verify Maximum Power Transfer Theorem through circuit experiments, ensuring maximum power delivery from source to load under optimal resistance conditions.	4
Practical 7	To verify super position Theorem	**3**	Verify Superposition Theorem by analyzing circuits with multiple sources, demonstrating the ability to determine individual effects on overall circuit behaviour.	4
Practical 8	To Study transformation ratio of single-phase transformer	**3**	Understand and determine the transformation ratio of a single-phase transformer through experimental analysis and accurate measurement techniques.	2
Practical 9	Mini-project	**6**	At the end of the mini-project, students will demonstrate fundamental knowledge and practical skills in Basic Electrical Engineering concepts.	2, 3

TEXT BOOKS:

T5: D. P. Kothari and I. J.Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

REFERENCE BOOKS:

R1:D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill,2009.
R2:E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze and apply basic electric and magnetic circuits.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
2	Understand the working principles of electrical machines and power converters.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
3	Understand the components of low-voltage electrical installations.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
4	Understand the usage of common electrical measuring instruments.	1, 2, 3, 4, 5, 6, 9,10, 11, 12
5	Understand the working and basic characteristics of transformers and electrical machines.	1, 2, 3, 4, 5, 6, 9,10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS11R	**Basic Electrical Engineering**	CO1	3	3	3	2	2	1			1	2	1	3
		CO2	3	3	3	2	2	1			1	2	1	3
		CO3	3	3	3	2	2	1			1	2	1	3
		CO4	3	3	3	2	2	1			1	2	1	3
		CO5	3	3	3	2	2	1			1	2	1	3

SEMESTER – I									
Course Title	**Workshop Manufacturing Practices**								
Course code	**22BTCS115R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10T+30P	**1**	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	Learning this course will lead you to understand basic concepts of workshop and manufacturing. Apply fundamental knowledge of workshop and manufacturing in day-to-day life. Recognize components using different materials.								
CO1	Introduction to various manufacturing methods like casting, Forming, machining etc.								
CO2	Application of computer coding in automation of Machines.								
CO3	Introduction to Carpentry & fitting operations and its application in industries.								
CO4	Different machining operations like turning, milling.								
CO5	Learning the different types of welding and its field of application.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Manufacturing Methods** Casting, forming, machining, joining, advanced manufacturing methods	**3**	Study manufacturing methods: casting, forming, machining, joining techniques, and advanced manufacturing processes for producing industrial components efficiently and effectively.	**4**
II	**CNC machining, Additive Manufacturing** Overview of CNC machining process, overview of additive manufacturing	**2**	Learn CNC machining: process overview including programming and operations. Understand additive manufacturing techniques for producing objects layer	**3**

			by layer.	
III	**Carpentry & Fitting operations** Carpentry tools, carpentry operations, fitting tools, fitting operations	**1**	Learn carpentry: tools and operations for woodwork. Understand fitting: tools and operations for assembling components accurately in manufacturing and construction.	**2**
IV	**Machining operations** Turning, milling, turning processes, milling processes	**2**	Study machining operations: learn turning and milling processes, including techniques, tools, and applications in manufacturing precision components.	**4**
V	**Welding** Arcwelding & gas welding, brazing	**2**	Learn welding techniques: arc welding, gas welding, and brazing methods, covering processes, safety measures, and applications in metal fabrication and construction.	**2**
Practical Component				

Practical 1	**Abriefintroductionofworkshop** Machineshop,Fittingshop,carpentryshop,weldingshop	**5**	Students gain introductory knowledge of workshop areas: Machine shop, Fitting shop, Carpentry shop, Welding shop, emphasizing basic operations and safety protocols.	2
Practical 2	**Machine shop** Plainturning,Taperturning,Stepturning	**10**	Students will demonstrate proficiency in plain turning, taper turning, and step turning techniques in machine shop.	3
Practical 3	**Carpentry shop** Dovetailjoint,T-lapjoint,Cross-lapjoint,Corner-lapjoint	**5**	At the end of the session, students will demonstrate proficiency in constructing dovetail, T-lap, cross-lap, and corner-lap joints in carpentry shop.	3
Practical 4	**Welding shop** Arcwelding(Buttjoint,T-joint,Lapjoint,Cornerjoint)	**5**	Students will demonstrate proficiency in arc welding techniques for butt, T-joint, lap, and corner joints.	3
Practical 5	**Fitting shop** Angle fitting, square fitting,corner fitting	**5**	Students will demonstrate proficiency in angle fitting,	3

			square fitting, and corner fitting techniques in fitting shop.	

TEXT BOOKS:

TI: Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, "Elements of Workshop Technology", Vol I 2008 and Vol II 2010, Media promoters and publishers private limited, Mumbai.

REFERENCE BOOKS:

R1: Manufacturing Technology – I, Pearson Education, 2008.
R2: Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

OTHER LEARNING RESOURCES:

O1: https://easyengineering.net/introduction-to-basic-manufacturing-process-workshop-technology

O2:
https://www.academia.edu/30316555/Introduction_to_Basic_Manufacturing_Processes_and_Workshop_Technology

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Introduction to various manufacturing methods like casting, Forming, machining etc.	1, 2, 3, 4, 5, 6, 10, 12
2	Application of computer coding in automation of Machines.	1, 2, 3, 4, 5, 6, 10, 12
3	Introduction to Carpentry & fitting operations and its application in industries.	1, 2, 3, 4, 5, 6, 10, 12
4	Different machining operations like turning, milling.	1, 2, 3, 4, 5, 6, 10, 12
5	Learning the different types of welding and its field of application.	1, 2, 3, 4, 5, 6, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS115R	**Workshop Manufacturing Practices**	CO1	3	2	2	2	3	2				1		2
		CO2	3	3	3	3	3	3				3		3
		CO3	3	2	2	2	3	2				1		2
		CO4	3	2	2	2	3	2				1		2
		CO5	3	3	2	2	3	2				1		2

SEMESTER – I									
Course Title	**Introductory English for Engineers** (Communicative English & Soft Skills)								
Course code	**22UBPD114R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To capacitate the students with mastery over Basic English grammar. To enable the students to communicate confidently with a focus on listening and speaki skills. With the help of the basics of Phonetics, the students will be able to pronounce wor correctly. To interact successfully and with decorum.								
CO1	Analyze and apply the rules of Parts of Speech in constructing grammatically corre sentences.								
CO2	Evaluate sentence structures, employ varied sentence types, and demonstrate effective comprehension skills.								
CO3	Assess listening skills, identify factors influencing listening, and implement strategies for improved listening.								
CO4	Demonstrate effective speaking skills, including self-introduction, pronunciation, and extempore speech delivery.								
CO5	Apply communication theories, recognize barriers, and enhance skills for diverse communication situations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Grammar** Parts of Speech Articles Auxiliary Verbs Affirmative and Negative Sentences	**5**	Learn grammar basics: parts of speech (noun, verb, adjective, etc.), articles (a, an, the), auxiliary verbs, affirmative and negative sentence structures.	**2**
II	**Grammar** Determiners Sentence Construction Types of Sentences (Assertive, Imperative, etc.) Degree of Comparison Comprehension Exercises	**7**	Learn grammar essentials: determiners, sentence construction, types of sentences (assertive, imperative), degree of comparison, and practice comprehension exercises for skill development.	**2**
III	**Listening Skills** What is listening? The Process of Listening Factors that adversely affect	**6**	Develop listening skills: understand listening vs. hearing, process, factors affecting it, importance, purpose, and methods for enhancing effective	**2**

	Listening Difference between Listening and Hearing, Purpose and Importance of Effective Listening How to Improve Listening Process.		listening abilities.	
IV	**Speaking Skills** Introducing yourself Self-discovery Basics of Phonetics , pronunciation Extempore speech Video Recording for Self reflection	**6**	Enhance speaking skills: self-introduction, phonetics, pronunciation basics, extempore speaking, and self-reflection through video recording for improvement.	**3**
V	**Communication Skills** Introduction to Communication, Importance of Communication Skills, Purpose of Communication, Types of Communication, Formal and informal communication Importance of Communication, Barriers to Communication, How to improve/ tips to improve Communication skills. Responding to different questions in various situations(formal/informal)	**6**	Learn communication fundamentals: introduction, importance, types, formal vs. informal, barriers, tips for improvement, and effective responses in different contexts.	**2**

TEXT BOOKS:

T6: Chaturvedi, P.D., Chaturvedi Mukesh, "Business Communication: Concepts, Cases and Applications", Second edition, Pearson, Noida, 2011.

T7: Alex K., Chand, S, "Soft Skills: Know Yourself and Know the World", first edition, S. Chand and Company Ltd., New Delhi, 2009.

REFERENCE BOOKS:

R1: Quirk, Randolp, "A Comprehensive Grammar of the English Language", Randolph Quirk, Sidney Greenbaum, Pearson Education India, 2010..

R2: Marks, Jonathan, "IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score". Book + CD-ROM, Delta Publishing, 2017.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/bEB8-SWMYhI

O2:https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze and apply the rules of Parts of Speech in constructing grammatically correct sentences.	1, 2, 3, 4, 5, 10, 12
2	Evaluate sentence structures, employ varied sentence types, and demonstrate effective comprehension skills.	1, 2, 3, 4, 5, 10, 12
3	Assess listening skills, identify factors influencing listening, and implement strategies for improved listening.	1, 2, 3, 4, 5, 10, 12
4	Demonstrate effective speaking skills, including self-introduction, pronunciation, and extempore speech delivery.	1, 2, 3, 4, 5, 10, 12
5	Apply communication theories, recognize barriers, and enhance skills for diverse communication situations.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD114R	**Introductory English for Engineers**	**CO1**	1	1	1	1	1					3		2
		CO2	1	1	1	1	1					3		2
		CO3	1	1	1	1	1					3		2
		CO4	1	1	1	1	1					3		2
		CO5	1	1	1	1	1					3		2

SEMESTER – I									
Course Title	**Extra-Curricular Activities**								
Course code	**22UBEC111**	**Total credits: 1** **Total hours: 15S**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**1**								
Course Objectives (Minimum 3)	To develop the social and soft skills To promote a holistic development of the learners								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		**15**		ADTU fosters holistic development through clubs like Dance, Music, Photography, Drama, and Literature, encouraging participation in workshops and competitions.			

TEXT BOOKS:

REFERENCE BOOKS:

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1, 2, 3, 4, 5, 6, 10, 12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1, 2, 3, 4, 5, 6, 10, 12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1, 2, 3, 4, 5, 6, 10, 12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1, 2, 3, 4, 5, 6, 10, 12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1, 2, 3, 4, 5, 6, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC111	**Extra-Curricular Activities**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – II									
Course Title	**Engineering Mathematics II**								
Course code	**22BTCS121R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Mathematics**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	Describe the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems. Apply the concept of graphs. Understand and apply concepts of multivariable calculus including partial derivatives, multiple integrals, and vector calculus								
CO1	Apply solutions of ordinary differential equations of various order.								
CO2	Apply solutions of partial differentiation equation of higher order.								
CO3	Analyse the complex analysis and solutions.								
CO4	Understand the concept of basic probability and its application.								
CO5	Understand the concept of basic and applied statistics.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Sets, relations and functions:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	**5**	Grasp the concept of relations, including properties like reflexivity, symmetry, and transitivity, and be able to represent relations using ordered pairs, matrices, and graphs. Need to differentiate between injective, surjective, and bijective mappings, understand function composition and inverses, and work with various types of functions, such as linear and exponential.	**1,2,3**
II	***Propositional Logic:*** Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.	**7**	Construct and interpret truth tables to evaluate the validity, satisfiability, and tautological nature of propositions, and differentiate between valid and invalid arguments through direct and indirect proofs, including proof by contradiction.	**3,4**

III	***Algebraic Structures:*** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	**6**	Perform operations within these structures, verify axioms, and apply homomorphisms and isomorphisms to explore structural similarities. Additionally, students should comprehend the significance of substructures like subgroups, subrings, and subfields, and use theorems such as Lagrange's theorem and the Fundamental Theorem of Algebra to solve related problems. Developing proficiency in proving properties and relationships within algebraic structures, students will be equipped to apply these concepts to more advanced mathematical contexts and real-world scenarios.	**3,4**
IV	***Introduction to Counting:*** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	**6**	Solve problems involving counting without replacement, use the binomial theorem for expansion, and apply Pascal's triangle in combinatorial contexts. Additionally, students should grasp more advanced topics such as the inclusion-exclusion principle, Pigeonhole Principle, and solving problems involving partitions of sets.	**4**
V	***Introduction to Graphs:*** Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	**6**	Learn to represent graphs using adjacency matrices and lists, and apply fundamental algorithms for traversing graphs, Understand and apply concepts of graph coloring, planarity, and isomorphism, and solve	**4**

			problems involving Eulerian and Hamiltonian paths and circuits. Mastery of these concepts will enable students to apply graph theory to real-world problems in computer science, network analysis, and other fields.	
Practical Component				
Practical 1	**Expert no 1**	**30**	LO	1,2,3,4
Practical 2	**Expert no 2**			
……				
Practical 15				

TEXT BOOKS:

T1: C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill,2000.
T2: K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, a.2007.

REFERENCE BOOKS:

R1: R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

OTHER LEARNING RESOURCES:

O1: Coursera: Platforms like Coursera offer courses such as "Mathematics for Engineers" which cover topics ranging from calculus to differential equations and linear algebra.
O2: edX: Courses like "Engineering Mathematics" provide an in-depth study of mathematical techniques important in engineering disciplines

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply solutions of ordinary differential equations of various order.	1,2,3,4,5,10,12
2	Apply solutions of partial differentiation equation of higher order.	1,2,3,4,5,10,12
3	Analyse the complex analysis and solutions.	1,2,3,4,5,10,12
4	Understand the concept of basic probability and its application.	1,2,3,4,5,10,12
5	Understand the concept of basic and applied statistics.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS121R	**Engineering Mathematics II**	CO 1	3	2	3	3	3					3		2
		CO 2	2	2	2	2	2					3		2
		CO 3	2	2	2	2	2					3		2
		CO 4	3	3	3	3	3					3		2
		CO 5	3	3	3	3	3					3		2

SEMESTER – II									
Course Title	**Engineering Chemistry**								
Course code	**22BTCS122R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	Identify scientific reasoning and quantitative analysis. Revise the scope, content, and pedagogy for one of existing general chemistry course sequences Produce the content of chemistry set in a current and relevant context for engineers.								
CO1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.								
CO2	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques								
CO3	Understand bulk properties and processes using thermodynamic considerations								
CO4	Understand periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity								
CO5	Analyse major chemical reactions that are used in the synthesis of molecules.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Atomic and molecular structure (12 lectures)** Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations .Molecular orbitals of diatomic molecules and plots of the multicentre orbitals .Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.	**5**	Comprehensive understanding of the organization of atoms, including the roles of protons, neutrons, and electrons within the nucleus and their distributions in electron orbitals. They should grasp the principles governing atomic spectra, electron configurations, and periodic trends.	**1,2,3**
II	**Spectroscopic techniques and applications (8 lectures)** Principles of spectroscopy and selections rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational	**7**	Comprehensive understanding of the principles and methods used to analyze the interaction between matter and	**3,4**

	and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging. Surface characterization techniques. Diffraction and scattering.		electromagnetic radiation across different wavelengths. They should be able to describe and apply techniques such as UV-Vis spectroscopy, infrared spectroscopy (IR), nuclear magnetic resonance spectroscopy (NMR), and mass spectrometry (MS) for qualitative and quantitative analysis of compounds.	
III	**Intermolecular forces and potential energy surfaces** Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces oh H_3 ,H_2F and HCN and trajectories on these surfaces **Use of free energy in chemical equilibria (6 lectures)** Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energies and emf. Cell potentials, the Nernst equations and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham Diagrams	**6**	grasp the fundamental interactions between molecules and their implications in physical properties and chemical behavior. Intermolecular forces, including van der Waals forces, hydrogen bonding, and dipole-dipole interactions, dictate the stability of molecular aggregates and influence phenomena such as boiling points, solubility, and viscosity. Understanding the concept of free energy in chemical equilibria is essential for students to comprehend the spontaneity and directionality of chemical reactions. Free energy (G) represents the energy available to do work under constant temperature and pressure conditions	**3,4**
IV	**Periodic Properties (4 lectures)** Effective nuclear charge. Penetration of	**6**	Grasp the underlying principles governing these trends, such as	**4**

	orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes. Ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries		effective nuclear charge and shielding effects, and how these influence the reactivity, chemical bonding, and physical properties of elements. Additionally, students should be able to predict and interpret periodic trends using periodic tables, understand the factors that affect these trends, and apply this knowledge to explain phenomena such as the formation of ions, trends in chemical reactivity, and the periodic classification of elements according to their properties.	
V	**Stereochemistry (4 lectures)** Representations of 3 dimensional structures, structural isomers and stereo isomers. Configurations and symmetry and chirality, enantiomers, diastereomers, optical activity , absolute configurations and conformational analysis. Isomerism in transitional metal compounds. **Organic reactions and synthesis of a drug molecule (4 lectures)** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule	**6**	understand the fundamental concepts of chirality, stereoisomerism, and geometric isomerism, and be able to distinguish between different types of stereoisomers such as enantiomers and diastereomers. They should comprehend how stereochemistry influences molecular interactions, including biological recognition processes and drug efficacy. Moreover, students should apply stereochemical principles to predict the outcomes of reactions, particularly in organic chemistry, and recognize the importance of spatial arrangement in shaping the physical and chemical properties of molecules. Mastery of	**4**

			stereochemistry enables students to understand complex molecular structures and their behaviors, essential for fields such as pharmaceuticals, materials science, and biochemistry.	
Practical Component				
Practical 1	QualitativeOrganicAnalysis(Minimum5 numberofsamples)	**5**	Learn to identify unknown organic compounds using a systematic approach involving several key techniques. They should be able to perform tests such as solubility tests, functional group tests (e.g., bromine water test for alkenes, silver nitrate test for halides), and spectroscopic methods including infrared (IR) and nuclear magnetic resonance (NMR) spectroscopy.	**1,2,3**
Practical 2	Estimationof IronUsingstandard$KMnO_4$ solution	**5**	Estimating iron using a standard potassium permanganate (KMnO4) solution involves a titration method that students should master for analytical chemistry. Initially, students prepare an acidic solution containing iron ions, then titrate it with KMnO4 solution until a color change occurs, typically from purple to colorless.	**3,4**
Practical 3	DeterminationofTotalHardnessof waterandEstimationofCa	**5**	Determining the total hardness of water and estimating the calcium ion concentration involves titration techniques essential in	**3,4**

			environmental and analytical chemistry.	
Practical 4	Determinationofsurface tensionofgivenliquid	**5**	Determining the surface tension of a liquid involves several experimental methods that students should master in physical chemistry and fluid mechanics. One common method is the capillary rise method, where students measure the height to which the liquid rises in a capillary tube due to capillary action.	**4**
Practical 5	Determinationofviscosityof givenliquid	**5**	Determining the viscosity of a liquid involves several experimental techniques that are fundamental in fluid mechanics and physical chemistry. One common method is the capillary viscometer technique, where students measure the time it takes for a liquid to flow through a narrow capillary tube under gravity.	**4**
Practical 6	Synthesisof apolymer/drug	**5**	Synthesizing a polymer or drug involves a series of chemical reactions and processes aimed at creating a specific molecular structure with desired properties. For polymers, students typically learn methods such as polymerization reactions (e.g., condensation polymerization, addition polymerization) to link monomers into long chains.	**4**

TEXT BOOKS:

T1: University chemistry, by B. H. Mahan

T2: University chemistry, by B. H. Mahan

T3: Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

T4: Fundamentals of Molecular Spectroscopy, by C. N. Banwell

T5: Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

REFERENCE BOOKS:

R1: Physical Chemistry, by P. W. Atkins

R2: Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

OTHER LEARNING RESOURCES:

O1:Coursera: Offers courses on engineering chemistry topics such as materials science, environmental chemistry, and chemical engineering principles.
O2: edX: Provides courses from universities worldwide covering topics like nanotechnology, renewable energy, and chemical process design.
O3: MIT Open Course Ware: Offers free lecture notes, exams, and videos from actual MIT courses in chemistry and chemical engineering.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	1,2,3,4,5,10,12
2	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques	1,2,3,4,5,10,12
3	Understand bulk properties and processes using thermodynamic considerations	1,2,3,4,5,10,12
4	Understand periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity	1,2,3,4,5,10,12
5	Analyse major chemical reactions that are used in the synthesis of molecules.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS122R	**Engineering Chemistry**	CO 1	3	2	1	3	1					1		3
		CO 2	3	2	2	2	2					2		2
		CO 3	3	2	1	3	1					1		3
		CO 4	3	2	2	2	2					2		2
		CO 5	3	2	2	2	2					2		2

SEMESTER – II									
Course Title	**Programming for Problem Solving**								
Course code	**22BTCS123R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To formulate simple algorithms for arithmetic and logical problems. To test and execute the programs and correct syntax and logical errors. Understanding algorithms, data structures, and computational thinking, enabling them to analyze problems logically and develop systematic solutions through coding								
CO1	Understand computer system elements and a foundational comprehension of algorithms and programming.								
CO2	Utilize branching and looping statements to address decision-making programming problems.								
CO3	Apply homogeneous derived data types, heterogeneous data types, strings, and functions effectively for programming tasks.								
CO4	Demonstrate understanding of pointers and applying their concepts skillfully in programming scenarios.								
CO5	Apply file handling concepts in C programming with competence, ensuring effective data management and storage solutions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Programming:** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code	**8**	Understanding of programming concepts, including variables, data types, control structures (such as loops and conditionals), functions, and basic data structures like arrays and lists. They should become proficient in writing, testing, and debugging code using a programming language such as Python, Java, or C++.	**1,2,3**
II	**Arithmetic expressions and precedence Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent	**12**	Understand how to construct and evaluate arithmetic expressions with correct operator precedence and	**3,4**

	branching, Iteration and loops Arrays: Arrays (1-D, 2-D), Character arrays and Strings Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formaldefinition required)		associativity rules to ensure accurate calculations. They should master using conditional branching (if, else-if, else statements) to direct program flow based on Boolean conditions, enabling the execution of different code blocks based on varying input scenarios.	
III	**Function:** Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Mergesort.	**8**	Understand the concepts of parameters, return values, and scope, ensuring proper data flow and variable accessibility within and outside functions.	**3,4**
IV	**Structure:** Structures, Defining structures and Array of Structures **Pointers:** Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)	**6**	Understand how to define and use structures to create complex data types that group different variables under a single name, enhancing data organization and manipulation. They should learn how to declare and access structure members, and understand memory layout and alignment.	**4**
V	File handling (only if time is available, otherwise should be done as part of the lab)	**5**	Learn how to open, read, write, and close files using programming languages such as Python, Java, or C++. They should understand the importance of file modes (e.g., read, write, append) and be able to handle different file types, such as text and binary files.	**4**
Practical Component				
Practical 1	Write a C program to find sum and average of three numbers.	**2**	These programs cover basic arithmetic	**1,2**

	Write a C program to find the sum of individual digits of a given positive Write a C program to generate the first n terms of the Fibonacci sequence		operations, digit manipulation, and sequence generation in C, demonstrating fundamental programming concepts such as loops, conditionals, and input/output operations	
Practical 2	Write a C program to generate prime numbers between 1 to n. Write a C program to Check whether given number is Armstrong Number or Not.	**2**	These programs demonstrate how to generate prime numbers within a specified range and how to check if a given number is an Armstrong number, illustrating fundamental concepts such as loops, conditionals, and basic mathematical operations in C.	**1,2**
Practical 3	Write a C program to evaluate algebraic expression (ax)/ (ax-b). Write a C program to check whether given number is perfect number or Not Write a C program to check whether given number is strong number or not.	**3**	These programs illustrate the evaluation of an algebraic expression, checking for perfect numbers, and identifying strong numbers, employing concepts such as mathematical operations, loops, conditionals, and functions in C.	**1,2**
Practical 4	a) Write a C program to find the roots of a quadratic equation. b) Write a C program perform arithmetic operations using switch statement.	**2**	These programs illustrate how to find the roots of a quadratic equation using mathematical formulas and handle various cases based on the discriminant, and how to perform basic arithmetic operations using a switch statement to select the operation based on user input, employing control structures, and mathematical operations in C.	**1,2**
Practical 5	Write a C program to find factorial of a given integer using non-recursive Function. Write a C program to find factorial	**2**	These programs demonstrate how to calculate the factorial of a given integer using both	**1,2**

	of a given integer using recursive function.		non-recursive and recursive approaches. The non-recursive approach employs a simple loop to multiply the integers up to the given number, while the recursive approach calls the function itself with a decremented value until it reaches the base case, illustrating fundamental concepts of iteration and recursion in C.	
Practical 6	Write C program to find GCD of two integers by using recursive function. Write C program to find GCD of two integers using non-recursive function.	**2**	These programs illustrate how to find the Greatest Common Divisor (GCD) of two integers using both recursive and non-recursive approaches. The recursive approach uses Euclid's algorithm, calling the function with the remainder until the base case of zero is reached. The non-recursive approach implements the same algorithm using a loop, demonstrating fundamental concepts of recursion and iteration in C.	**1,2**
Practical 7	Write a C program to find both the largest and smallest number in a list of Integers Write a C Program to Sort the Array in an Ascending Order. Write a C Program to find whether given matrix is symmetric or not.	**2**	These programs demonstrate how to find the largest and smallest numbers in a list of integers, sort an array in ascending order using the bubble sort algorithm, and check whether a given matrix is symmetric by comparing elements across the main diagonal, illustrating fundamental concepts of arrays, sorting, and matrix operations in C	**3,4**
Practical 8	Write a C program to perform addition of two matrices. Write a C program that uses functions to perform Multiplication	**2**	These programs demonstrate matrix operations in C. The first program performs the	**3,4**

	of Two Matrices.		addition of two matrices by iterating through each element and summing corresponding elements. The second program defines a function to multiply two matrices, adhering to matrix multiplication rules, and then uses this function to compute the product, illustrating modular programming and array manipulation in C	
Practical 9	Write a C program to use function to insert a sub-string in to given main string from a given position. Write a C program that uses functions to delete n Characters from a give position in a given string.	**2**	These programs demonstrate string manipulation in C. The first program inserts a sub-string into a main string at a specified position using a function, while the second program deletes a specified number of characters from a given position in a string using a function. These tasks illustrate the handling of character arrays, string operations, and function use in C	**3,4**
Practical 10	Write a C program using user defined functions to determine whether the given string is palindrome or not. Write a C program that displays the position or index in the main string S where the sub string T begins, or -1 if S doesn't contain T	**3**	These programs illustrate string operations in C using user-defined functions. The first program checks if a given string is a palindrome by comparing characters from both ends toward the center. The second program finds the starting index of a sub-string within a main string or returns -1 if the sub-string is not found, demonstrating the implementation of string search algorithms.	**3,4**
Practical 11	Write C program to count the number of lines, words and characters in a given text.	**2**	These programs demonstrate string and	**3,4**

	Write a C program to find the length of the string using Pointer.		character manipulation in C. The first program counts the number of lines, words, and characters in a given text by iterating through the characters and detecting spaces, tabs, and newline characters to determine word boundaries and lines. The second program calculates the length of a string using a pointer, iterating through the characters until it reaches the null terminator, showcasing the use of pointers in C for string operations. These tasks highlight foundational concepts in C programming related to strings, pointers, and character handling.	
Practical 12	Write a C program to Display array elements usingcalloc ( ) function Write a C Program to Calculate Total and Percentage marks of a student using structure.	**2**	These programs demonstrate practical uses of calloc() for dynamic memory allocation and structures for organizing data related to students' academic information, showcasing core concepts in C programming such as memory management and structured data handling.	**3,4**
Practical 13	Write a C program that uses functions and structures to perform the following operations: Reading a complex number Writing a complex number Addition of two complex numbers Multiplication of two complex numbers Write a C program to display the contents of a file	**2**	These programs illustrate practical applications of structures, functions, file handling, and basic operations with complex numbers in C, showcasing fundamental concepts in programming and data handling.	**3,4**
Practical 14	Write a C program to copy the contents of one file to another. Write a C program to merge two files into a third file.	**2**	These programs illustrate file handling operations in C, including reading, writing, and manipulating	**3,4**

	Write a C program to reverse the first n characters in a file		file contents based on user input, showcasing fundamental concepts in file handling and C programming.	

TEXT BOOKS:

T1:E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill.

T2: Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHallof India.

REFERENCE BOOKS:

R1: Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

OTHER LEARNING RESOURCES:

O1:Coursera: Courses such as "Programming for Everybody (Getting Started with C).

O2: edX: Introduction to C Programming" by Dartmouth College.

O3:Udemy: Various courses on C programming, including "C Programming For Beginners - Master the C Language".

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand computer system elements and a foundational comprehension of algorithms and programming.	1,2,3,5,11,12
2	Utilize branching and looping statements to address decision-making programming problems.	1,2,3,4,5,9,11,12
3	Apply homogeneous derived data types, heterogeneous data types, strings, and functions effectively for programming tasks.	1,2,3,4,5,9,11,12
4	Demonstrate understanding of pointers and applying their concepts skillfully in programming scenarios.	1,2,3,4,5,11,12
5	Apply file handling concepts in C programming with competence, ensuring effective data management and storage solutions.	1,2,3,4,5,9,11,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCS1 23R	**Programm ing for Problem Solving**	CO 1	3	3	3	2	2	1				2		3
		CO 2	3	2	2	2	2	1				2		2
		CO 3	3	2	2	2	2	1				2		2
		CO 4	3	3	3	2	2	1				2		3
		CO 5	3	3	3	2	2	1				2		3

Semester II									
Course Title	**Engineering Graphics and Design**								
Course code	**22BTCS124R**	**Total credits: 3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing To impart knowledge on the projection of points, lines and plane surfaces To improve the visualization skills for better understanding of projection of solids To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces To make the students understand the viewing perception of a solid object in Isometric and Perspective projections								
CO1	Understand drawing principles accurately for conic sections, cycloid, epicycloid, hypocycloid, and involute.								
CO2	Create solid orthographic projections, auxiliary views, annotations, dimensions, and floor plans with windows, doors, and fixtures.								
CO3	Apply isometric principles and convert views, showing understanding of scale and conventions.								
CO4	Utilize computer graphics in CAD drawing, demonstrating knowledge of software theory, customizing settings, applying ISO and ANSI standards, and producing drawings using different coordinate input methods for lines and circles.								
CO5	Apply computer-aided geometric design.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Engineering Graphics and curves**: Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction. Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals along with normal and tangent to each curve	**5**	Learn the fundamental principles and techniques of technical drawing and drafting. They should become proficient in creating and interpreting various types of engineering drawings, including orthographic projections, isometric views, and sectional views. Students should understand the use of standard drawing instruments and computer-aided design (CAD) software for precision and efficiency.	**1,2,3**

II	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes Projections of Planes: Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	**7**	Understand the principles of orthographic projection, including the projection of points and lines onto various planes. They should learn to accurately depict the position of points in different quadrants and the true length and inclination of lines relative to the projection planes.	**3,4**
III	**Projections of Solids and Section of Solids**: Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section	**6**	Learn to accurately draw various solids such as prisms, cylinders, pyramids, and cones in different orientations and positions relative to the projection planes. Additionally, students should understand how to create sectional views by cutting through solids to reveal internal features, using cutting planes and identifying sectional shapes.	**3,4**
IV	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial - 35% view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view	**6**	Understand how to create multiple views (front, top, side) of objects using orthographic projection methods, ensuring accurate depiction of object dimensions, shapes, and spatial relationships. Students should master the conventions of first-angle and third-angle projection systems, apply projection rules to generate orthogonal views from isometric or perspective drawings, and interpret engineering drawings to extract geometric	**4**

			information for manufacturing and construction purposes.	
V	**Isometric Projections and Isometric View or Drawing**: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing	**6**	Understand the principles of isometric projection, which involves projecting object edges onto three mutually perpendicular axes at equal angles of 120 degrees. Students learn to create isometric views that accurately depict the shape, size, and orientation of objects, providing a realistic and intuitive representation useful in fields such as engineering, architecture, and design.	**4**
Practical Component				
Practical 1	**Introduction to Engineering Drawing**, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales. **Principles of Orthographic** Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;	**6**	Learn the fundamental principles and techniques essential for creating precise and standardized technical drawings used in engineering disciplines. They acquire skills in producing orthographic projections, isometric views, and sectional views of objects, ensuring accurate representation of dimensions, shapes, and relationships in two-dimensional formats	**1,2**
Practical 2	**Projections of Regular Solids** Covering those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. **Sections and Sectional Views** of Right Angular Solids Covering Prism, Cylinder, Pyramid, Cone– Auxiliary Views; Development of surfaces of Right Regular Solids -	**6**	Grasp how to create sectional views to reveal internal structures of regular solids, employing cutting planes to illustrate cross-sections and understand spatial relationships within the objects. Mastery of these skills in engineering drawing and technical illustration allows students to communicate design	**1,2**

	Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects. From industry and dwellings (foundation to slab only)		concepts effectively, aiding in manufacturing, architectural planning, and spatial analysis in various engineering disciplines.	
Practical 3	**Isometric Projections** Covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions	**6**	Learn how to create accurate and visually appealing representations of objects by projecting their edges onto three mutually perpendicular axes at equal angles of 120 degrees. This technique allows for the visualization of objects from different perspectives, enhancing spatial understanding and design communication in fields such as engineering, architecture, and product design.	**1,2,3**
Practical 4	**Overview of Computer Graphics** Covering listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software,	**6**	Learn about the basic principles of rasterization, vector graphics, and rendering techniques such as ray tracing and rasterization. They explore topics like geometric transformations, 3D modeling, shading, and texture mapping, essential for creating realistic and interactive virtual environments in fields like gaming, animation, simulation, and virtual reality.	**3,4**
Practical 5	**Customization & CAD Drawing** consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and to learning; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to	**6**	Learn to customize designs by manipulating geometric shapes, dimensions, and materials to meet specific project requirements. Students gain proficiency in CAD tools to draft 2D and 3D models, apply engineering principles, and simulate real-world conditions for design validation.	**3,4**

	Draw straight lines, Applying various ways of drawing circles			

TEXT BOOKS:

T1: Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
T2: Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS:

R1: Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
R2: Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
R3: Corresponding set of) CAD Software Theory and User Manuals

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing	1,2,3,4,5,6,10,12
2	To impart knowledge on the projection of points, lines and plane surfaces	1,2,3,4,5,6,10,12
3	To improve the visualization skills for better understanding of projection of solids	1,2,3,4,5,6,10,12
4	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces	1,2,3,4,5,6,10,12
5	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS124R	**Engineering Graphics and Design**	CO1	3	3	3	2	2	1				2		3
		CO2	3	2	2	2	2	1				2		2

		CO 3	3	2	2	2	2	1				2		2
		CO 4	3	3	3	2	2	1				2		3
		CO 5	3	3	3	2	2	1				2		3

SEMESTER – II									
Course Title	**Techno Professional Skills I**								
Course code	**22BTCS125R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the first year of the program**								
Course Objectives (Minimum 3)	To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations To acquire elementary knowledge of programming code style. Problem-solving skills are honed through analytical thinking and practical application of technical knowledge to real-world challenges.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens, Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions.	**6**	Understanding of programming concepts, including variables, data types, control structures (such as loops and conditionals), functions, and basic data structures like arrays and lists. They should become proficient in writing, testing, and debugging code using a programming language.	**1,2,3**
II	**Control Statements:** Decision Making using if statement, Types of if ...else block, Switch case Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement, Introduction to Arrays, Strings and Functions.	**6**	Understand how to construct and evaluate arithmetic expressions with correct operator precedence and associativity rules to ensure accurate calculations. They should master using conditional branching (if, else-if, else statements) to direct	**3,4**

			program flow based on Boolean conditions, enabling the execution of different code blocks based.	
III	**Arrays:** One Dimensional Arrays, Two-dimensional Arrays, Multidimensional Arrays, Dynamic Arrays.	**6**	Grasp the importance of array operations including sorting, searching, and iterating through elements, which are fundamental for implementing algorithms and solving computational problems. Mastery of arrays enables students to manage large datasets, optimize memory usage, and enhance the performance of software applications across diverse domains such as data analysis, image processing, and simulation modeling.	**3,4**
IV	**Strings:** Implementing String Variables, String handling Functions.	**6**	Learn how to declare, initialize, and access individual characters or substrings within strings using indexing and slicing techniques. Students also explore various operations and functions available for manipulating strings, including concatenation, comparison, and modification.	**4**
V	**Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.	**6**	Understand the concepts of parameters, return values, and scope, ensuring proper data flow and variable accessibility within and outside functions.	**4**
Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill.

REFERENCE BOOKS:

R1: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
R2: Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
R3: Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.
R4: Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
R5: Dr. Guruprasad Nagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1

OTHER LEARNING RESOURCES:

O1:https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,10,12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2

22BTCS125R	**Techno Professional Skills I**	CO 1	2	1	1	1	1					3		2
		CO 2	2	1	3	1	1					3		2
		CO 3	2	3	1	1	1					3		2
		CO 4	2	2	2	2	2					3		2
		CO 5	2	2	2	2	2					3		2

SEMESTER – II									
Course Title	**EFFECTIVE ENGLISH FOR ENGINEERS**								
Course code	**22UBPD124R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Civil Engineering/B.Tech in Mechanical Engineering/B.Tech in Computer Science and Engineering/ B.Tech in Computer Science and Engineering (B)/ B.Tech in Mechanical Engineering (B)/ B.Tech in Civil Engineering (B)/ B.Tech in Computer Science and Engineering on Cloud Technology and Information Security**								
Semester	**Fall/I or Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	This course will enable the students to acquire the important knowledge on grammar like the formation of sentences. To enable the students to use vocabulary meaningfully for a successful conversation. To establish Reputation and Rapport, a dress code session is much needed The 3 P's (Planning, Prioritizing, and Performing) of Time Management will be taught to the students.								
CO1	Understand and identify common errors in English writing.								
CO2	Acquire skill of report writing.								
CO3	Develop the ability as critical readers and writers.								
CO4	Improve speaking ability in English both in terms of fluency and comprehensibility.								
CO5	Understand the correct usage of English grammar in writing and speaking.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Grammar** Interchange of Interrogative and Assertive Sentences Interchange of Exclamatory and Assertive Sentences Analysis of Sentences Types of Tenses Exercises on Tense	**6**	Understanding the rules and structures that govern the formation and arrangement of words and phrases in a language. Students explore the components of grammar such as syntax, morphology, and semantics, learning how these elements combine to form meaningful sentences and expressions.	**1,2,3**
II	**Vocabulary** Synonyms Antonyms Homonyms	**6**	Acquiring and understanding the meanings, usage, and contexts of words within a language. Students focus on expanding their vocabulary by learning new words, idiomatic	**3,4**

			expressions, and specialized terminology relevant to their fields of study or interests. They develop skills in recognizing word forms, meanings, and relationships through activities such as reading, listening, and practice exercises.	
III	**Reading Skills** Techniques of Effective Reading Gathering ideas and information from a text The SQ3RTechnique Interpret the text	**6**	Learn to apply strategies such as skimming and scanning to locate specific information quickly, while also improving their ability to infer meaning from context and draw conclusions. Mastery of reading skills enhances students' capacity to synthesize information, evaluate arguments, and critically assess sources across various disciplines and genres.	**3,4**
IV	**Dress Code Ethics** Introduction to Dress Code Ethics, Purpose and Importance, How to Make FIRSTIMPRESSION What to Wear During Interviews or Any Other Formal Meetings – Male &	**6**	Learn the importance of presenting themselves professionally and respectfully through their clothing choices. They understand the impact of attire on first impressions, professionalism, and cultural sensitivity. By adhering to dress code policies, students demonstrate their understanding of workplace norms and expectations, preparing them for future careers and professional interactions.	**4**
V	**Time-Management Skills** Introduction To Time Management, Purpose And Importance of Time Management, Basic Tips to Maintain Time.	**6**	Learn to identify and set realistic objectives, break tasks into manageable steps, and create schedules or timelines to organize their workload. They develop strategies such as	**4**

			setting priorities, avoiding procrastination, and using tools like calendars or task management apps to optimize productivity.	
Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: Wren,P.C and Martin,H. 1995. High School English Grammar and Composition, S Chand Publishing.
T1: Barrett,Grant.2016.PerfectEnglishGrammar:TheIndispensibleGuidetoExcellent Writing and Speaking, ZephyrosPress

REFERENCE BOOKS:
R1: Carthy. (2008) English Vocabulary in Use Upper - Intermediate with CD-ROM, Cambridge University Press
R1: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in	1,2,3,4,5,10,12

	practice.	
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBPD124R	**EFFECTIVE ENGLISH FOR ENGINEERS**	CO 1	1	1	1	1	1					3		2
		CO 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – II									
Course Title	**MOOCS I: Enhancing Study Skills**								
Course code	**22MOSY124R**	**Total credits: 2** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Computer Science Engineering**								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	Develop critical thinking and problem-solving abilities to approach academic challenges systematically. To enable the students to use vocabulary meaningfully for a successful conversation. Teach time-management skills to help students prioritize tasks, set goals, and create effective study schedules. Enhance reading comprehension and note-taking techniques for better information retention and understanding. Improve test-taking strategies, including preparation, anxiety management, and answering techniques								
CO1	Students will learn to analyze your learning style, set realistic goals, and create a structured schedule that maximizes your learning potential.								
CO2	To discover time management techniques like prioritization, task scheduling, and identifying and overcoming procrastination tendencies.								
CO3	Apply information literacy skills to effectively research, evaluate, and synthesize information from various sources, including academic databases, credible websites, and scholarly articles.								
CO4	To develop strategies for analyzing complex information, identifying main ideas, evaluating arguments, and drawing insightful conclusions from reading materials.								
CO5	To explore Explore various test-taking approaches, including exam preparation techniques, managing test anxiety, and developing test-specific strategies that boost your confidence and performance.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	Introduction: Defining effective studying and its importance for academic success. Learning Styles: Identifying your preferred learning style (visual, auditory, kinesthetic) and tailoring your study strategies accordingly. Goal Setting: Setting SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound) for your studies. Developing a Personalized Study Plan: Creating a schedule that incorporates class time, study sessions, breaks, and personal		**8**		Learn to assess their individual learning styles, strengths, and areas for improvement to create an effective and tailored approach to their studies. They should understand how to set realistic and achievable academic goals, prioritize tasks, and allocate appropriate time for each subject or activity.				**1,2,3**

	commitments. Self-Assessment Tools: Introduction to self-assessment exercises to evaluate your current study habits and identify areas for improvement.			
II	Time Management Techniques: Exploring various time management strategies like the Eisenhower Matrix, the Pomodoro Technique, and time tracking tools. Prioritization: Learning to prioritize tasks based on urgency and importance and allocate study time accordingly. Identifying Time Wasters: Recognizing and eliminating distractions like social media, multitasking, and disorganized study areas. Combating Procrastination: Understanding the root causes of procrastination and developing strategies to overcome it (e.g., breaking down tasks, reward systems). Creating a Sustainable Study Routine: Establishing a consistent study schedule that integrates well with your overall lifestyle	**12**	Learn to effectively organize their tasks and responsibilities to maximize productivity and achieve their goals. They should understand and apply strategies such as prioritizing tasks using methods like the Eisenhower Matrix, setting SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound), and breaking down larger projects into manageable steps.	**3,4**
III	Research Strategies: Developing effective research techniques including using library resources, academic databases, and credible online sources. Evaluating Information: Learning to assess the credibility of sources, identify biases, and distinguish between fact and opinion. Citation Styles: Understanding different citation styles (APA, MLA, Chicago) and practicing proper citation methods. Note-taking Techniques: Exploring various note-taking methods (e.g., outlining, mind mapping) and choosing a method that suits your learning style. Information Organization:	**8**	Learn to systematically gather, analyze, and interpret information to address specific questions or problems effectively. They should understand how to define a clear research question or hypothesis, conduct comprehensive literature reviews, and utilize various sources, including academic journals, books, and credible online resources. Students should become proficient in employing different research methodologies, such as qualitative,	**3,4**

	Developing strategies for organizing research findings, including using reference management tools..		quantitative, or mixed methods, and in using tools for data collection and analysis.	
IV	Active Reading Strategies: Learning to read actively by highlighting key points, annotating text, and summarizing information in your own words. Critical Analysis: Developing skills to analyze arguments, identify assumptions and biases, and evaluate evidence presented in reading materials. Comprehension Strategies: Building comprehension skills through techniques like SQ3R (Survey, Question, Read, Recite, Review) and identifying main ideas and supporting details. Information Synthesis: Learning to synthesize information from different sources, identify connections, and draw well-supported conclusions. Critical Thinking Exercises: Practicing critical thinking skills through analyzing case studies, engaging in debates, and formulating persuasive arguments	**6**	Learn techniques to enhance their comprehension, retention, and critical engagement with texts. They should understand how to set reading goals and preview materials to identify key themes and structure. Students should practice annotating texts by highlighting important points, making notes in the margins, and summarizing sections in their own words. They should also develop the ability to ask critical questions, make inferences, and connect new information to prior knowledge.	**4**
V	Test Preparation Techniques: Creating a study plan specifically for exams, including reviewing class materials, practicing with past exams, and forming study groups. Test Anxiety Management: Understanding and combating test anxiety through relaxation techniques, positive self-talk, and visualization exercises. Test-Taking Strategies: Learning different test-taking approaches for various question formats (multiple choice, essay, short answer) and maximizing your exam performance. Time Management During Exams: Developing strategies for allocating time effectively during exams and prioritizing responses.	**5**	Learn strategies to enhance their understanding and recall of material, reduce anxiety, and perform effectively during exams. They should understand how to create a study schedule that allocates sufficient time for reviewing each subject, utilizing techniques such as spaced repetition and active recall. Students should practice summarizing notes, creating mind maps, and using flashcards for key concepts. They should also engage in self-testing	**4**

	Self-Evaluation and Reflection: Learning from exam experiences by reviewing results, identifying areas for improvement, and setting goals for future exams		through practice exams and quizzes to identify areas needing improvement.	
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Brown, Peter C., Henry L. Roediger III, and Mark A. McDaniel. Make it stick: The science of successful learning. Harvard University Press, 2014..

REFERENCE BOOKS:

R1: Newport, Cal. How to become a straight-A student: The unconventional strategies real college students use to score high while studying less. Crown, 2006.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Students will learn to analyze your learning style, set realistic goals, and create a structured schedule that maximizes your learning potential.	1,2,3,4,5,10,12
2	To discover time management techniques like prioritization, task scheduling, and identifying and overcoming procrastination tendencies.	1,2,3,4,5,10,12
3	Apply information literacy skills to effectively research, evaluate, and synthesize information from various sources, including academic databases, credible websites, and scholarly articles.	1,2,3,4,5,10,12
4	To develop strategies for analyzing complex information, identifying main ideas, evaluating arguments, and drawing insightful conclusions from reading materials.	1,2,3,4,5,10,12
5	To explore Explore various test-taking approaches, including exam preparation techniques, managing test anxiety, and developing test-specific strategies that boost your confidence and performance.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22MOSY124R	**MOOCSI: Enhancing Study Skills**	CO 1	2	2	2	2	3					2		2
		CO 2	2	3	3	2	3					2		2
		CO 3	2	2	2	2	3					2		2
		CO 4	2	2	2	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – II									
Course Title	**Universal Human Values and Professional Ethics**								
Course code	**22UUHV101R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**1**	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Computer Science Engineering**								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession To help students understand the meaning of happiness and prosperity for a human being. To facilitate the students to understand harmony at all the levels of human living, and live accordingly. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life								
CO1	Evaluate the importance and process of Value Education, aligning it with human aspirations.								
CO2	Analyze the concept of harmony within oneself, emphasizing the connection between 'I' and the body.								
CO3	Assess and apply foundational values in family and society for comprehensive human goals.								
CO4	Examine the interconnectedness and mutual fulfillment in nature, emphasizing co-existence principles.								
CO5	Demonstrate competence in professional ethics, incorporating a holistic understanding for eco-friendly production systems.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration– what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario,		3		Understand the need for value education in fostering ethical, moral, and socially responsible behavior. The basic guidelines include promoting core values such as integrity, empathy, respect, and responsibility. The course content covers various dimensions of human values, ethical theories, and real-life applications in personal and professional contexts. The process involves interactive teaching methods, including discussions, case studies, reflective exercises, and				**1,2,3**

	Method to fulfill the above human aspirations: understanding and living in harmony at various levels.		community service activities, to engage students in deep thinking and practical application of values.	
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya	3	Learn to identify and align their thoughts, emotions, and actions through self-awareness and self-regulation techniques. The course emphasizes the integration of the body, mind, and spirit, promoting practices such as mindfulness, meditation, and reflective journaling to achieve internal balance. Students are encouraged to recognize their intrinsic values and aspirations, fostering a sense of purpose and contentment.	**3,4**
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious	3	Learn about the importance of empathy, effective communication, mutual respect, and cooperation in fostering strong and positive human connections. The course emphasizes the roles and responsibilities of individuals in contributing to the well-being of their families and communities, encouraging practices that promote trust, understanding, and support. Students are taught conflict resolution strategies and the value of compassion and ethical behavior in interpersonal interactions.	**3,4**

	order in societyUndivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!.			
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	3	Learn to recognize the intrinsic balance and mutual dependence that sustain ecosystems and the broader environment. The course emphasizes the concept of co-existence, where harmony arises from understanding and respecting the natural world's interdependent relationships. Students are encouraged to adopt sustainable practices and an ethical attitude towards nature, recognizing their role in maintaining ecological balance.	**4**
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	3	It fosters values such as integrity, empathy, and sustainability, guiding professionals to consider the broader impact of their decisions and actions. Professionals are encouraged to cultivate a balanced approach that respects diverse perspectives, promotes collaboration, and prioritizes ethical conduct in business practices. This holistic perspective also emphasizes accountability and responsibility towards stakeholders, communities, and the environment, encouraging ethical leadership and long-term sustainability in organizational strategies and operations.	**4**

Practical Component				
Practical 1				
Practical 5				

TEXT BOOKS:

T1: Business Ethics: Ethical Decision Making & Cases by O.C. Ferrell and John Fraedrich.
T2: Professional Ethics and Human Values by Jayakumar.

REFERENCE BOOKS:

R1: The Oxford Companion to Philosophy edited by Ted Honderich.

R2: The Cambridge Encyclopedia of Language edited by David Crystal.

OTHER LEARNING RESOURCES:

O1:https://youtu.be/rl85jxktfms

O2:https://www.betterteam.com/dress-code-policy#:~:text=Everyone%20is%20expected%20to%20be,religion%20or%20ethnicity%20are%20exempt

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Evaluate the importance and process of Value Education, aligning it with human aspirations.	1,2,3,4,6,7,10,12
2	Analyze the concept of harmony within oneself, emphasizing the connection between 'I' and the body.	1,2,3,4,6,7,10,12
3	Assess and apply foundational values in family and society for comprehensive human goals.	1,2,3,4,6,7,10,12
4	Examine the interconnectedness and mutual fulfillment in nature, emphasizing co-existence principles.	1,2,3,4,6,7,10,12
5	Demonstrate competence in professional ethics, incorporating a holistic understanding for eco-friendly production systems.	1,2,3,4,6,7,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UUHV101R	**Universal Human Values and Professional Ethics**	CO 1	1	1	1	2		2	2			1		2
		CO 2	1	2	1	2		3	3			1		2
		CO 3	1	1	1	2		2	3			1		2
		CO 4	1	2	1	2		3	3			1		2
		CO 5	1	1	1	2		3	3			1		2

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<tr><th colspan="10">SEMESTER – II</th></tr>
<tr><td>Course Title</td><td colspan="9">COMPUTATIONAL SYSTEMS AND DIGITAL WORLD</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UCDL103R</td><td rowspan="2">Total credits: 1
Total hours: 30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>PROGRAMMES
(All Degree / Diploma programme of Engineering, Computer Technology, Management, Humanities, Science, and Agricultural Sciences)</td><td colspan="9">BachelorofArtsinPerformingArts
BachelorofScienceinActuarialScience
BachelorofScienceinForensicScience
BachelorofBusinessAdministration
BachelorofHotelManagement andCateringTechnology
Bachelor ofBusinessAdministration
BachelorofSocialWork
BachelorofArtsinSociology
BachelorofArtsinPsychology
BachelorofScienceinBiotechnology
B.Sc.(Hons)Agriculture
BachelorofScienceinMicrobiology
BachelorofScienceinFoodNutritionandDietetics
BachelorofComputer Application
B.TechinCivilEngineering
B.TechinMechanicalEngineering
B.TechinComputerScienceandEngineering
B.TechinComputerScienceandEngineering
MasterofBusinessAdministration
MasterofBusiness AdministrationinHealthcareManagement
MasterofSocialWork
MasterofArtsinAppliedPsychology
MasterofScienceinClinicalPsychology
MasterofArtsinSociology
MasterofScienceinBiotechnology
MasterofScienceinMicrobiology
MasterofScienceinFoodNutritionandDietetics
Master ofScienceinBotany</td></tr>
</table>

	Master ofScienceinZoology MasterofComputerTechnology			
Semester	**Winter/II Semester of First Year of the Programme**			
Course Objectives (Minimum 3)	Students will be able to understand the fundamentals of computer systems and Internet search along with advanced features of MS-Office. Students will be able to understand about the introduction to Social Media and E-Commerce and utility software Students will develop a solid foundation in computational thinking, which includes problem- solving, algorithmic design, and logical reasoning.			
CO1	FundamentalsofComputerSystems,OfficeAutomationandInternetSearch.			
CO2	KnowmoreabouttheInternet&CyberWorld			
CO3	Know Social Media, E-Commerce, and apply the samefordigital branding			
CO4	Knowtousethedigitalpaymentsanddigitaltransactions, andotherutilitysoftware			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Fundamentals of Computer Systems, Office Automation and Internet Search**	**7**	Learn about computer hardware components, operating systems, and software applications that facilitate office automation tasks such as word processing, spreadsheets, and presentations. Additionally, students delve into internet search strategies, mastering techniques to efficiently locate and evaluate information using search engines, databases, and online resources.	**1,2, 3**

II	**Internet&CyberWorld**	**8**	Encompasses exploring the interconnected global network of computers and digital systems that facilitate communication, information sharing, and collaboration on a massive scale. Students delve into the technical infrastructure of the internet, including protocols, servers, and data transmission methods, as well as the evolution and impact of cyberspace on society. They learn about cybersecurity principles and practices to safeguard data, systems, and personal information from cyber threats such as hacking, phishing, and malware.	**3,4**
III	**SocialMedia,E-Commerce,anddigitalbranding**	**7**	Understanding their interconnected roles in modern digital marketing and communication strategies. Students explore how social	**3,4**

			media platforms such as Facebook, Instagram, and Twitter are utilized for brand promotion, customer engagement, and community building. They learn about e-commerce principles, including online retail strategies, payment systems, and logistics management, essential for conducting business in the digital age.	
IV	**Digitalpaymentsanddigitaltransactions,andother utilitysoftware**	**8**	Learn about digital payment methods such as mobile wallets, online banking, and cryptocurrencies, understanding their security protocols, transaction processes, and integration with e-commerce platforms. They also explore utility software applications that streamline tasks such as document management, scheduling, and communication, enhancing	**4**

			productivity in personal and professional environments.	
Practical Component				
Practical 1	**Experiment 1**: Disassemble and reassemble a desktop computer, identifying and explaining the function of each component. Discuss the importance of hardware compatibility. **Experiment 2**: Install an operating system (e.g., Windows or Linux) on a virtual machine. Configure essential settings, such as user accounts, network connections, and system updates. **Experiment 3:** Use office software (e.g., Microsoft Office or Google Workspace) to create documents, spreadsheets, and presentations. Teach formatting, inserting images, and collaboration features. **Experiment 4:** Instruct students on effective internet searching, including the use of search engines, keywords, and advanced search operators. **Experiment 5:** Set up email accounts, compose and send emails, attach files, and organize emails into folders. Discuss email etiquette and best practices. **Experiment 6:** Use cloud storage services (e.g., Google Drive or Dropbox) to store and synchronize files. Create a backup of important data and discuss data recovery options.	**8**	Familiarize students with computer hardware components.	**1,2, 3**
Practical 2	**Experiment 1:** Set up a small local network with routers and computers. Configure network settings, assign IP addresses, and establish connectivity. Explore basic network diagnostics. **Experiment 2**: Guide students in creating a simple website using HTML and CSS. They should design webpages, add text and images, and format their content using CSS. Discuss web hosting and domain registration. **Experiment 3**: Use email clients that support encryption (e.g., Thunderbird) to send and receive encrypted emails. Practice creating and verifying digital signatures for email authenticity.	**7**	Introduce students to the fundamentals of the internet and network configuration.	**3,4**
Practical 3	**Experiment 1:** Instruct students to create	**8**	Familiarize	**3,4**

	accounts on popular social media platforms (e.g., Facebook, Twitter, Instagram). Guide them through profile setup, privacy settings, and content posting. **Experiment 2:** Have students create a content calendar for a fictional business or brand. Plan posts, including text, images, and hashtags, and use social media management tools to schedule posts. **Experiment 3:** Guide students in building a basic e-commerce website using platforms like Shopify or WooCommerce. They should add products, set up payment gateways, and configure the online store. **Experiment 4:** Set up a payment gateway for the e-commerce website created in Experiment 3. Test payment transactions and discuss security protocols such as SSL encryption. **Experiment 5**: Create and manage paid social media advertising campaigns using platforms like Facebook Ads or Google Ads. Monitor campaign performance and adjust ad targeting. **Experiment 6**: Simulate an influencer marketing campaign. Students should identify potential influencers, negotiate partnerships, and track the impact of influencer promotions. **Experiment 7:** Analyze online reviews and social media mentions related to a fictional brand. Develop strategies to manage and improve the brand's online reputation.		students with social media platforms and digital branding	
Practical 4	**Experiment 1:** Instruct students to create accounts on popular digital payment platforms (e.g., PayPal, Venmo, or a mobile payment app). Guide them through account verification, linking bank accounts or cards, and adding funds. **Experiment 2**: Provide a list of online shopping websites. Students should select products, add them to the cart, and complete transactions using the digital payment methods they set up in Experiment 1. **Experiment 3:** Make digital purchases and collect digital receipts. Discuss the advantages of digital receipts, such as organization and ease of tracking expenses. **Experiment 4:** Provide a list of utility software applications (e.g., antivirus, system optimization tools). Have students select one, download it, and install it on their computers.	**7**	Familiarize students with digital payment methods and their setup.	**4**

TEXT BOOKS:

T1: Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems Applications. 3rd ed. New Delhi: BPB Publications.
T2: Goel, A, 2010. Computer Fundamentals, Pearson India.

REFERENCE BOOKS:

R1: Balaguruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.

R2: Balaguruswamy, 2014. E. Fund Of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-Hill Education.

R3: Lawson, C. 2022. Introduction to Social Media, Oklahoma State University.

OTHER LEARNING RESOURCES:

O1:https://www.w3schools.com

O2:https://edu.gcfglobal.org

O3:https://www.tutorialspoint.com

O4:https://www.javatpoint.com/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	FundamentalsofComputerSystems,OfficeAutomationandInternetSearch.	1,2,3,4,5,10,12
2	Know more about the Internet & Cyber World	1,2,3,4,5,10,12
3	Know Social Media, E-Commerce, and apply the same for digital branding	1,2,3,4,5,10,12
4	Know to use the digital payments and digital transactions, and other utility software	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UCDL103R	**COMPUTATIONAL SYSTEMS AND DIGITAL WORLD**	CO 1	3	3	3	2	3					2		3
		CO 2	3	3	1	3	3					2		3
		CO 3	2	3	1	2	3					2		3
		CO 4	2	3	1	3	3					2		3

Evaluation Criteria:

SlNo	Evaluation Type	Total Marks
1	In-Semester Examination	70
2	End Semester Examination	30
Total		**100**

a. In-Semester Examination Details(70)

SlNo	Components	Count	Individual Components Marks	Total Marks	Remarks
1	Skill Test	2	20	40	The student's score out of 100willbe Converted to a eoutof70.
2	Quizzes	2	10	20	
3	Lab Experiments (Eachexperiments16inno'swillcarry20marks,later reducedtooverall20)	---	20	20	
4	Home Assignments (Eachassignments5inno'swill carry20marks,later reducedtooverall10)	---	10	10	
5	Participation in Class	---	10	10	
Grand Total				**100**	

b. End Semester Examination Details (30)

SlNo	Components	al Components Marks	Total Marks	Remarks
1	Theory(MCQ based)	20	20	The student's scoreoutof100 will be Converted to a e out of 30.
2	Practical Experiments	60	60	
3	Viva	20	20	
Grand Total			**100**	

SEMESTER – II									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15S	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programmes	All UG Programmes								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	It is to develop the social and soft skills and to promote a holistic development of the learners								
CO1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc.								
CO2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies								
CO3	The students will be trained to represent ADTU in various inter university, state and national level competitions								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct	**10**	ADTU fosters holistic development through clubs participation in workshops and competitions. This course promotes promotes a holistic development of the learners.	

	workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			
Practical Component				
Practical 1				
Practical 2				
Practical 3				
Practical 4				

TEXT BOOKS:

T1:

REFERENCE BOOKS:

R1:

OTHER LEARNING RESOURCES:

O1:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc.	1,2,3,4,5,6,10,12
2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies	1,2,3,4,5,6,10,12
3	The students will be trained to represent ADTU in various inter university, state and national level competitions	1,2,3,4,5,6,10,12
4	The students will be given a platform to earn from invited experts in their respective fields.	1,2,3,4,5,6,10,12
5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBCC121	CO CURRICULAR ACTIVITIES	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – II									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15S	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programmes	All UG Programmes								
Semester	**Winter/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	It is to develop the social and soft skills and to promote a holistic development of the learners								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the	**10**	ADTU fosters holistic development through clubs like Dance, Music, Photography, Drama, and Literature, encouraging participation in workshops and competitions.	

	platform to learn from experts in the respective fields.			
Practical Component				
Practical 1				
Practical 2				
Practical 3				
Practical 4				

TEXT BOOKS:

T1:

REFERENCE BOOKS:

R1:

OTHER LEARNING RESOURCES:

O1:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22UBEC121	**EXTRA CURRICULAR ACTIVITIES**	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – III									
Course Title	**Analog Electronic Circuits**								
Course code	**22BTCS211R**	Total credits: 4	L	T	P	S	R	O/F	C
		Total hours: 45T+30P	3	0	2	0	0	0	4
Pre-requisite	Nil	Co-requisite	Nil						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3rd semester of the second year of the program**								
Course Objectives (Minimum 3)	Design and analysis of CE, CB, CC amplifiers using small signal h-model and pi-model and derivation of voltage gain, current gain, input impedance and output impedance. Design and analysis of common source FET amplifier. Behaviour of operational amplifier.								
CO1	To understand the characteristics of transistor								
CO2	Design and analyse various rectifier circuits								
CO3	Design and analyse various amplifier circuits								
CO4	Design sinusoidal and non-sinusoidal oscillators								
CO5	Understand the function an op amp and design op amp based circuits								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.	7	Understand P-N junction operation; use rectifiers for AC to DC conversion; apply Zener diodes for voltage regulation; design clamping/clipping circuits for waveform modification.	1,2,3

II	Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits	10	Understand BJT structure, I-V characteristics; use as switch, amplifier (small-signal model, biasing circuits); analyze common-emitter, common-base, common-collector configurations; grasp small-signal and high-frequency equivalent circuits.	3
III	MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits- gain, input and output impedances, trans-conductance, high frequency equivalent circuit.	10	Understand MOSFET structure, I-V characteristics; utilize as switch, amplifier (small-signal model, biasing circuits); analyze common-source, common-gate, common-drain configurations; grasp small-signal parameters, high-frequency behavior.	3,4
IV	Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product	8	Understand differential amplifier operation; design power amplifiers and direct-coupled multi-stage amplifiers; analyze operational amplifier internals, ideal behavior, and non-idealities (offsets, bias currents, slew rate, gain-bandwidth product).	3,4

V	Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.) Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.	10	Analyze op-amp circuits: inverting/non-inverting amplifiers, differential amp, integrator, active filters, controllers, oscillators, analog-to-digital conversion, comparators, detectors, generators, rectifiers, and monostable multivibrators.	3,4
PRACTICAL COMPONENT				
1	To Study the V-I characteristics of Forward Biased	2	Students will be able to describe the V-I characteristics of a forward-biased diode, and analyze and interpret the experimental data to explain the behavior of the diode under different voltage conditions.	2,3
2	To Study the Reverse characteristics of Zener diode.	2	Understand and explain the reverse characteristics of a Zener diode, identifying key concepts such as breakdown voltage and reverse current. Analyze and interpret the behavior of Zener diodes in reverse bias conditions through experimental data.	2,4

3	To Study the working of a diode as half wave rectifier with and without filter.	3	Explain the basic operation of a diode in a half-wave rectifier circuit, both with and without a filter.Compare the performance and output characteristics of a half-wave rectifier circuit with and without a filter using practical observations.	2,4
4	To study the input and output characteristic of BJT in CE configuration.	3	Students will be able to analyze and interpret the input and output characteristics of a BJT in CE configuration. Students will be able to evaluatethe performance parameters of a BJT based on its characteristic curves.	4,5
5	To design an Inverting Amplifier for the given specifications using Op-Amp IC 741.	3	Upon completing this task, students will be able to design an inverting amplifier circuit using the Op-Amp IC 741 to meet specified requirements and they will analyze the circuit's performance to ensure it meets the given specifications.	3,4
6	To design and setup a non-inverting amplifier circuit with OPAMP 741 for a fixed gain, plot the waveforms, observe the phase reversal.	3	By the end of this task, students will be able to design and set up a non-inverting amplifier circuit using OPAMP 741 for a fixed gain and plot and analyze the resulting waveforms to observe phase reversal.	3,4

7	To study a low pass and a high pass filter with a given cut off frequency.	3	Describe the functioning and applications of low pass and high pass filters, including their cut off frequencies. Students will be able to design and implement low pass and high pass filters with specified cut off frequencies in practical circuits. (Bloom's Level 3: Applying)	2,3
8	To study a low pass and a high pass filter with a given cut off frequency.	3	Understand the fundamental principles and applications of low pass and high pass filters with given cut off frequencies. Apply their knowledge to analyze and design basic low pass and high pass filter circuits.	2,3
9	To design a differentiator and integrator using OPAMP IC741.	3	Design both a differentiator and an integrator circuit using the OPAMP IC741 and analyzetheir performance in various applications.	6,4
10	To design and setup a summing amplifier circuit with OPAMP 741 for a fixed gain and verify the output**.**	3	Understand and apply the principles of summing amplifier circuits using OPAMP 741 to achieve a fixed gain. Analyze and verify the output of the designed summing amplifier circuit to ensure it meets the specified requirements.	3,4

TEXT BOOKS:
T1:Micro Electronics by Millman And Grabel , McGRAW HILL
T2: Integrated Electronics by Millman &Halkias ,McGRAW HILL

T3: Electronic Devices and Circuits by Boylstead&Nashelsky, Pearson

REFERENCE BOOKS:
R1: Micro electronics circuit by Sedra and Smith, Oxford University;
R2: Microelectronics circuit analysis and design, by Rashid , PWS publication house;
R3: Electronic devices and integrated circuit- BP Singh and Rekha Singh, Pearson.
R4: Electronic Prith Ed. by Albert Malvino

OTHER LEARNING RESOURCES:

1. Analog Devices - Op-Amp Circuits
2. All About Circuits - Operational Amplifier Circuits

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To understand the characteristics of transistor.	1,2,3,5,10 and 12
2	Design and analyse various rectifier circuits	1,2,3,5,9,10 and 12
3	Design and analyse various amplifier circuits	1,2,3,4,5,6,10 and 12
4	Design sinusoidal and non-sinusoidal oscillators	1,2,3,4,5,6,10 and 12
5	Understand the function an op amp and design op amp based circuits	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS211R	**Analog Electronic Circuits**	CO1	3	3	2		2					2		2
		CO2	3	3	2		2				2	2		3
		CO3	3	2	1	2	2	2				2		2
		CO4	2	3	2	2	2	2				2		2
		CO5	3	3	3	3	3	3				2		3

SEMESTER – III									
Course Title	**Digital Electronic Circuits**								
Course code	22BTCS212R	Total credits: 4	L	T	P	S	R	O/F	C
		Total hours: 45T+30P	2	0	2	0	0	0	3
Pre-requisite	Nil	Co-requisite	Nil						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3rd semester of the second year of the program**								
Course Objectives (Minimum 3)	To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems. The course will help in design and analysis of the digital circuit and system. Apply skills in digital system integration and troubleshooting								
CO1	Apply Boolean algebra and analyze digital logic families, demonstrating proficiency in interfacing and understanding characteristics of digital ICs.								
CO2	Design and simplify logic functions using K-maps, implement combinatorial digital circuits, showcasing expertise in MSI chips and function realization using the Q-M method.								
CO3	Analyze and design sequential circuits, demonstrating proficiency in applications and design considerations of various types of flip-flops and counters.								
CO4	Evaluate and design digital-to-analog converters, understanding of quantization, encoding, and various A/D converter types.								
CO5	Analyze semiconductor memories and programmable logic devices, demonstrating proficiency in the operation, classification, and characteristics of different memory technologies and PLDs.								
Unit-No.	Content		Contact Hour	Learning Outcome					KL

I	Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.	7	Understanding digital signals, circuits, logic operations, Boolean algebra, IC gates, binary number systems, arithmetic, error codes, digital IC characteristics, TTL, Schottky TTL, CMOS logic, and interfacing techniques including tri-state logic.	**1,2,3**
II	Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.	10	Understanding combinational digital circuits: logic function representation, K-map simplification, multiplexers, demultiplexers, adders, subtractors, ALU design, MSI chips, comparators, encoders, decoders, display drivers, and function realization methods like Q-M method.	**3,4**
III	Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	10	Understanding sequential circuits: 1-bit memory, bistable latch properties, clocked SR flip-flop, JK, T, D flip-flops, applications, shift registers, converters, counters, special ICs, and their applications in digital memory, timing, and sequence control systems.	**3,4**

IV	A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D	8	Understanding A/D and D/A converters: types (weighted resistor, R-2R ladder), specifications, IC examples, sample-and-hold circuits, A/D conversion techniques (parallel comparator, successive approximation, counting, dual slope), and their applications in digital systems.	**4**
V	Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	10	Understanding semiconductor memories: organization, expanding size, types (ROM, RAM, CAM, CCD), characteristics, commonly used chips, ROM as PLD, programmable logic devices (PLAs, PALs, CPLDs, FPGAs), and their roles in digital systems.	**4**
PRACTICAL COMPONENT				
1	To study and verify the truth table of logic gates.	3	Understand and explain the functionality and truth tables of basic logic gates. Apply knowledge to construct and verify the truth tables of various logic gates through experimentation	2,3

2	To design and implementation using NAND gate & NOR gate as Universal Gate.	3	1. Understand and apply the concept of using NAND and NOR gates as universal gates in digital circuit design 2. Construct and evaluate various digital logic circuits using only NAND and NOR gates to demonstrate their universality.	3,5
3	To study about Ex-OR gates and verify their Truth Table.	3	Understand the fundamental operation and logic of Ex-OR gates. Apply knowledge to verify the truth table of Ex-OR gates through practical experimentation	2,3
4	To study about adder circuits, half adder circuits and verify their truth table.	3	Understand the concepts and functionality of adder and half-adder circuits. Analyze and verify the truth tables of adder and half-adder circuits to ensure their correct operation.	2,4
5	To study about adder circuits, full adder circuits and verify their truth table.	3	Comprehend the concepts and functionality of adder and full adder circuits. Apply knowledge to verify the truth tables of adder and full adder circuits through practical implementation	2,3
6	To study half subtractor using basic gates.	3	Understandthe functionality and design of a half subtractor using basic logic gates. Construct and verify the operation of a half subtractor circuit to demonstrate its subtraction capability	2,3

7	To study full subtractor using basic gates.	3	Understand the operation and logic of a full subtractor circuit using basic gates. Implement and analyze a full subtractor circuit to verify its functionality	2,4
8	To design and set up a 4:1 and 2:1 Multiplexer.	3	Design and construct 4:1 and 2:1 multiplexer circuits, demonstrating an understanding of their functional principles. Evaluate and test the performance of the constructed multiplexer circuits to ensure accurate operation	3,4
9	To design and set up a 1:4 Demultiplexer (DE-MUX) .	3	Understand the functional principles of a 1:4 Demultiplexer and apply this knowledge to design and set up the circuit. Evaluate the performance of the 1:4 Demultiplexer to ensure correct signal distribution and functionality	3,5
10	Implementation and verification of decoder and encoder using logic gates.	3	Apply knowledge of digital logic to design and implement encoder and decoder circuits using logic gates. Evaluate the functionality of the encoder and decoder circuits through systematic verification	3,5

TEXT BOOKS:
T1:Dr. Sanjay Sharma “Digital Electronics and logic Design”, Katson Books, fourth edition 2015

REFERENCE BOOKS:
R1: R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009
R2: Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.,

OTHER LEARNING RESOURCES:
www.nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply Boolean algebra and analyze digital logic families, demonstrating proficiency in interfacing and understanding characteristics of digital ICs.	1,2,3,10 and 12
2	Design and simplify logic functions using K-maps, implement combinatorial digital circuits, showcasing expertise in MSI chips and function realization using the Q-M method.	1,2,3,4,5,10 and 12
3	Analyze and design sequential circuits, demonstrating proficiency in applications and design considerations of various types of flip-flops and counters.	1,2,3,4,5,10 and 12
4	Evaluate and design digital-to-analog converters, understanding of quantization, encoding, and various A/D converter types.	1,2,3,4,5,10 and 12
5	Analyze semiconductor memories and programmable logic devices, demonstrating proficiency in the operation, classification, and characteristics of different memory technologies and PLDs.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
22BTCS212R	**Digital Electronic Circuits**	CO1	2	2	1							1		1
		CO2	3	3	2	2	1					1		2
		CO3	3	3	3	1	1					1		2
		CO4	3	3	2	2	1					1		2

		CO5	3	3	2	2	1					1		2

SEMESTER – III									
Course Title	**Data Structure& Algorithms**								
Course code	**22BTCS213R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Fundamentals of programming logic**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To impart the basic concepts of data structures and algorithms. To understand basic concepts about stacks, queues, lists, trees and graphs. To understand concepts about searching and sorting techniques								
CO1	Analyze algorithms using asymptotic notations, demonstrating proficiency in searching techniques like linear search and binary search, and making informed time-space trade-offs.								
CO2	Design and analyze algorithms for stack and queue operations, including expression conversion and evaluation, demonstrating mastery in implementing and evaluating various types of queues.								
CO3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.								
CO4	Apply tree terminologies and operations on different types of trees, with a focus on algorithmic analysis and practical applications.								
CO5	Evaluate and compare various sorting algorithms and hashing techniques; demonstrate proficiency in graph terminologies, representations, and algorithms for search and traversal with complexity analysis.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.	**8**	By learning these concepts, students will understand data organization, perform key operations on data structures, analyze algorithms using asymptotic notations, and evaluate search techniques for efficiency, understanding their time-space trade-offs.	**1,2,3**
II	**Stacks and Queues**: ADT Stack and its operations: Algorithms and their complexity analysis,	**8**	Understand stack and queue ADTs, perform and analyze stack operations,	**3,4**

	Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.		apply stacks in expression conversion and evaluation, and explore various queue types with their operations and complexities.	
III	**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**10**	Comprehend singly, doubly, and circular linked lists, perform operations like traversal, insertion, deletion, and implement linked representations of stack and queue. They will analyze algorithms and complexities associated with these data structures..	**3,4**
IV	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.	**10**	Understand binary trees, BSTs, AVL trees, B trees, and B+ trees. They'll perform operations, analyze algorithms, and explore applications, enhancing skills in data organization and algorithmic analysis.	**4**
V	**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	**9**	Understand hashing techniques. In graph theory, they'll grasp basic terms, representations, search algorithms, and analyze complexities, enhancing problem-solving skills in data manipulation.	**4**
Practical Component				
Practical 1	Array Operations Program to perform basic array operations (insertion, deletion, search, update).	**3**	Gain proficiency in implementing and analyzing basic array operations in programming. Understand their implications and	4

			efficiency in problem-solving contexts.	
Practical 2	Linked List Operations Program to implement singly linked list operations (insertion, deletion, traversal). Program to implement doubly linked list operations (insertion, deletion, traversal). Circular Linked List Program to implement circular linked list operations (insertion, deletion, traversal).	**3**	Implemented singly, doubly, and circular linked list operations (insertion, deletion, traversal) in Python, fostering understanding, implementation skills, and analytical comparison of dynamic data structures in programming.	5
Practical 3	Stacks and Queues Stack Using Array Program to implement stack operations using arrays (push, pop, peek). Stack Using Linked List Program to implement stack operations using linked lists. Infix to Postfix Conversion Program to convert infix expression to postfix expression using stack.	**3**	Implement stack operations (push, pop, peek) using arrays in Python, emphasizing stack properties and array-based implementation efficiency.	4
Practical 4	Queue Using Array Program to implement queue operations using arrays (enqueue, dequeue, front, rear). Queue Using Linked List Program to implement queue operations using linked lists. Circular Queue Program to implement circular queue using arrays.	**3**	Implement queue operations (enqueue, dequeue, front, rear) using linked lists in Python, emphasizing dynamic memory management and efficient queue operations.	4
Practical 5	Trees	**3**	Create a binary tree in Python and perform preorder, inorder, and	5

	Binary Tree Creation Program to create a binary tree and perform preorder, inorder, and postorder traversals. Binary Search Tree (BST) Operations Program to implement BST operations (insertion, deletion, search).		postorder traversals, illustrating tree structure and traversal algorithms.	
Practical 6	AVL Tree Implementation Program to implement AVL tree operations (insertion with rotations). Heap Implementation Program to implement a max-heap or min-heap and perform heap operations (insert, delete, heapify).	**3**	Implement AVL tree operations (insertion with rotations) in Python, ensuring balance and efficient search, insertion, and deletion operations in self-balancing trees.	4
Practical 7	Sorting Programs Merge Sort Implementation: Write a C program to implement the merge sort algorithm to sort an array of integers. Quick Sort Implementation: Implement the quick sort algorithm in C to sort an array of integers. Heap Sort Implementation: Write a C program to implement the heap sort algorithm to sort an array of integers.	**3**	Implement merge sort in C for array sorting, emphasizing divide-and-conquer principles and efficient sorting of large datasets. Implement quick sort in C for array sorting, focusing on partitioning and recursion for efficient average-case sorting of arrays.Implement heap sort in C for array sorting, showcasing heap properties and efficient in-place sorting using a max-heap or min-heap structure.	5
Practical 8	Hash Table with Chaining: Implement a hash table using chaining for collision resolution in C. Include functions to insert, search, and display elements.	**3**	Implement hash table with chaining in C, handling collisions with linked lists for efficient insert, search, and display operations in hash-based data storage.	5
Practical 9	Hash Table with Linear Probing: Write a C program to implement a	**3**	Implement hash table with linear probing in C, resolving collisions by	4

	hash table using open addressing with linear probing for collision resolution. Include functions to insert, search, and display elements.		linearly searching for open slots, ensuring efficient key-value storage and retrieval.	
Practical 10	Hash Table with Quadratic Probing: Implement a hash table using open addressing with quadratic probing for collision resolution in C. Include functions to insert, search, and display elements	**3**	Implement hash table with quadratic probing in C, resolving collisions using quadratic increments for open slots, ensuring efficient key-value storage and retrieval.	5

TEXT BOOKS:

T8:"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

REFERENCE BOOKS:

R3: Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

R4: "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

OTHER LEARNING RESOURCES:

1. https://books.google.co.in/books/about/Data_Structures_and_Algorithms.html?id=1lCHYj5eV-EC&redir_esc=y
2. https://techdevguide.withgoogle.com/paths/data-structures-and-algorithms/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze algorithms using asymptotic notations, demonstrating proficiency in searching techniques like linear search and binary search, and making informed time-space trade-offs.	1,2,3,10 and 12
2	Design and analyze algorithms for stack and queue operations, including expression conversion and evaluation, demonstrating mastery in implementing and evaluating various types of queues.	1,2,3,4,5,10 and 12
3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.	1,2,3,4,5,10 and 12
4	Apply tree terminologies and operations on different types of trees, with a focus on algorithmic analysis and practical applications.	1,2,3,4,5,10 and 12

5	Evaluate and compare various sorting algorithms and hashing techniques; demonstrate proficiency in graph terminologies, representations, and algorithms for search and traversal with complexity analysis.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22BTCS213R	**Data Structure& Algorithms**	CO 1	2	2	1							1		1
		CO 2	3	3	2	2	1					1		2
		CO 3	3	3	3	1	1					1		2
		CO 4	3	3	2	2	1					1		2
		CO 5	3	3	2	2	1					1		2

SEMESTER – III									
Course Title	**Biology For Engineers**								
Course code	**22BTCS214R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**C Programming**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To introduce the students about the biological concepts from an engineering perspective. To enable the students to have a strong knowledge of functioning of an ecosystem and identification of organisms. To introduce with the concepts of genetics and mechanisms related to it. To describe about the genetic code and its applicability. To explain the students about different physiological phenomenon occurring in human body.								
CO1	Analyze and differentiate between the fundamental principles of biology and engineering, emphasizing the significance of biological observations.								
CO2	Evaluate the importance of classification in biology, considering criteria such as cellularity, ultrastructure, energy utilization, and molecular taxonomy.								
CO3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.								
CO4	Explore the molecular basis of information transfer in genetics, understanding the hierarchy of DNA structure, the universality of the genetic code, and defining genes.								
CO5	Explore the fundamental principles of microbiology, including identification, classification, and ecological aspects of single-celled organisms.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction Importance and scope of Biology as an important scientific discipline. Branches of biological sciences. Fundamental differences between science and engineering. Comparison between the working mechanism of eye and camera, Bird flying and aircraft. Biological observations of 18th century that lead to major discoveries in the world Steps in scientific research works. Brownian motion in biological sciences.	**8**	.Understand the importance and scope of Biology, its branches, and differences from engineering. They'll compare biological phenomena like vision and flight with man-made technologies, grasp historical biological observations, scientific research steps, and Brownian motion's significance.	**1,2,3**
II	**Classification & Ecology** Classification of organisms, Basis of classification: Morphological,	**8**	Classify organisms based on morphology, biochemistry, and ecology, understand unicellular vs.	**3,4**

	biochemical or ecological, level of organization, symmetry, germ layer organization, segmentation, notochord. Concept of unicellular and multicellular organisms; prokaryotes and eukaryotes; Habitat & Adaptations. Concept of Ecosystem: Structure & Function. Energy flow in an ecosystem: Lindemann ten percent law. Types of excretion: Ammonotelism, Ureotelism and Uricotelism. Animal Kingdom: Characters of phylum with examples. Model organisms for the study of biology come from different groups. E. coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.		multicellular, prokaryotic vs. eukaryotic organisms, habitats, and adaptations. They'll grasp ecosystem structure, energy flow, types of excretion, and characteristics of major animal phyla.	
III	**Genetics & Biomolecules** Concept of Allele; Dominance &Recessive; Monohybrid, Dihybrid & Trihybrid cross; Mitosis & Meiosis. Mendel's laws, Concept of Segregation and Independent assortment. Concept of co-dominance and incomplete dominance with illustrations. Sex determination in human. Genetic disorders in human beings. DNA & RNA as genetic material. Enzymes: Classification; Mechanism of enzyme action.	**10**	Understand allele concepts, dominance, inheritance patterns, mitosis, meiosis, Mendelian laws, co-dominance, incomplete dominance, sex determination, genetic disorders, DNA/RNA roles, enzyme classification, and mechanisms, enhancing understanding of genetic principles and biomolecules.	**3,4**
IV	**Information Transfer & Metabolism** Genetic code: Properties Structure of DNA Concept of recombination and crossing over Proteins: Primary secondary, tertiary and quaternary structure. Concept of Central dogma ATP as an energy currency of cell. Concept of docking: Protein Ligand	**10**	grasp properties of the genetic code, DNA structure, recombination, protein structures, the central dogma, ATP's role in cellular energy, and protein-ligand interactions, enhancing understanding of information transfer and metabolism in biological systems.	**4**

	interaction			
V	**Physiology** Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosisfetalis. Neuroendocrine system of human: Endocrine glands and their functions. Human Excretory system: Structure of Kidney and Nephron Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse. Human Respiratory System: Structure of lungs and exchange of gases. Human digestive enzymes: Components and enzymes. Mechanism of muscle contraction.	**9**	understand the functioning of the human circulatory, neuroendocrine, excretory, respiratory systems, nervous system, and muscle contraction mechanism. They'll grasp blood groups, erythroblastosis, kidney structure, neuron function, digestive enzymes, and gas exchange, enhancing physiological knowledge.	**4**

TEXT BOOKS:

T1: Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
T2: Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
T3: Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

REFERENCE BOOKS:

R1: Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
R2: Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

OTHER LEARNING RESOURCES:

1. **IEEE Transactions on Biomedical Engineering**: Research articles and reviews on biomedical engineering topics.
2. **Nature Biotechnology**: Leading journal in biotechnology and biological engineering.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze and differentiate between the fundamental principles of biology and engineering, emphasizing the significance of biological observations.	2,3,4,6,8,9,10 and 12

2	Evaluate the importance of classification in biology, considering criteria such as cellularity, ultrastructure, energy utilization, and molecular taxonomy.	2,3,4,6,8,9,10 and 12
3	Implement and analyze operations on linked lists and its variations, showcasing competence in memory representation and algorithmic complexities.	2,3,4,6,8,9,10 and 12
4	Explore the molecular basis of information transfer in genetics, understanding the hierarchy of DNA structure, the universality of the genetic code, and defining genes.	2,3,4,6,8,9,10 and 12
5	Explore the fundamental principles of microbiology, including identification, classification, and ecological aspects of single-celled organisms.	2,3,4,6,8,9,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22BTCS214R	**Biology For Engineers**	CO 1		2	2	3		1		3	1	1		2
		CO 2		3	2	3		1		2	1	1		2
		CO 3		3	2	2		1		2	1	1		2
		CO 4		2	3	2		1		2	1	1		2
		CO 5		2	3	3		1		3	1	1		2

SEMESTER – III									
Course Title	**Mathematics III (Differential Calculus)**								
Course code	**22BTCS215R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Gather, analyze, evaluate, and synthesize information relevant to a question or issue. Manipulate and analyze numerical data and arrive at an informed conclusion. Understand applications of derivatives in optimization, related rates, and curve sketching.								
CO1	Understand the skills of partial derivatives with their applications.								
CO2	Understand the skills of vector calculus								
CO3	Analyse the application of integral calculus								
CO4	Understand the concept of line integral, surface integral and volume integral.								
CO5	Understand the concept of applications of multivariable calculus (Integration).								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Sequences, Series and Mean value theorems** Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test –Cauchy's root test – Alternate series– Leibnitz's rule. Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem.	**8**	Convergence and divergence tests for sequences and series, including ratio, comparison, integral, Cauchy's root, and alternating series tests. They'll understand and apply Rolle's and Lagrange's mean value theorems in solving mathematical problems effectively.	**1,2,3**
II	**Differential equations of first order and first degree** Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exactform. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories–Electrical circuits.E. coli, S.cerevisiae, D. Melanogaster,	**8**	Students will learn to solve first-order linear, Bernoulli, and exact differential equations, and apply them to real-world scenarios such as Newton's Law of cooling, growth and decay laws, electrical circuits, and orthogonal trajectories, enhancing problem-	**3,4**

	C. elegance, A. Thaliana, M. musculus.		solving skills in differential equations.	
III	**Linear differential equations of higher order** Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type eax, sin ax, cos ax, polynomials in xn, eaxV(x) and xnV(x) – Method of Variation of parameters, Cauchy and Legendre's linear equations.	**10**	Students will master solving linear differential equations of higher order with constant coefficients, both homogeneous and non-homogeneous, using methods such as variation of parameters and Cauchy-Legendre equations. They'll apply these techniques to diverse mathematical and scientific contexts.	**3,4**
IV	**Partial differentiation** Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange'smethod.	**10**	Understand partial differentiation, including homogeneous functions, Euler's theorem, total derivative, chain rule, Jacobian, and Taylor/MacLaurin series for functions of two variables. They'll apply these concepts to find extrema using Lagrange's method, enhancing problem-solving abilities in multivariable calculus.	**4**
V	**Multiple integrals** Double and Triple integrals – Change of order of integration in double integrals – Change of variables topolar, cylindrical and spherical coordinates..	**9**	Students will learn double and triple integrals, change of integration order in double integrals, and transformations to polar, cylindrical, and spherical coordinates. They'll apply these techniques to compute volumes and solve practical problems in diverse fields.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Introduction to Integral Calculus: Systematic Studies with Engineering Applications for Beginners, Ulrich L. Rohde, 2011.

REFERENCE BOOKS:

R5: Calculus. Gilbert Strang, 1991.

OTHER LEARNING RESOURCES:

1. **Wolfram Alpha** - Computational tool for exploring differential calculus concepts, performing calculations, and visualizing functions.
2. **Mathematical Association of America (MAA) -** Offers resources, journals, and articles related to calculus and mathematics education.
3. **MathWorld** - Online mathematics encyclopedia that provides detailed explanations and definitions related to differential calculus concepts.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the skills of partial derivatives with their applications.	1,2,3,4,5,10 and 12
2	Understand the skills of vector calculus	1,2,3,4,5,10 and 12
3	Analyse the application of integral calculus	1,2,3,4,5,10 and 12
4	Understand the concept of line integral, surface integral and volume integral.	1,2,3,4,5,10 and 12
5	Understand the concept of applications of multivariable calculus (Integration).	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS215R	**Mathematics III (Differential Calculus)**	CO 1	3	2	3	3	3					3		2
		CO 2	2	2	2	2	2					3		2
		CO 3	2	2	2	2	2					3		2
		CO 4	3	3	3	3	3					3		2
		CO 5	3	3	3	3	3					3		2

SEMESTER – III									
Course Title	**Techno Professional Skills II**								
Course code	**22BTCS216R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations To acquire advanced practical knowledge of programming code style. Gain advanced practical knowledge and expertise in programming code style, emphasizing clarity, efficiency, and maintainability in software development.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language,Structure of a 'C' Program, Executing and Debugging a 'C'Program, 'C' Tokens, Keywords and Identifiers, Operators, Constants, Variables, DataTypes, Precedence of Operators, Scope and Lifetime of Variables,Arithmetic Expressions, Evaluation of Expressions.	**8**	Understand the fundamentals of C programming, including language evolution, program structure, execution, debugging, tokens, keywords, identifiers, operators, data types, variable scope and lifetime, arithmetic expressions, and expression evaluation, enhancing their coding proficiency and problem-solving skills.	**1,2,3**
II	**Control Statements:** Decision Making using if statement, Types of if ...else block,Switch case	**8**	Master control statements (if, if-else, switch-case, GOTO) for decision-	**3,4**

	Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop,Do- while loop, jumpingin Loop, break and continue statement, Introduction to Arrays, Strings and Functions.		making, and looping structures (for, while, do-while) with break, continue, and jump statements. They'll understand arrays, strings, and functions, enhancing their ability to design structured and efficient C programs.	
III	**Arrays:** One Dimensional Arrays, Two-dimensional Arrays,Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-definedFunctions, passing in Functions.	**10**	Students will proficiently handle one-dimensional, two-dimensional, and multidimensional arrays, including dynamic arrays. They will implement string variables, utilize string handling functions effectively, and grasp the concepts of user-defined and system-defined functions, enhancing their ability to develop robust and modular C programs.	**3,4**
IV	**Pointers in C:** Pointers: Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing a Variable through its Pointer, Pointer Expressions, Pointer Increments and Scale Factor.	**10**	Understand pointers in C, including declaration, initialization, and accessing variables through pointers. They will manipulate pointer expressions, perform increments, and comprehend scale factors, enhancing their ability to manage memory efficiently and solve complex programming tasks.	**4**

V	**Structures:** Introduction, Defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures. **Unions:** Defining a Union,using a Union, Difference between Structure and Union. **File Management in C:** Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files.	**9**	Students will grasp structures in C: defining, declaring, accessing members, initializing, and using arrays of structures. They'll understand unions, differentiate them from structures, and manage file operations, including defining, opening, closing files, and handling input/output and errors effectively.	**4**
Practical Component				
Practical 1				
Practical 2				
Practical 10				

TEXT BOOKS:

T1: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

REFERENCE BOOKS:

R1: PradipDey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

R2: Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

R3: Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.

OTHER LEARNING RESOURCES:

1. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
2. Dr. GuruprasadNagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome

1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,10 and 12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,10 and 12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,10 and 12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,10 and 12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**COs**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22BTCS216R	**Techno Professional Skills II**	**CO 1**	2	1	1	1	1					3		2
		CO 2	2	1	3	1	1					3		2
		CO 3	2	3	1	1	1					3		2
		CO 4	2	2	2	2	2					3		2
		CO 5	2	2	2	2	2					3		2

<table>
<tr><th colspan="10">SEMESTER – III</th></tr>
<tr><td>Course Title</td><td colspan="9">BASIC LIFE SAVING SKILLS</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UULS212R</td><td rowspan="2">Total credits: 4
Total hours: 45T+30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td>Co-requisite</td><td colspan="7">NIL</td></tr>
<tr><td>Programme</td><td colspan="9">Bachelor of Technology in Computer Science & Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">3</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">Equip learners with essential knowledge and practical skills for handling emergency fire situations, including fire safety protocols, evacuation procedures, and fire prevention measures.
Teach learners to provide basic management and treatment for injuries resulting from fire emergencies, focusing on immediate first aid techniques, injury assessment, and stabilization.
Enhance learners' capability to respond effectively to fire-related injuries by emphasizing practical skills in first aid administration and emergency response protocols..</td></tr>
<tr><td>CO1</td><td colspan="9">Basic Life Support (BLS) is the specific skills and knowledge that individuals should acquire and demonstrate after completing a BLS training course. These outcomes are essential for anyone who may encounter a medical emergency and need to provide immediate assistance before professional medical help arrives.</td></tr>
<tr><td>CO2</td><td colspan="9">Soft skills encompass personal attributes and abilities enabling effective interpersonal interactions in personal and professional settings. They enhance communication, collaboration, and overall success in diverse aspects of life, emphasizing their significant value in achieving personal and professional goals</td></tr>
<tr><td>CO3</td><td colspan="9">Focuses on equipping healthcare professionals, first responders, and emergency care providers with the knowledge and skills to promptly recognize, assess, and effectively manage various types of traumatic injuries and emergencies. This training is critical for ensuring timely and appropriate care in emergencies, enhancing overall preparedness and response capabilities.</td></tr>
<tr><td>CO4</td><td colspan="9">The course aims to educate on the principles and purpose of the Triage system in healthcare, focusing on prioritizing patient care based on urgency. Learners will explore triage levels such as immediate, delayed, minimal, and expectant, understanding their significance in allocating resources and treatment. They will identify medical conditions and injuries needing immediate attention versus those manageable later. Emphasis is on accurate and timely patient assessment during triage to optimize outcomes in emergency settings.</td></tr>
<tr><td>CO5</td><td colspan="9">Learners will identify and distinguish common medical emergency conditions such as myocardial infarction (heart attack), stroke, diabetic emergencies (hypoglycemia and hyperglycemia), anaphylaxis, respiratory distress (including asthma exacerbation), seizures (epileptic and non-epileptic), and allergic reactions (including severe allergic reactions or anaphylactic shock)..</td></tr>
</table>

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Basic Life Support(BLS)** Introduction of BLS Chain of survival ABCs Assessment CPR and Ventilation Technique AED Choking for adult and children	**8**	Basic Life Support (BLS) teaches lifesaving skills, including the Chain of Survival, ABCs Assessment, CPR and ventilation techniques, AED usage, and choking management for adults and children.	**1,2,3**
II	**Soft skills** Introduction Communications Skills Situational Skills Team Work Other Soft Skills	**8**	Soft skills training enhances communication, situational awareness, and teamwork. Learning outcomes include improved communication skills, effective situational responses, and collaborative teamwork, along with other essential interpersonal skills.	**3,4**
III	Trauma emergencies ● Introduction ● Priorities of Initial approach inpre-hospital care a) Scene safety b) Primary assessment c) Bleeding control d) Helmet removal e) Care of amputated body part f) Extrication of victims and safe transfer g) Cervical spine stabilization h) Cervical collar application i) Splinting of broken Limbs	**10**	Trauma emergency training covers initial pre-hospital care priorities: scene safety, primary assessment, bleeding control, helmet removal, amputated body part care, victim extrication, cervical spine stabilization, collar application, and limb splinting.	**3,4**
IV	Triage system ● Introduction ● Flowchart approach of Triage ● Triage of Multiple Casualties in Pre-Hospital setting	**10**	Triage system training includes understanding the triage flowchart, managing multiple casualties in pre-hospital settings, and prioritizing single casualty	**4**

	● Triage of Single casualty		care, ensuring efficient and effective emergency response.	
V	Medical emergencies ● Introduction ● Victim centred approach in medical emergency ● Management of a)seizures b)heart attack c)asthma Diabetic emergencies d)emergency child birth e)stroke recovery position	**9**	Medical emergency training covers victim-centered care and management of seizures, heart attacks, asthma, diabetic emergencies, emergency childbirth, and stroke recovery positions, ensuring effective and compassionate emergency response.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: Nancy Caroline'S Emergency Care in the streets Seventh edition by Jones and Bartlett First Aid book by LC Gupta

REFERENCE BOOKS:

R1: Advance Cardio vascular life support and Basic life support provider manual @ American Heart Association (AHA)

OTHER LEARNING RESOURCES:

1. **Red Cross First Aid App**: Provides step-by-step instructions for responding to emergencies and locating nearby AEDs.
2. **PulsePoint**: Alerts CPR-trained individuals to nearby cardiac arrests and AED locations.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Basic Life Support (BLS) is the specific skills and knowledge that individuals should acquire and demonstrate after completing a BLS training course. These outcomes are essential for anyone who may encounter a medical emergency and need to provide immediate assistance before professional medical help arrives	1,2,3,4,5,9,11 and 12
2	Soft skills encompass personal attributes and abilities enabling effective interpersonal interactions in personal and professional settings. They enhance communication, collaboration, and overall success in diverse aspects of life, emphasizing their significant value in achieving personal and professional goals.	1,2,3,4,5,9,11 and 12
3	Focuses on equipping healthcare professionals, first responders, and emergency care providers with the knowledge and skills to promptly recognize, assess, and effectively manage various types of traumatic injuries and emergencies. This training is critical for ensuring timely and appropriate care in emergencies, enhancing overall preparedness and response capabilities.	1,2,3,4,5,9,11 and 12
4	The course aims to educate on the principles and purpose of the Triage system in healthcare, focusing on prioritizing patient care based on urgency. Learners will explore triage levels such as immediate, delayed, minimal, and expectant, understanding their significance in allocating resources and treatment. They will identify medical conditions and injuries needing immediate attention versus those manageable later. Emphasis is on accurate and timely patient assessment during triage to optimize outcomes in emergency settings.	1,2,3,4,5,9,11 and 12
5	Learners will identify and distinguish common medical emergency conditions such as myocardial infarction (heart attack), stroke, diabetic emergencies (hypoglycemia and hyperglycemia), anaphylaxis, respiratory distress (including asthma exacerbation), seizures (epileptic and non-epileptic), and allergic reactions (including severe allergic reactions or anaphylactic shock)..	1,2,3,4,5,9,11 and 12

MAPPING TABLE

Course code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UULS212R	BASIC LIFE SAVING SKILLS	CO 1	2	2	3	2	2				3		3	3
		CO 2	3	2	3	2	2				2		3	3
		CO 3	3	2	3	3	3				3		3	2
		CO 4	3	2	3	1	3				2		3	2
		CO 5	3	2	3	3	3				2		2	2

SEMESTER – III									
Course Title	**PERSONAL FINANCIAL PLANNING**								
Course code	22UUFL213R	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	Introduction to Financial Budgeting And Planning	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	1. The course would offer an inclusive approach to understand the relevant concepts of money, borrowing, lending, taxes and their application to financial planning. 2. Assess the personal financial planning process, the life cycle of financial plans, and methods of goal achievement. 3. Formulate a budget, record-keeping system, and tax planning strategy based on current financial goals.								
CO1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.								
CO2	Design a diversified investment portfolio that addresses several different investment objectives.								
CO3	Differentiate between open and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.								
CO4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.								
CO5	Apply financial knowledge and skills to make informed decisions, ensuring long-term financial stability and security.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Fundamentals of Financial Planning - i. Functions of money; ii. Inflation- Meaning, causes, how it can be controlled; iii.process official planning, iv. Time value of money-simple and	**8**	Fundamentals of Financial Planning covers understanding money's functions, inflation causes and control, financial planning processes, time value of money including simple and compound interest, Net Present Value (NPV) and Future Value (FV), compounding	**1,2,3**

	compound interest; v.Net Present Value and Future value, vi. Power of Compounding; vii. Doubling period and Rule of 72.		power, doubling periods, and the Rule of 72 for effective financial decision-making.	
II	Income Tax Planning- i. Meaning of Income, ii. Direct & Indirect Taxes, Taxable Income, various heads of Income for tax Calculation, iii. Non-taxable Income, iv. Tax evasion and tax avoidance, v.GST, Tax Planning Strategies.	**8**	Learning Outcome: Gain proficiency in understanding income, taxes (direct, indirect), taxable and non-taxable income, tax evasion, avoidance, GST, and effective tax planning strategies.	**3,4**
III	Entrepreneurial planning - i. Meaning of Entrepreneurship, prerequisites for becoming an entrepreneur, ii. Entrepreneurship Support Systems in India, iii. Institutional support systems for entrepreneurs, iv. Financial support systems for entrepreneurs; v. Venture Capital, Business Angels, vi. Assistant of Government, vii. Commercial Bank Loans and Overdraft.	**10**	Understand entrepreneurship fundamentals, support systems in India, institutional and financial support mechanisms (venture capital, business angels, government assistance, commercial bank loans), enabling effective entrepreneurial planning and implementation.	**3,4**
IV	Planning for investing in securities market - i. Investment avenues offered by Securities Markets.. Primary Market and Secondary Market, ii . Stock market- meaning, features, functions of NSE, BSE DEMAT trading account,	**10**	Gain knowledge of investment avenues in securities markets, primary and secondary markets, stock market functions (NSE, BSE), DEMAT trading, security repositories, stock brokers, operational aspects (order placement, contract notes,	**4**

	iii. Security repository, stock brokers. Operational aspects of securities markets: placement of orders, contract note, pay-in and pay-out, trading and settlement cycle, iv. Various risks involved in investing in securities markets; Role of Financial Intermediaries; Stock indices. v. Mutual Funds- meaning concept, definition, types, importance and drawbacks of mutual funds, mutual funds in India, investing in mutual funds, vi. Systematic Investment Plan (SIP) and its advantages.		trading cycles), risks, financial intermediaries, stock indices, mutual funds (types, importance, drawbacks, investing in India), and advantages of Systematic Investment Plans (SIPs).	
V	Planning for debts and Retirement i. Consumer credit Introduction to consumer credit; choosing a source of credit, the cost of credit alternatives, ii. Consumer Legal Protection; iii. Housing Decision: Factors and Finance: Vehicle Decisions. iv. Retirement planning Meaning of cost of living; retirement need analysis; development of retirement plan, various retirement schemes. v. Estate Planning; Pension and Medicare Planning; Wills.	**9**	Develop skills in consumer credit management, including choosing credit sources and evaluating costs. Understand consumer legal protections and factors influencing housing and vehicle decisions. Master retirement planning, including cost-of-living considerations, retirement needs analysis, retirement scheme evaluation, estate planning, pension, Medicare planning, and wills.	**4**
Practical Component				
Practical 1				
Practical 2				
Practical 10				

TEXT BOOKS:

T1: Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems &The Million- Dollar Financial Advisor: Powerful Lessons and Proven Strategies from Top Producers by David J. Mullen Jr

T2: Personal Finance and Planning by Dr. Rajni

T3: Peaceful Personal Finance: A Short Read on the Basics of Personal Finance and Planning Kindle Edition by Hema Singh

REFERENCE BOOKS:

R1: Be Your Own Financial Advisor: Financial Planning, Investment Options, Risk Management, Tax Management, Succession Planning Kindle Edition y Sushil Bali

R2: The Dumb Things Smart People Do with Their Money: Thirteen Ways to Right Your Financial Wrongs Kindle Edition y Jill Schlesinger

OTHER LEARNING RESOURCES:

1. **Financial Planning Association (FPA)**:Offers resources, workshops, and events for financial planners and individuals seeking financial advice.
2. **Local Community Resources**: Check local libraries, community centers, and universities for workshops or seminars on personal financial planning.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.	1,2,4,5,11 and 12
2	Design a diversified investment portfolio that addresses several different investment objectives.	1,2,4,5,11 and 12
3	Differentiate between open and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.	1,2,4,5,11 and 12
4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.	1,2,4,5,11 and 12
5	Apply financial knowledge and skills to make informed decisions, ensuring long-term financial stability and security.	1,2,4,5,11 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
22UUFL202R	PERSONAL FINANCIAL PLANNING	CO 1	1	2		3	3						3	3
		CO 2	1	2		3	3						3	3
		CO 3	1	3		2	3						3	3
		CO 4	1	2		3	3						3	3
		CO 5												

SEMESTER – III									
Course Title	**ENGLISH FOR EMPLOYABILITY FOR ENGINEERS**								
Course code	**22UBPD214R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	To introduce the types of sentences and their significance. To strengthen the vocabulary of the students to enhance student' vocabulary to enhance their speaking and writing skills it the importance of dress codes in various organizations. To overcome fear of Public Speaking To understand the process of Effective Reading techniques and Listening skills.								
CO1	Create effective written communication for professional scenarios, incorporating engineering terminology and conventions.								
CO2	Demonstrate proficient verbal communication skills, applying engineering vocabulary and technical language appropriately.								
CO3	Evaluate and apply effective teamwork strategies in engineering contexts, fostering collaboration and innovation.								
CO4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.								
CO5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence**.**								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Module 1: Reading Skills** Exercise 1: Interpreting different texts Exercise 2: Importance and significance of Punctuation Exercise 3: Story -reading Exercise 4: News-reading Exercise 5: Comprehending texts of different genres	**8**	Reading Skills enhances abilities to interpret various texts, understand punctuation significance, read stories and news, and comprehend different genres, fostering improved reading comprehension and analysis.	**1,2,3**
II	**Unit 2: Non-Verbal Communication** **i.** Understanding Non-Verbal Communication & Body Language Types of Body Language ii. Importance and Impact of Body Language &Introduction to Haptics,	**8**	Non-Verbal Communication teaches understanding and interpreting body language, the importance and impact of non-verbal cues, and introduces haptics, kinesics, and proxemics for effective	**3,4**

	Kinesics and Proxemics		interpersonal communication.	
III	**Unit 3: Grammar (Flipped Classroom)** i. Types of Sentences (using Assertive, Imperative, exclamatory in respective contexts), ii. Degrees of Comparison	**10**	Grammar (Flipped Classroom) covers using assertive, imperative, and exclamatory sentences in context, and understanding degrees of comparison, enhancing grammatical accuracy and contextual sentence construction.	**3,4**
IV	**Unit 4: Public Speaking Skills** i. Introduction to public speaking Preparation for Public speaking (scripts, non-verbal cues) ii. Understanding and overcoming Fear of Public Speaking Tips Public Speaking	**10**	Public Speaking Skills focuses on preparing and delivering speeches, utilizing non-verbal cues, overcoming fear of public speaking, and applying effective tips for confident and engaging public presentations.	**4**
V	**Module 5: Listening Skills** i. Process of listening ii. Understanding listening barriers iii. Difference between Listening and Hearing, iv. Importance of Effective Listening Practice Session: Listening to podcasts, Lectures, Audio Books etc.	**9**	Listening Skills explores the listening process, identifies barriers, distinguishes between listening and hearing, underscores the importance of effective listening, and includes practical sessions with podcasts, lectures, and audio books to enhance listening proficiency.	**4**

TEXT BOOKS:

T1: Wren, P.C and Martin, H. 1995. High School English Grammar and Composition, S Chand Publishing.

T2: Barrett, Grant. 2016. Perfect English Grammar: The indispensable Guide to Excellent Writing and Speaking, Zephyros Press

REFERENCE BOOKS:

R1: Mccarthy. (2008) English Vocabulary in Use Upper - Intermediate with CD ROM, Cambridge University Press

R2: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

OTHER LEARNING RESOURCES:

1. https://www.youtube.com/watch?v=rl85jxktfms
2. https://www.slideshare.net/JavedIqbal15/presentation-on-vocabulary-building-14522369

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Create effective written communication for professional scenarios, incorporating engineering terminology and conventions.	1,2,3,4,5,10 and 12
2	Demonstrate proficient verbal communication skills, applying engineering vocabulary and technical language appropriately.	1,2,3,4,5,10 and 12
3	Evaluate and apply effective teamwork strategies in engineering contexts, fostering collaboration and innovation.	1,2,3,4,5,10 and 12
4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.	1,2,3,4,5,10 and 12
5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence**.**	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**	**Cos**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
22UBPD214R	**ENGLISH FOR EMPLOYABILITY FOR ENGINEERS**	CO 1	1	1	1	1	1					3		2
		CO 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – III									
Course Title	**MOOCS II: HTML**								
Course code	**2MOCECS217R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Understand HTML syntax and structure. Create semantically meaningful web pages. Incorporate multimedia (images, audio, video). Implement forms for user data collection, applying accessibility and responsiveness best practices for well-rounded HTML design skills.								
CO1	Students will understand the basic syntax and structure of HTML								
CO2	To create well-structured and semantically meaningful web pages using HTML tags.								
CO3	To explore how to incorporate multimedia elements such as images, audio, and video into web pages.								
CO4	They will learn to implement forms and input elements to collect user data.								
CO5	They will be able to apply best practices for accessibility and responsiveness in HTML design.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to HTML: Overview of the World Wide Web and HTML, basic structure of an HTML document, understanding HTML tags and elements, creating headings, paragraphs, and line breaks, working with text formatting and styling	**8**	Understanding the World Wide Web and HTML, structuring HTML documents, using tags for headings, paragraphs, and line breaks, applying text formatting and styling, ensuring foundational skills in web content creation.	**1,2,3**
II	HTML Elements and Attributes: Semantic HTML elements, text-level semantic elements , understanding attributes and their usage, linking web pages with anchor tags , including images and multimedia content	**8**	Module focuses on using semantic and text-level elements effectively, mastering attributes for enhanced functionality, linking pages with anchor tags, and incorporating images and multimedia, ensuring comprehensive skills in web content	**3,4**

			creation.	
III	Forms with HTML: Introduction to HTML forms and their importance, Form structure using <form> tag, Input types for text, email, password, etc. , using radio buttons, checkboxes, and select lists, implementing form validation with HTML attributes	**10**	Forms with HTML teaches the importance and structure of HTML forms, utilizing <form> tag for form creation, incorporating input types like text, email, password, radio buttons, checkboxes, and select lists, and implementing form validation through HTML attributes, ensuring proficient form development skills.	**3,4**
IV	HTML5 Features and Advanced Techniques: Introduction to HTML5 and its new features ,semantic elements in HTML5 , incorporating geolocation and local storage, utilizing canvas for graphics and animations, working with responsive design and media queries	**10**	HTML5 Features and Advanced Techniques introduces HTML5's new features including semantic elements, geo location, local storage, canvas for graphics/animations, and responsive design with media queries, ensuring proficiency in modern web development practices and enhanced user experience.	**4**
V	Accessibility and Best Practices : Importance of web accessibility , semantic markup for improved accessibility, implementing ARIA roles and attributes, testing and validating HTML code, applying best practices for cross-browser compatibility and performance optimization	**9**	Accessibility and Best Practices module emphasizes the importance of web accessibility, using semantic markup for improved accessibility, implementing ARIA roles and attributes, testing and validating HTML code for compliance, and applying best practices for cross-browser compatibility and performance optimization, ensuring inclusive and efficient web development skills.	**4**
Practical Component				
Practical 1				

TEXT BOOKS:

T1: **"HTML and CSS: Design and Build Websites" by Jon Duckett**:

- Beginner-friendly book with visual examples and clear explanations of HTML and CSS concepts.

T2: **"Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins**:

- Comprehensive guide covering HTML basics and beyond, suitable for beginners.

REFERENCE BOOKS:
R1: "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
R2: "HTML5: Up and Running" by Mark Pilgrim

OTHER LEARNING RESOURCES:

1. **YouTube Tutorials**:

   Channels like Traversy Media, The Net Ninja, and Academind offer video tutorials on HTML for visual learners.

2. **HTML Cheat Sheets and Reference Cards**:

   Download and use cheat sheets for quick reference to HTML tags and attributes.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Students will understand the basic syntax and structure of HTML	1,2,3,4,5,10 and 12
2	To create well-structured and semantically meaningful web pages using HTML tags.	1,2,3,4,5,10 and 12
3	To explore how to incorporate multimedia elements such as images, audio, and video into web pages.	1,2,3,4,5,10 and 12
4	They will learn to implement forms and input elements to	1,2,3,4,5,10 and 12

	collect user data.	
5	They will be able to apply best practices for accessibility and responsiveness in HTML design.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
2MOCECS217R	MOOCS II: HTML	CO 1	2	2	2	2	3					2		2
		CO 2	2	3	3	2	3					2		2
		CO 3	2	2	2	2	3					2		2
		CO 4	2	2	2	3	3					2		2
		CO 5	3	3	3	3	3					2		2

SEMESTER – III									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Actively engage in diverse club activities (dance, music, photography, drama, literacy) to foster personal development. Participate enthusiastically in workshops and competitions, enhancing practical skills and competitive spirit. Develop proficiency to represent ADTU effectively in inter-university and national competitions, showcasing leadership and teamwork. Gain insights and skills from industry experts through workshops, enhancing professional competence and career readiness.								
CO1	Engage actively in diverse club activities such as dance, music, photography, drama, and literacy, fostering personal interests and skills development.								
CO2	Participate enthusiastically in workshops and competitions aligned with individual hobbies and interests, enhancing practical learning and competitive spirit.								
CO3	Gain proficiency to represent ADTU effectively in inter-university, state, and national level competitions, demonstrating leadership and teamwork.								
CO4	Benefit from workshops conducted by industry experts, gaining valuable insights and skills applicable to their respective fields of interest.								
CO5	Experience a 360-degree learning approach that integrates academic growth with holistic development, nurturing well-rounded personalities capable of thriving in various professional and social contexts.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended tomeet learner's interest, These activities are aimed to develop the social and soft skills and promote aholisticdevelopmentofthelearners,Keeping in mind the 360 degree learning methodology the studentsare engaged in different activities headed under different clubs viz. Dance, music, photography, drama,literary etc.,The students are encouraged to participate inregular club activities, workshops, competitions as per	**10**	Students at AdtU develop social and soft skills through diverse club activities like dance, music, photography, and drama. They participate in workshops, competitions, and expert-led sessions, preparing them for inter-university and	**4,5**

	their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		national level events.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Engage actively in diverse club activities such as dance, music, photography, drama, and literacy, fostering personal interests and skills development.	1,2,3,4,5,6,10 and 12
2	Participate enthusiastically in workshops and competitions aligned with individual hobbies and interests, enhancing practical learning and competitive spirit.	1,2,3,4,5,6,10 and 12
3	Gain proficiency to represent ADTU effectively in inter-university, state, and national level competitions, demonstrating leadership and teamwork.	1,2,3,4,5,6,10 and 12
4	Benefit from workshops conducted by industry experts, gaining valuable insights and skills applicable to their respective fields of interest.	1,2,3,4,5,6,10 and 12
5	Experience a 360-degree learning approach that integrates academic growth with holistic development, nurturing well-rounded personalities capable of thriving in various professional and social contexts.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	**Course Name**	**Cos**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22UBCC211	**CO-CURRICULAR ACTIVITIES**	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2

		CO 5	1	1	1	1	2	1				1		3

SEMESTER – III									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC211**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T+30P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**3**								
Course Objectives (Minimum 3)	Develop effective planning skills to contribute meaningfully, maintain commitment, and manage time and priorities. Cultivate leadership qualities and passion for diverse interests beyond academics. Engage in co-curricular activities for holistic personality development. Demonstrate clear expression, in-depth evaluation, and analytical skills in chosen topics, integrating transferable learning experiences.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are	**10**	AdtU fosters holistic development through extracurricular activities like dance, music, photography, and more. Students engage in club activities, workshops, and competitions, enhancing social skills and learning from industry experts, preparing them for national-level competitions.	**4,5**

	encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			
Practical Component				

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10 and 12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10 and 12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10 and 12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10 and 12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	Course Name	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12
22UBEC211	EXTRA CURRICULAR ACTIVITIES	CO 1	2	2	2	1	2	2				2		2
		CO 2	2	2	2	1	2	3				2		2
		CO 3	1	1	2	1	2	2				3		3
		CO 4	2	2	2	1	2	2				2		2
		CO 5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**Computer Organization & Architecture**								
Course code	**22BTCS221R**	**Total credits: 3** **Total hours: 42T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3
Pre-requisite	**Programming For Problem Solving**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Discuss the organization and architecture of computer systems and electronic computers. 2. Analyze the basic components of computer systems besides the computer arithmetic. 3. Discuss input-output organization, memory organization and management, and pipelining.								
CO1	Understand the interaction of the components of a computer system with the instruction set architecture of a CPU and addressing modes.								
CO2	Analyse the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers.								
CO3	Analyse the control unit design approaches, memory design technologies and I/O transfers.								
CO4	Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory. .								
CO5	Summarize the concepts of memory organization with mapping functions and replacement algorithms.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.	**8**	Understanding the key functional blocks of a computer, including CPU, memory, input/output devices, and their interrelationships and operations	1,2, 3
II	**Data representation:** signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	**8**	Understand how computers represent data using binary, hexadecimal, and ASCII systems. Learn conversion methods between these formats and comprehend their significance in computer operations and programming.	3, 4

	Introduction to x86 architecture..			
III	**CPU control unit design:** hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB	**10**	Understand the architecture and function of the CPU control unit, including instruction decoding, control signal generation, and execution sequencing. Learn to design control units using both hardwired and microprogrammed approaches, and comprehend their role in overall CPU performance.	3, 4
IV	**Pipelining**: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	**8**	Understand the concept and implementation of pipelining in CPU architecture to improve instruction throughput. Learn about various stages of pipeline execution, potential hazards (data, control, structural), and techniques for hazard mitigation. Gain insight into the impact of pipelining on overall system performance and efficiency.	4
V	**Memory organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	**8**	Understand the structure and organization of computer memory, including hierarchical levels (cache, primary, secondary storage), memory addressing, and data access methods. Learn about memory management techniques, such as paging and segmentation, and comprehend their impact	4

			on system performance and resource allocation.	

TEXT BOOKS:

T1:"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

REFERENCE BOOKS:

R1: "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

R2: "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.

R3: "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the interaction of the components of a computer system with the instruction set architecture of a CPU and addressing modes.	1, 2, 3, 10, 12
2	Analyse the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers.	1, 2, 3, 4, 5, 10, 12
3	Analyse the control unit design approaches, memory design technologies and I/O transfers.	1, 2, 3, 10, 12
4	Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory.	1, 2, 3, 4, 10, 12
5	Summarize the concepts of memory organization with mapping functions and replacement algorithms.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
22BTCS221R	Computer Organization & Architecture	CO 1	2	3	1							1		3
		CO 2	3	3	3	2	2					1		3
		CO 3	2	2	2							1		3
		CO 4	2	2	3	2						1		3
		CO 5	2	2	2	2	1					1		3

SEMESTER – IV									
Course Title	**Operating Systems**								
Course code	**22BTCS222R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 42T+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	4. To learn the mechanisms of OS to handle processes and threads and their communication and the mechanisms involved in memory management in contemporary OS. 5. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 6. To know the components and management aspects of concurrency management.								
CO1	Analyze operating system evolution, types, services, and structures including UNIX and WINDOWS.								
CO2	Analyze process concepts, relationships, and states, examine thread advantages, and appraise CPU scheduling objectives, algorithms, and criteria. .								
CO3	Evaluate IPC mechanisms and solutions for classical problems; assess deadlock conditions and use prevention, avoidance, detection, and recovery techniques.								
CO4	Evaluate memory management concepts, including mapping, allocation strategies, paging, virtual memory principles, and analyse page fault/replacement algorithms.								
CO5	Analyze I/O hardware, device controllers, DMA principles, and I/O software, secondary-storage structures, disk scheduling algorithms, file management concepts, allocation methods, and directory implementations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.	7	Understand the fundamental concepts and evolution of operating systems, different OS types, services, and system calls. Learn the structural models of operating systems—layered, monolithic, microkernel—and grasp the concept and benefits of virtual machines.	2
II	Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context	8	Understand processes, their relationships, states, state transitions, and the Process Control Block (PCB). Learn about	2, 4

	switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling.		threads, their states, benefits, and types, including multithreading. Grasp process scheduling foundations, objectives, types of schedulers, scheduling criteria, and algorithms like FCFS, SJF, RR, including pre-emptive and non-pre-emptive methods, and multiprocessor scheduling.	
III	Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker‘s algorithm, Deadlock detection and Recovery.	8	Understand inter-process communication, focusing on critical sections, race conditions, and mutual exclusion, including hardware solutions. Learn about deadlocks, including their definition, necessary and sufficient conditions, prevention, avoidance using the Banker's algorithm, and methods for detection and recovery. Gain insight into ensuring robust and efficient process synchronization.	2, 4
IV	Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	8	Understand memory management concepts, including logical and physical address mapping, contiguous memory allocation with fixed and variable partitions, internal and external fragmentation, and compaction. Learn about paging, virtual memory basics, control structures, locality of reference, demand paging, and page replacement algorithms like Optimal, FIFO, SC,	2, 4, 5

			NRU, and LRU for efficient memory utilization and management.	
V	I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure.. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management. Disk Management: Disk structure, Disk scheduling, Disk reliability, Disk formatting, Boot-block, Bad blocks.	8	Gain understanding of I/O hardware, including devices, controllers, and principles of direct memory access (DMA). Explore I/O software goals, including interrupt handlers, device drivers, and device-independent I/O software. Learn file management concepts, access methods, types, operations, directory and file system structures, allocation methods, and free-space management. Understand disk management encompassing structure, scheduling, reliability, formatting, boot-block, and handling bad blocks for efficient storage and retrieval operations.	2, 4, 5
Practical	**1. Write Shell Script for followings** a. To find the global complete path for any file. b. To broadcast a message to a specified user or a group of users logged on any terminal. c. To copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the directories. d. To compare identically named files in two different directories and if they are same, copy one of them in a third directory e. To delete zero sized files from a given directory (and all its sub-directories). f. To display the name of those files (in the given directory) which are having multiple links.	**20**	Upon completion of these shell scripting tasks, learners will gain proficiency in file path retrieval, user message broadcasting, selective file copying based on timestamp, file comparison and copying, zero-sized file deletion, identifying files with multiple links, listing executable files, displaying formatted date/time with a greeting, and sorting directories by file size in descending order.	1,2,3,4

	g. To display the name of all executable files in the given directory. h. Write a script to display the date, time and a welcome message (like Good Morning etc.). The time should be displayed with "a.m." or "p.m." and not in 24 hours notation. i. Write a script to display the directory in the descending order of the size of each file			
	2. Implementation of FCFS (First Come First Serve) CPU Scheduling. 3. Implementation of SJF (Shortest Job First) CPU Scheduling. 4. Implementation of Round Robin (RR) CPU Scheduling. 5. Implementation of Priority CPU Scheduling Algorithm.	**20**	Upon implementing FCFS, SJF, Round Robin, and Priority CPU scheduling algorithms, learners will achieve proficiency in understanding and simulating these fundamental scheduling techniques, gaining insight into their respective advantages, limitations, and practical applications in optimizing CPU resource allocation and system performance.	2,3,4, 5
	6. Implementation of FIFO Replacement Algorithm. 7. Implementation of Optimal Page Replacement Algorithm. 8. Implementation of LRU Page Replacement Algorithm by Stack method 9. Implement the producer-consumer problem using threads	**20**	Through implementing FIFO, Optimal, and LRU page replacement algorithms, as well as the producer-consumer problem using threads, learners will develop a deep understanding of memory management strategies, gaining practical experience in simulating and evaluating these techniques to optimize resource allocation, enhance system performance, and mitigate concurrency issues in computer systems.	2,3,4,5,6

TEXT BOOKS:

T1: Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

T2: Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

REFERENCE BOOKS:

R1: Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.

R2: Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley

R3: Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

R4: Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze operating system evolution, types, services, and structures including UNIX and WINDOWS	1, 2,3, 4, 5, 10, 12
2	Analyze process concepts, relationships, and states, examine thread advantages, and appraise CPU scheduling objectives, algorithms, and criteria.	1, 2,3, 4, 5, 10, 12
3	Evaluate IPC mechanisms and solutions for classical problems; assess deadlock conditions and use prevention, avoidance, detection, and recovery techniques.	1, 2,3, 4, 5, 10, 12
4	Evaluate memory management concepts, including mapping, allocation strategies, paging, virtual memory principles, and analyse page fault/replacement algorithms.	1, 2,3, 4, 5, 10, 12
5	Analyze I/O hardware, device controllers, DMA principles, and I/O software, secondary-storage structures, disk scheduling algorithms, file management concepts, allocation methods, and directory implementations.	1, 2,3, 4, 5, 10, 12

MAPPING TABLE

Course code	**Course Name**	**CO**	**PO1***	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
22BTCS222R	**Operating Systems**	CO1	3	2	2	3	2					3		2
		CO2	3	2	2	2	2					2		1
		CO3	3	3	3	3	2					3		1
		CO4	2	2	3	2	3					2		2
		CO5	2	2	2	3	2					3		1

SEMESTER – IV									
Course Title	**Design & Analysis of Algorithms**								
Course code	**22BTCS223R**	**Total credits: 3 Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Data Structures**	**Co-requisite**	**C / C++ Programming**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Analyze the asymptotic performance of algorithms. 2. Demonstrate a familiarity with major algorithms and data structures. 3. Apply important algorithmic design paradigms and methods of analysis.								
CO1	Analyze algorithms, apply asymptotic notations, solve mathematical analyses, showing proficiency in problem-solving.								
CO2	Apply sorting and searching algorithms, matrix multiplication, using brute force and divide-and-conquer strategies.								
CO3	Apply greedy approaches and dynamic programming to optimize problems, showcasing expertise in algorithmic design.								
CO4	Apply strategies to solve problems like the N-Queen, knapsack, and traveling salesperson problems.								
CO5	Evaluate decision tree lower bounds, grasp P, NP, and NP-Complete complexity classes, showing understanding of lower bound theory's algorithmic implications..								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	**Introduction:** Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.		10	Upon completing this study, learners will understand algorithm characteristics, analyze complexity using best, average, and worst-case scenarios, measure algorithmic performance considering time and space trade-offs, and effectively analyze recursive algorithms using methods like substitution, recursion tree, and the Master's theorem for efficiency evaluation.					1,2, 3
II	**Fundamental Algorithmic Strategies:**Brute-Force, Greedy, Dynamic		8	Upon completion, learners will proficiently apply fundamental					3, 4

	Programming		algorithmic strategies—Brute-Force, Greedy, and Dynamic Programming—to solve computational problems efficiently and optimally.	
III	**Advanced Algorithmic Strategies:** Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.	10	Upon completion, learners will master advanced algorithmic strategies such as Branch and Bound, Backtracking, and heuristics, applying them to solve complex computational problems like Bin Packing, Knapsack, and Traveling Salesman Problem (TSP), enhancing problem-solving skills across diverse application domains.	3, 4,
IV	**Graph and Tree Algorithms**: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.	10	Upon mastering graph and tree algorithms including DFS, BFS, shortest path, transitive closure, MST, topological sorting, and network flow algorithms, learners will effectively analyze and solve problems using graph structures, enhancing their proficiency in algorithm design and application across diverse computational domains.	3, 4
V	**Tractable and Intractable Problems:** Computability of Algorithms, Computability classes – P,NP, and NPhard, Approximation algorithms, Randomized algorithms	7	Upon completion, learners will understand the fundamental concepts of computability in algorithms, distinguish between tractable (P) and intractable (NP,	4

			NP-complete, NP-hard) problems, comprehend Cook's theorem, identify standard NP-complete problems, and apply reduction techniques to solve complex computational challenges effectively.	

TEXT BOOKS:

T1:Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.

T2: Fundamentals of Algorithms – E. Horowitz et al.

REFERENCE BOOKS:

R1: Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.

R2: Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.

R3: Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze algorithms, apply asymptotic notations, solve mathematical analyses, showing proficiency in problem-solving.	1, 2, 3, 4, 11, 12
2	Apply sorting and searching algorithms, matrix multiplication, using brute force and divide-and-conquer strategies.	1, 2, 3, 4, 11, 12
3	Apply greedy approaches and dynamic programming to optimize problems, showcasing expertise in algorithmic design.	1, 2, 3, 4, 9, 10, 11, 12
4	Apply strategies to solve problems like the N-Queen, knapsack, and traveling salesperson problems.	1, 2, 3, 4, 9, 10, 11, 12
5	Evaluate decision tree lower bounds, grasp P, NP, and NP-Complete complexity classes, showing understanding of lower bound theory's algorithmic implications.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS223R	Design & Analysis of Algorithms	CO1	2	2	2	2							3	2
		CO2	2	2	2	2							2	2
		CO3	2	2	3	3					1	1	2	2
		CO4	2	3	2	2					1	1	2	2
		CO5	1	2	1	2	2				1	1	1	2

SEMESTER – IV									
Course Title	**Discrete Mathematics**								
Course code	**22BTCS224R**	**Total credits: 4 Total hours: 52T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Programming For Problem Solving**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. To provide students with an overview of discrete mathematics. 2. Students will learn about topics such as logic and proofs, sets and functions. 3. Students will also learn probability, recursion, graph theory, matrices, Boolean algebra and other important discrete math concepts.								
CO1	Understand the concepts of relation, function and partially ordered set.								
CO2	Enable to solve logical problems using truth table.								
CO3	Understand the concept of algebraic structures and it's relevant theorems.								
CO4	Understand the basic counting techniques.. .								
CO5	Understand the concepts of graphs and their basic properties.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	***Sets, relations and functions*:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	**12**	Upon completion, learners will understand and manipulate sets through basic operations and Cartesian products, comprehend various types of relations including compositions and inverses, and analyze different functions with their compositions and inverses. They will also grasp the concepts of complete partial ordering, lattices (chain, complete, distributive, modular, complemented), Boolean and pseudo-Boolean lattices.	1,2, 3
II	**Propositional Logic:** Syntax and semantics, proof systems, satisfiability, validity,	**10**	Upon completion, learners will grasp the syntax and semantics of propositional	2, 3, 4

	soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.		logic, proficiency in proof systems, evaluation of satisfiability and validity, understanding of soundness and completeness, application of the deduction theorem, and introduction to first-order logic and its theory.	
III	**Algebraic Structures:** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	**12**	Upon completion, learners will understand algebraic structures like semigroups, monoids, groups, rings, integral domains, fields, and Boolean algebra, with applications in coding theory and quotient structures.	2, 3, 4
IV	**Introduction to Counting:** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	**10**	Upon completion, learners will proficiently apply basic counting techniques, including inclusion-exclusion, pigeonhole principle, permutation, combination, summations, and understand introductory concepts of recurrence relations and generating functions.	1, 2, 3
V	**Introduction to Graphs:** Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	**8**	Upon completion, learners will understand fundamental graph theory concepts such as degrees, paths, cycles, subgraphs, isomorphism, Eulerian and Hamiltonian paths, and trees.	2, 3, 4

TEXT BOOKS:

T1:C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
T2:K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

R1: R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concepts of relation, function and partially ordered set	1, 2, 3, 4, 12
2	Enable to solve logical problems using truth table.	1, 2, 3, 4, 12
3	Understand the concept of algebraic structures and it's relevant theorems.	1, 2, 3, 4, 12
4	Understand the basic counting techniques.	1, 2, 3, 4, 12
5	Understand the concepts of graphs and their basic properties.	1, 2, 3, 4, 12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS224R	Discrete Mathematics	CO1	3	3	2	2								2
		CO2	3	2	3	2								2
		CO3	3	3	2	2								2
		CO4	3	2	3	2								2
		CO5	3	3	2	2								2

SEMESTER – IV									
Course Title	**Environmental Science**								
Course code	**22BTCS226R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 52T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite		**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Understanding Ecological Systems and Processes 2. Analyzing Environmental Issues and Solutions 3. Promoting Environmental Stewardship and Sustainable Practices.								
CO1	Understand the relationships between natural and man-made systems.								
CO2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development								
CO3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.								
CO4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment .								
CO5	Analyse various aspects of human population, and the impact of the population growth on the environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Environment:** Definition and scope, components of environment, atmosphere, hydrosphere, lithosphere and biosphere, structure and composition, Life systems, pro and eukaryotic organizations, Metabolic principles; types of plants and animals. Producers, consumers and decomposers.	**12**	Upon completion, learners will understand the fundamental concepts of the environment, encompassing its scope, components (atmosphere, hydrosphere, lithosphere, biosphere), life systems (prokaryotic and eukaryotic), metabolic principles, plant and animal classifications, and ecological roles of producers, consumers, and decomposers in ecosystems.	1,2, 3
II	**Ecology:** Terminology and approach, ecosystem, types of ecosystems; structure and function, mineral cycling, energy flow and trophic chains. Development and evolution.	**10**	. Upon completion, learners will grasp ecological concepts including terminology, ecosystem types, structure, function, mineral cycling, energy flow, trophic chains, and understand ecosystem	2, 3, 4

			development and evolution, enabling them to analyze and interpret ecological systems and their dynamics effectively.	
III	**Environmental Pollution**: Sources, causes, assessment, effect, prevention and control of water pollution, air pollution noise and land pollution. Strategies of management, concept of sustainability. Energy, e n v i r o n m e n t , and their relationship with human activities. Water Resources and utilization, forest resources.	**12**	Upon completion, learners will comprehend the sources, causes, assessment, effects, prevention, and control of water, air, noise, and land pollution. They will understand management strategies, sustainability concepts, and the interrelationship between energy, environment, and human activities, including the utilization of water and forest resources.	2, 3, 4
IV	**Global Environmental Problems:** Human health, settlements, management of rivers, lakes, forests, wild life and catchments. Role of society, NGO and Govt. agencies. Concept of urbanization and green cities Global Warming, greenhouse causes and effects, carbon Sequestration**.**	**10**	Upon completion, learners will understand global environmental issues including human health impacts, sustainable settlement management, conservation of rivers, lakes, forests, and wildlife. They will grasp the roles of society, NGOs, and government agencies in environmental stewardship, and comprehend concepts related to urbanization, green cities, global warming, greenhouse gas causes and effects, and carbon sequestration.	12, 3, 4
V	**International agreements and protocols**, National forest policy and Environmental laws and acts. EIA.	**8**	Upon completion, learners will grasp international agreements and protocols concerning environmental conservation, understand national forest policies, environmental laws, and acts governing sustainable practices. They will also comprehend Environmental Impact	2, 3, 4

			Assessment (EIA) processes, enabling them to contribute effectively to environmental management and policy implementation.	

TEXT BOOKS:

T11. Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the relationships between natural and man-made systems.	1,2,3,4,7,12
2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development	1,2,3,4,7,12
3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.	2,7,12
4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment .	2,3,7
5	Analyse various aspects of human population, and the impact of the population growth on the environment.	1,2,3,4,7,12

MAPPING TABLE

Course code	**Course Name**	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS226R	**Environmental Science**	CO1	1	2	2	2			3					3
		CO2	2	2	2	2			3					3
		CO3		3					3					3
		CO4		1	2				3					
		CO5	1	2	2	2			3					3

SEMESTER – IV									
Course Title	**Techno Professional Skills III**								
Course code	**22BTCS225R**	**Total credits: 1 Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology in Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Develop advanced technical skills and knowledge relevant to the specific professional field or industry. 2. Enhance communication skills for effective interaction with clients, colleagues, and stakeholders in both technical and non-technical contexts. 3. Prepare students for successful entry into and advancement within their chosen profession through practical experience, problem-solving abilities, and ethical decision-making.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking. .								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**C Programming:** Programming constructs, Control Statements, Looping, Arrays, Strings.	**6**	Upon completion, learners will understand fundamental C programming constructs, including control statements, looping mechanisms, arrays, and string manipulation, enabling them to write, debug, and optimize basic to intermediate-level C programs efficiently.	2
II	**Advanced C Programming**: Functions, Pointers, Structures and Unions, File Handling.	**6**	Upon completion, learners will master advanced C programming concepts, including the use of functions, pointers, structures, unions, and file handling techniques, enabling them to develop	3, 4

			more complex and efficient C programs with enhanced functionality and data management capabilities.	
III	**Analog Electronic Circuits:**	**6**	Upon completion, learners will understand the principles and design of analog electronic circuits, including amplifiers, oscillators, filters, and their applications, enabling them to analyze and build analog systems effectively.	2
IV	**Digital electronic Circuits**	**6**	Upon completion, learners will understand the design and operation of digital electronic circuits, including logic gates, flip-flops, counters, and memory devices, enabling them to analyze, design, and implement digital systems effectively.	2
V	**Data Structure and Algorithms**	**6**	Understand and implement data structures and algorithms to solve computational problems efficiently and optimize program performance.	2

TEXT BOOKS:

T1:Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

T2:Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,9,10,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,9,10,12

3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,9,10,12
4	Encourage the students towards Non-traditional thinking. .	1,2,3,4,5,9,10,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,9,10,12

MAPPING TABLE

Course code	**Course Name**	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS225R	Techno Professional Skills III	CO1	2	2	3	2	2				3	2	3	3
		CO2	3	2	3	2	2				2	2	3	3
		CO3	3	2	3	3	3				3	2	3	2
		CO4	3	2	3	1	3				2	2	3	2
		CO5	3	2	3	3	3				2	2	2	2

SEMESTER – IV									
Course Title	**ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD223R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36P	0	0	**4**	0	0	0	**2**
Pre-requisite	**English for Employability for Engineers**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	7. To enhance the writing skills in different areas including Paragraph writing and letter writing. 8. To understand and enhance the Self-management skills. 9. To familiarize students with the use of Contextual vocabulary and Use of phrasal verbs and idioms in a conversation								
CO1	Demonstrate effective written communication skills in English, employing proper grammar and vocabulary.								
CO2	Analyze technical texts, extracting relevant information, and summarizing it with clarity and coherence.								
CO3	Apply English language proficiency in oral communication, including presentations and discussions in engineering contexts.								
CO4	Evaluate and synthesize complex technical information, demonstrating advanced comprehension and expression in English.								
CO5	Construct and critique engineering-related documents, such as reports and manuals, using precise language and appropriate conventions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Writing Skills **i.** Paragraph Writing & Narratives **ii.** Letter Writing **iii.** Technical Writing Pipe and cistern i.Introduction of pipes and cistern iii.Solving different types of questions	**7**	Upon completion, learners will enhance their writing skills through paragraph writing, narratives, letter writing, and technical writing. They will also understand the basics of pipes and cisterns, and develop proficiency in solving various related problems effectively.	1,2, 3
II	Self- Management Skills **i.** SWOT Analysis **ii.** Goal Setting and Personal Hygiene Mixture allegation and Clock i.Introduction of basics ii.Solving questions on mixture	**7**	Upon completion, learners will develop self-management skills through SWOT analysis, goal setting, and personal hygiene practices. They will also understand the basics of mixtures, allegations, and clocks, gaining proficiency in	1,2, 3

			solving related problems effectively.	
III	Vocabulary Development i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus Statement and Course of action i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement	**7**	Develop vocabulary through understanding word usage, learning strategies, contextual learning, phrasal verbs, idioms, and effective dictionary/thesaurus use. Analyze statements and actions.	1,2, 3
IV	Interview Skills & Dress Code Ethics i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session Sitting arrangement (puzzle) i.Linear arrangement puzzle ii.Circular arrangement puzzle Matrix	**11**	Upon completion, learners will master interview skills for various formats, answering strategies for common questions, and dress code ethics. They will also enhance problem-solving abilities through mock interviews and practice with linear and circular arrangement puzzles and matrix-based puzzles.	1,2, 3
V	Grammar (Flipped Classroom) i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt)	**4**	Upon completion, learners will enhance grammar skills through word-stress and syllable practice, addressing common errors. They will also master concepts of profit, loss, and discount, including basic principles and problem-solving	1,2, 3

	Profit loss and discount i. Introduction to basics ii. Introduction to discount iii. Probems related on the topic		techniques related to these financial calculations.	

TEXT BOOKS:

T1: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.

T2: • McDowell, Gayle Laakmann.2008.Cracking the Coding Interview (Indian Edition)

REFERENCE BOOKS:

R1: Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction Harper Perennial

R2: Taylor J. and Wright, J., IELTS Advantage Reading Skills: A step-by-step guide to a high IELTS reading score, Delta Publishing by Klett

R3: Murphy, Raymond,.(2012) English Grammar in Use Book with Answers: A Self- Study and Practice Book for Intermediate Learners of English, Cambridge University Press

R4: Job Interview Skills , Paige Labert, Publisher:DiDio Calderone Giuseppina

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate effective written communication skills in English, employing proper grammar and vocabulary.	2,3,7,8,10,12
2	Analyze technical texts, extracting relevant information, and summarizing it with clarity and coherence.	1,2,3,4,10,12
3	Apply English language proficiency in oral communication, including presentations and discussions in engineering contexts.	10,12
4	Evaluate and synthesize complex technical information, demonstrating advanced comprehension and expression in English.	1,2,3,4,10,12
5	Construct and critique engineering-related documents, such as reports and manuals, using precise language and appropriate conventions.	1,2,3,4,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD223R	ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS	CO1		1	1				1	2		3		1
		CO2	2	2	2	2						2		2
		CO3										3		1
		CO4	2	2	2	1						2		2
		CO5	3	2	2	2						3		3

SEMESTER – IV									
Course Title	MOOCS III: Web Application Development with Java Script and Mongo DB								
Course code	**22MOCS221R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Discuss the organization and architecture of computer systems and electronic computers. 2. Analyze the basic components of computer systems besides the computer arithmetic. 3. Discuss input-output organization, memory organization and management, and pipelining.								
CO1	Grasp the core principles of web development.								
CO2	Become proficient in writing clean, efficient, and maintainable JavaScript code.								
CO3	Leverage JavaScript libraries and frameworks like jQuery or React to create dynamic and user-friendly web interfaces with interactive elements and animations.								
CO4	Implement client-server communication.								
CO5	Grasp the concepts of NoSQL databases and explore MongoDB for data storage and retrieval.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to Web Development Fundamentals The Web Development Landscape: Understanding the building blocks of the web, including HTTP requests and responses, client-server architecture, and the role of HTML, CSS, and JavaScript. Client-Side vs. Server-Side Scripting: Differentiating between front-end and back-end functionalities and how JavaScript interacts with both sides. Browser Developer Tools: Introduction to browser developer tools for inspecting elements, debugging code, and analyzing network requests. HTML and CSS Refresher: Reviewing basic HTML syntax and structure, along with fundamental CSS concepts for styling web pages. Introduction to JavaScript: Learning	**3**	Upon completion, learners will understand web development fundamentals, including client-server architecture, HTML, CSS, JavaScript, and their interactions. They will gain skills in using browser developer tools, differentiating client-side and server-side scripting, and mastering core JavaScript syntax and concepts.	3

	the core syntax of JavaScript, including variables, data types, operators, control flow statements, and functions.			
II	Mastering JavaScript Programming DOM Manipulation: Understanding the Document Object Model (DOM) and using JavaScript to manipulate elements, attributes, and styles. Event Handling: Learning to respond to user interactions like clicks, scrolls, and form submissions using event listeners. Working with Functions and Objects: Creating reusable functions, understanding object-oriented programming concepts, and working with built-in JavaScript objects. Asynchronous Programming: Exploring asynchronous programming techniques like callbacks, promises, and async/await to handle asynchronous operations effectively. JavaScript Libraries and Frameworks: Introducing popular JavaScript libraries like jQuery or React for simplifying common tasks and building more complex web interfaces.	**3**	Upon completion, learners will master JavaScript programming, including DOM manipulation, event handling, reusable functions, object-oriented programming, and asynchronous techniques (callbacks, promises, async/await). They will also be introduced to popular JavaScript libraries and frameworks like jQuery and React for advanced web development.	3
III	**Building Interactive Web Interfaces** Interactive Elements and User Experience: Focusing on creating engaging user experiences with interactive elements like forms, animations, and dynamic content. Form Validation and Error Handling: Implementing JavaScript-based form validation to ensure user input accuracy and handling potential errors gracefully. Introduction to Web APIs: Exploring web APIs for accessing data and functionalities from external sources like weather APIs	**3**	Upon completion, learners will create engaging web interfaces using interactive elements, implement form validation and error handling, explore web APIs for external data access, understand single-page applications (SPAs) with frameworks like React or Angular, and learn web application deployment strategies.	3

	or social media APIs. Building Single-Page Applications (SPAs): Understanding the concept of SPAs and learning how JavaScript frameworks like React or Angular can be used to build them. Deployment Strategies: Learning how to deploy your web applications to a web server for public access			
IV	Server-Side Development with Node.js Introduction to Node.js: Understanding Node.js as a server-side JavaScript runtime environment and its role in web development. Building a Simple Web Server: Creating a basic web server using Node.js to handle HTTP requests and respond with HTML content. RESTful APIs: Learning the principles of RESTful APIs for designing communication protocols between the front-end and back-end of web applications. Routing and Handlers: Implementing routing mechanisms in Node.js to handle different URL paths and associated functionalities. Databases and Data Persistence: Understanding the need for data persistence in web applications and how Node.js can interact with databases.	**3**	Upon completion, learners will understand Node.js as a server-side runtime, create simple web servers, design RESTful APIs for front-end and back-end communication, implement routing mechanisms, and interact with databases for data persistence in web applications.	3
V	Data Management with MongoDB Introduction to NoSQL Databases: Exploring the concepts of NoSQL databases and their advantages compared to traditional relational databases. MongoDB Fundamentals: Learning about MongoDB as a popular	**3**	Upon completion, learners will understand NoSQL databases, focusing on MongoDB's document-based structure. They will perform CRUD operations, design efficient data models, and utilize advanced	3

	NoSQL document database and its core data structures (documents and collections). CRUD Operations: Performing Create, Read, Update, Delete (CRUD) operations on MongoDB data using its query language and drivers for Node.js. Data Modeling for MongoDB: Learning how to design efficient data models for your web applications using MongoDB's document structure. Advanced Features: Exploring advanced functionalities of MongoDB such as querying with complex filters, sorting, and data aggregation		MongoDB features like complex queries, sorting, and data aggregation for robust data management in web applications	

TEXT BOOKS:

T1:Haverbeke, Marijn. Eloquent javascript: A modern introduction to programming. No Starch Press, 2018.

T2: Chodorow, C. "Introduction to mongodb." In Free and Open Source Software Developers European Meeting (FOSDEM), vol. 18, pp. 80-83. 2010.

REFERENCE BOOKS:

R1: 1. Robson, Elisabeth, and Eric Freeman. Head First Html With CSS & XHTML. " O'Reilly Media, Inc.", 2005.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Grasp the core principles of web development.	1,2,3,4,5,10,12
2	Become proficient in writing clean, efficient, and maintainable JavaScript code.	1,2,3,4,5,10,12
3	Leverage JavaScript libraries and frameworks like jQuery or React to create dynamic and user-friendly web interfaces with interactive elements and animations.	1,2,3,4,5,10,12
4	Implement client-server communication.	1,2,3,4,5,10,12
5	Grasp the concepts of NoSQL databases and explore	1,2,3,4,5,10,12

	MongoDB for data storage and retrieval.	

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22MOCS221R	MOOCS III: Web Application Development with Java Script and Mongo DB	CO1	2	2	2	2	3					2		2
		CO2	2	3	3	2	3					2		2
		CO3	2	2	2	2	3					2		2
		CO4	2	2	2	3	3					2		2
		CO5	3	3	3	3	3					2		2

SEMESTER – IV									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions,	**30**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC221	CO CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Enhance students' practical skills, teamwork, and leadership abilities through engaging activities that complement academic learning and promote personal growth. 2. Foster physical, emotional, social, and cultural development by providing diverse opportunities for creative expression, athletic participation, and community involvement. 3. Encourage active participation in community service and social initiatives, cultivating a sense of responsibility, empathy, and civic engagement among students.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and	**30**	Upon completion, students will develop practical skills, teamwork, and leadership abilities, experience holistic growth through creative, athletic, and social activities, and gain a sense of responsibility and civic engagement through active participation in community service and social initiatives.	3

	national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC221	EXTRA CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – IV									
Course Title	**BASIC ACCLIMATIZING SKILLS (BAS)**								
Course code	**23UULS221R**	**Total credits: 1 Total hours: 30 P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	2	0	0	0	1
Pre-requisite		**Co-requisite**							
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. To impart knowledge of the fundamentals of Hospitality industry and its applications. 2. Students will be able to familiarize with the cooking equipment's & Utensils. 3. Students will be able to handle different modes of reservations.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	"Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Accommodation Management** ● Telephone handling technique ● Organizing of Rooms. ● Cleaning equipment's and uses. ● Bed making Process.	6	Upon completion, learners will efficiently manage accommodation facilities, demonstrating proficiency in telephone handling, room organization, cleaning equipment utilization, and bed making processes.	1,2, 3

II	**Fundamental of Cooking** ● Uses of basic cooking equipment's ● Uses of fire & Fuel ● Different cuts of vegetables ● Uses of herbs & spices Regional Food Habits	6	Upon completion, learners will demonstrate competency in using cooking equipment, managing fire and fuel, preparing vegetable cuts, utilizing herbs and spices, and understanding regional food habits.	2, 3, 4
III	**Food and Beverage skills** ● Introduction to catering industry ● Types menus and beverages ● Identifications of Cutlery, crockery & glassware ● Table etiquettes or manners ● Customer handling skills or Situation Handling	6	Upon completion, learners will master the catering industry, understand menu and beverage types, identify cutlery, crockery, and glassware, practice table etiquette, and develop customer handling and situation management skills.	2, 3, 4
IV	**Travel management** ● Travel Documentation (Types) ● Application of passport & Visa ● Tourism products (UNESCO sites) ● Types of logistics in travel and tourism management	6	Upon completion, learners will effectively manage travel logistics, handle travel documentation including passports and visas, understand tourism products like UNESCO sites, and apply various types of logistics in travel and tourism management.	1, 2, 3
V	**Basic Hospitality Skills** ● Various Egg Preparations ● Canapés preparations ● Mock tail & Shakes Preparations ● Butter Rice / Lemon	6	Upon completion, learners will proficiently prepare a variety of dishes including eggs, canapés, mocktails, shakes, rice dishes, lentils, and both vegetarian and non-vegetarian dishes in basic	2, 3, 4

	Rice ● Various Lentils Preparations ● 1 non-veg preparation/ 1 veg preparation		hospitality settings.	

TEXT BOOKS:

T1:Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt ltd-New Delhi.

T2: Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restauranteur, Guides.

REFERENCE BOOKS:

R1: Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	1,2,3,4,7,10,12
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	1,2,3,4,7,10,12
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	1,2,3,4,7,10,12
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	1,2,3,4,7,10,12
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges	1,2,3,4,7,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
23UULS111R	BASIC ACCLIMATIZIG SKILLS (BAS)	CO1	1	1	2	2			3			1		2
		CO2	1	1	2	2			3			1		2
		CO3	1	2	3	2			3			1		2
		CO4	2	3	2	3			3			1		2
		CO5	3	3	3	3			3			1		2

SEMESTER – V									
Course Title	**Signals and Systems**								
Course code	**22BTCS311R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	10. Introduces students for an intermediate level of fluency with signals and systems in both continuous time and discrete time. 11. Prepares students for more advanced subjects in digital signal processing (including audio, image and video processing). 12. Prepares students in communication theory, and system theory, control and robotics.								
CO1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.								
CO2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.								
CO3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.								
CO4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.								
CO5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Signal and System:** signal and system as seen in everyday life, signal properties, periodicity, determinism and stochastic characteristics, special signal, system properties.	**7**	To Explain different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2
II	**Behaviour of continuous and discrete time LTI system:** Impulse response, step response, convolution, input-output behaviour, Characterization of causality and stability of LTI system.	**8**	Classifications of the standard forms of Signals with respect to systems based on their properties	1,2
III	**Laplace Transform:** Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros.	**10**	Analysing the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2
IV	**Fourier Analysis of Continuous**	**12**	Analyzation of the	1,2

	and discrete Time Signals and Systems: Fourier Series, Fourier Transform and properties, Parseval‟s theorem, Frequency response of LTI systems. Sampling Theorem.		concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	
V	**Z-Transform:** Z-Transform and its inverse: Definition, Existence Region of convergence and properties. Application of Z-Transform for the analysis of Discrete time LTI systems, Significance of poles and zeros.	**8**	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2

TEXT BOOKS:

T1: Oppenheim Alan, V., Willsky Alan. S., and Nawab, H., “Signals and Systems‟, Prentice Hall, 1997.

REFERENCE BOOKS:

R1: Haykin Simon, “Communication Systems”, 3rd Edition, John Wiley, 1995.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2,3,4,5,10,12
2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.	1,2,3,4,10,12
3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,10,12
4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,10,12
5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2,3,4,5,10,12

MAPPING TABLE

Course Code	Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12

22BTCS311R	Signals and Systems	CO 1	3	2	3	2	1					2		3
		CO 2	3	3	3	3						3		3
		CO 3	3	3	3	3						3		3
		CO 4	3	2	3	2	1					2		3
		CO 5	3	2	3	2	1					2		3

SEMESTER – V									
Course Title	**Database Management Systems**								
Course code	**22BTCS312R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 35T+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**File Systems**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To understand and use data manipulation language to query, update, and manage a database. 2. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency. 3. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.								
CO1	Understand the fundamental concepts of database management systems with DBMS languages and data models.								
CO2	Apply the concepts of query languages such as DDL and DML for designing a relational database.								
CO3	Apply the ACID properties and concurrency control schemes to perform transaction processing with database recovery.								
CO4	Apply security to the database by checking for authentication and authorization.								
CO5	Apply advanced topics of data warehousing and data mining, distributed databases and web databases.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	**6**	Analyzing data system architecture and the data models.	1,2
II	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.	**10**	Analyzing Relational Query languages, database design and query processing and optimization.	1,2

	Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.			
III	**Transaction processing:** Concurrency control, ACID property, Serializability ofscheduling, Locking and timestamp based schedulers, Multi-version and optimistic, Concurrency Control schemes, Database recovery.	**8**	Analysing the concepts of Transaction Processing.	1,2
IV	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	**6**	Analyzation of the concepts of Database Security.	1,2
V	**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	**5**	Analyzation of Advanced topics of Object oriented and object relational databases.	1,2
Practical	10. **Database Design and Modeling:** Introduction to Database Systems, Data Abstraction and Data Models, Entity-Relationship (ER) Modeling, Relational Model and Schema Design, Case Studies and Lab Exercises: Creating ER Diagrams and Converting ER Models to Relational Schemas.	**6**	Describe, illustrate, and explain the creation of ER Diagrams and Converting ER Models to Relational Schemas.	1,2,3,4
	11. SQL Querying and Data Manipulation: Introduction to SQL, Data Definition Language (DDL), Data Manipulation Language (DML), Data Query Language (DQL), Advanced SQL Queries: Joins, Subqueries, and Views, Case Studies and Lab Exercises: Writing and Executing SQL Queries.	**6**	Describe, illustrate, and explain the creation of Writing and Executing SQL Queries.	1,2,3,4
	12. Transaction Management and Concurrency Control: Introduction to Transactions, ACID Properties (Atomicity, Consistency, Isolation, Durability), Concurrency Control Mechanisms, Isolation	**6**	Describe, illustrate, and explain and creation of Transaction Management and Concurrency Control	1,2,3,4

	Levels and Locking, Case Studies and Lab Exercises: Implementing Transactions and Concurrency Control.			
	13. Database Security and Authorization: Introduction to Database Security, User Authentication and Roles, Access Control and Authorization, SQL Injection and Security Best Practices, Case Studies and Lab Exercises: Securing Databases	**6**	Describe, illustrate, and explain Database Security and Authorization	1,2,3,4
	14. Advanced topics: Object-Oriented Databases, Distributed Databases, Data Warehousing and OLAP, NoSQL Databases, Case Studies and Lab Exercises: Implementing Advanced Database Solutions.	**6**	Describe, illustrate, and explain the Implementation of Advanced Database Solutions.	1,2,3,4

TEXT BOOKS:

T1: "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

REFERENCE BOOKS:

R1: "Principles of Database and Knowledge–Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
R2: "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
R3: "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the fundamental concepts of database management systems with DBMS languages and data models.	1,2,3,4,5,9,11,12
2	Apply the concepts of query languages such as DDL and DML for designing a relational database.	1,2,3,4,5,9,11,12
3	Apply the ACID properties and concurrency control schemes to perform transaction processing with database recovery.	1,2,3,4,5,9,11,12

4	Apply security to the database by checking for authentication and authorization.	1,2,3,4,5,9,11,12
5	Apply advanced topics of data warehousing and data mining, distributed databases and web databases.	1,2,3,4,5,9,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS312R	Database Management Systems	CO1	2	2	3	2	2				3		3	3
		CO2	3	2	3	2	2				2		3	3
		CO3	3	2	3	3	3				3		3	2
		CO4	3	2	3	1	3				2		3	2
		CO5	3	2	3	3	3				2		2	2

SEMESTER – V									
Course Title	**Formal Language & Automata Theory**								
Course code	**22BTCS313R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Knowledge in Mathematics and Data Structure and Algorithm**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To provide an introduction to some of the central ideas of theoretical computer science from the perspective of formal languages. 2. To introduce the fundamental concepts of formal languages, grammar, and automata theory. 3. To develop problem-solving abilities using deterministic and non-deterministic machines.								
CO1	Understand the fundamental characteristics of formal languages and formal grammar.								
CO2	Understand the similarity between deterministic and non-deterministic finite automata								
CO3	Understand the minimization of deterministic and nondeterministic finite automata.								
CO4	Analyze the similarity between non-deterministic push-down automata and context-free grammars.								
CO5	Analyze the fundamental characteristics of Turing machines and how they are used in computing.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Finite Automata:** Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition.	8	Describe, illustrate, and explain the central concepts of Automata Theory.	1,2
II	**Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata – Pumping Lemma.	8	Describe, illustrate, and explain regular expressions and languages.	1,2
III	**Context Free Grammars and Languages:** Definition, Leftmost and rightmost grammars, Parse	6	Describe, illustrate, and explain context Free Grammars and Languages.	1,2

	trees, Ambiguity: Ambiguous grammar, Removing ambiguity, Normal forms, Applications of context free grammars: Parsers			
IV	**Pushdown automata (PDA) and context free languages (CFL):** Definition & representation of pushdown automata, Acceptance by PDA: By final state, By empty stack, Deterministic PDA, Equivalence of PDA and CFL, Pumping lemma for CFL Closure properties of CFL.	8	Describe, illustrate, and explain the representation of pushdown automata and context free languages.	1,2
V	**Turing machines:** Definition, Language of a Turing machine, Programming Turing machines, The Church-Turing thesis, A simple programming language, Extensions of the basic Turing machine.	6	Describe, illustrate, and explain the basic Turing machine.	1,2

TEXT BOOKS:

T1: Theory of Computer Science : Automata, Languages and Computation – K.L.P. Mishra and N. Chandrasekaran, PHI.

T2: Introduction to Languages and Theory of Computations – Martin J. C., TMH.

REFERENCE BOOKS:

R1: Introduction to Automata Theory, Languages and Computation – Hopcroft, Ullman, Pearson Education.

R2: Elements of the Theory of Computation – Papadimitrou, C. and Lewis, C.L, PH.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the fundamental characteristics of formal languages and formal grammar.	1,2,3,10,12
2	Understand the similarity between deterministic and non-deterministic finite automata	1,2,3,4,5,10,12
3	Understand the minimization of deterministic and nondeterministic finite automata.	1,2,3,4,5,10,12
4	Analyze the similarity between non-deterministic push-down	1,2,3,4,5,10,12

	automata and context-free grammars.	
5	Analyze the fundamental characteristics of Turing machines and how they are used in computing.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS313R	Formal Language & Automata Theory	CO1	2	2	1							1		1
		CO2	3	3	2	2	1					1		2
		CO3	3	3	3	1	1					1		2
		CO4	3	3	2	2	1					1		2
		CO5	3	3	2	2	1					1		2

SEMESTER – V									
Course Title	**Object-Oriented Programming**								
Course code	**22BTCS314R**	**Total credits: 5**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 39T+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**File Systems**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To enable students to understand the basic object-oriented programming concepts and apply them in problem solving. 2. To illustrate among students the inheritance concepts for reusing the program. 3. To enable students to develop GUI-based applications using AWT, Swing and Event handling.								
CO1	Understand object-oriented programming concepts and implement in java.								
CO2	Understand and apply building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.								
CO3	Understand and apply concepts like multithreading, exception handling etc. in object-oriented programs.								
CO4	Apply exception-handling methods in programming.								
CO5	Create interactive as well as GUI-based java applications in project-based learning.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Java Overview:** Java Introduction, Platform Independence, JVM & JDK, Data types, Operators, If, else statement, Switch condition, while, do-while, for loop, break and continue statement. Array and String: Single Array & Multidimensional Array, Library Classes-String, String Buffer & Wrapper Class, Command line arguments and Various String Operations.	**7**	Analyzing Java and its properties, and also array and string.	1,2
II	**Classes, Objects and Methods:** Class and Object, Object reference, Constructor: Constructor Overloading, Method: Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Import statement, Static import, Access control, Nested class, Inner class,	**8**	Analyzing classes, objects, and methods.	1,2

	Anonymous inner class.			
III	**Inheritance and Interfaces in Java:** Overview of Inheritance, inheritance in constructor, Inheriting Data members and Methods, Multilevel Inheritance – method overriding Handle multilevel constructors super keyword, Stop Inheritance, final keyword. Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Abstract class, Comparison between Abstract Class and interface, inside of System.out.println – statements.	**8**	Analyzing the concepts of Inheritance and Interfaces in Java.	1,2
IV	**Exception Handling in Java:** Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class. **JAVA File Handling:** Overview of Different Stream (Byte Stream, Character stream), Readers and Writers class, File Class, File Input Stream, File Output Stream, Input Stream Reader and Output Stream Writer class, File reader and writer class, File Writer, Buffered Reader class.	**8**	Analyzation of the concepts of Exception Handling in Java.	1,2
V	**Applet, AWT and Swing:** Applet: Applet Fundamental, Applet Architecture, Applet Skeleton, Requesting Repainting , Event Handling: various event handling mechanisms, various classes related to event sources and event listeners, AWT: window fundamentals, creating frames, Adding removing various controls, Layout managers, Introduction To Swing.	**8**	Analyzation of fundamentals of Applet, AWT and Swing.	1,2

Practical	1. Hands-on Introduction to Object-Oriented Programming: Practical exercises on creating classes and objects, Implementing encapsulation through practical examples, Coding exercises on constructors and destructors, Applying access modifiers (public, private, protected) in practical scenarios.	**12**	Describe, illustrate and explain coding exercises on constructors and destructors, applying access modifiers in practical scenarios.	1,2,3,4
	2. Practical Inheritance and Polymorphism: Coding exercises on implementing different types of inheritance (single, multi-level, and multiple), Practical examples of method overriding, Creating and using abstract classes and interfaces, Implementing static and dynamic binding through practical examples.	**12**	Describe, illustrate and explain practical examples of method overriding, Creating and using abstract classes and interfaces, Implementing static and dynamic binding through practical examples,	1,2,3,4
	3. Advanced OOP Concepts in Practice: Practical exercises on creating and using packages and namespaces, Implementing exception handling in real-world scenarios, Creating and managing multithreaded applications, Practical exercises on generics and collections.	**12**	Describe, illustrate and explain creation and managing multithreaded applications, Practical exercises on generics and collections.	1,2,3,4
	4. Software Design and Development in Action: Hands-on Object-Oriented Analysis and Design (OOAD) exercises, Implementing design patterns (e.g., Singleton, Factory, Observer) in practical scenarios, Software testing and debugging exercises, Code optimization and refactoring practical sessions.	**12**	Describe, illustrate and explain Software testing and debugging exercises, Code optimization and refactoring practical sessions.	1,2,3,4
	5. Project-Based Learning and GUI Development: Practical exercises on building Graphical User Interfaces (GUI), Implementing event handling in GUI applications, Developing interactive and GUI-based applications using Swing/JavaFX/Qt, Project-based	**12**	Describe, illustrate and explain development of a real-world application using OOP concepts and GUI.	1,2,3,4

	learning: Developing a real-world application using OOP concepts and GUI.			

TEXT BOOKS:

T1: Herbert Schildt and Dale Skrien, ”Java Fundamentals – A comprehensive Introduction”, McGraw Hill.
T2: Herbert Schildt, “Java the complete reference”, McGraw Hill, Osborne.
T3: T. Budd, “Understanding Object- Oriented Programming with Java”, Pearson Education.

REFERENCE BOOKS:

R1: P.J.Dietel and H.M.Dietel , “Java How to program”, Prentice Hall.
R2: P.Radha Krishna , “Object Oriented programming through Java”, CRC Press.
R3: S.Malhotra and S. Choudhary, “Programming in Java”, Oxford University Press.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand object-oriented programming concepts and implement in java.	1,2,3,4,5,10,12
2	Understand and apply building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.	1,2,3,4,5,10,12
3	Understand and apply concepts like multithreading, exception handling etc.in object-oriented programs.	1,2,3,4,5,10,12
4	Apply exception-handling methods in programming.	1,2,3,4,5,10,12
5	Create interactive as well as GUI-based java applications in project-based learning.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS314R	Object-Oriented Programming	CO1	2	2	3	1	1							1
		CO2	2	1	3	1	1							1
		CO3	2	1	2	1	1							1
		CO4	2	1	2	1	1							1
		CO5	2	2	2	1	1							1

SEMESTER – V									
Course Title	**PE-1 : Foundations of Data Science**								
Course code	**22BTCS316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1.To provide fundamental knowledge on data science with querying and analytics required for the field of data science. 2.To understand the process of handling heterogeneous data, pre-process and visualize them for better understanding. 3.To gain the fundamental knowledge of data science tools and gain basic skill set to solve real-time data science problems.								
CO1	Acquire foundational knowledge in data science.								
CO2	Understand and apply various data analytics techniques.								
CO3	Apply advanced tools to work on dimensionality reduction and mathematical operations.								
CO4	Manage diverse data types and employ programming for knowledge representation through visualization.								
CO5	Demonstrate numerous open-source data science tools to solve real-world problems through industrial case studies.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction** NeedforDataScience– WhatisDataScience - Data Science Process – BusinessIntelligenceandDataScience– Prerequisites for a Data Scientist – ToolsandSkillsrequired.	**5**	To acquire foundational knowledge in data science.	1,2
II	**Exploratory Data Analysis (EDA) and Basic Statistical Interface:** Exploratory Data Analysis (EDA), statistical measures, Basic tools (plots, graphs and summary statistics) of EDA,Data Analytics Lifecycle, Discovery, Developing Initial Hypotheses, Identifying Potential Data Sources, EDA case study,testing hypotheses on means, proportions and variances, Errormetrics	**7**	To understand Exploratory Data Analysis (EDA) and Basic Statistical Interface.	1,2
III	**Data Science Methodology:** Analytics for Data Science–Examples of Data Analytics, Data Discovery, Data Preparation, Model Planning, Model Building,	**6**	To apply various algorithms of Data Science	1,2

	Communicate Results, Data cleaning -Data integration-Data Reduction-Data Transformation and Data Discretization, Feature Generation and Feature Selection, Feature Selection algorithms:Filters-Wrappers			
IV	**Basic Machine Learning Algorithms :**Classifiers-Decision tree-Naïve Bayes-k-Nearest Neighbors(k-NN),k-means–SVM,AssociationRulemining–Ensemblemethods	**6**	Analyzation of the concepts of Basic Machine Learning Algorithms.	1,2
V	**Platform for Data Science:** PythonforDataScience – PythonLibraries –Data Frame Manipulation with numpyand pandas – Exploration Data Analysis –Time Series Dataset – Clustering with Python–Dimensionality Reduction .Python integrated Development Environments(IDE) for Data Science.	**6**	Analyzation of Python integrated Development Environments(IDE) for Data Science.	1,2

TEXTBOOKS:

T1Sanjeev Wagh, Manisha Bhende, Anuradha Thakare, 'Fundamentals of Data Science, CRCPress,1st Edition, 2022

T2Datasciencefromscratch-FirstprincipleswithPython,JoelGrus,OâReily,2015.

REFERENCEBOOKS:

R1 Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt,O'Reilly(2014).

R2AvrimBlum,JohnHopcroft,Ravindran Kannan, "FoundationsofDataScience",Cambridge UniversityPress, First Edition, 2020.

R3 Data Mining: Concepts and Techniques", Third Edition, 2 Jiawei Han, MichelineKamberand Jian Pei,ISBN 0123814790 (2011).

R4BigDataandBusiness Analytics, JayLiebowitz, CRC press (2013)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Acquire foundational knowledge in data science.	1,2,3,4,10,12
2	Understand and apply various data analytics techniques.	1,2,3,4,10,12
3	Apply advanced tools to work on dimensionality reduction and mathematical operations.	1,2,3,4,5,10,12
4	Manage diverse data types and employ programming for knowledge representation through visualization.	1,2,3,4,10,12
5	Demonstrate numerous open-source data science tools to solve real-world problems through industrial case studies.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS316R	Foundations of Data Science	CO1	2	2	1	3						1		2
		CO2	2	2	1	3						1		2
		CO3	3	3	3	3	3					1		3
		CO4	3	3	3	3						1		3
		CO5	3	3	3	3	3					1		3

SEMESTER – V									
Course Title	**PE-1 : Neural Networks**								
Course code	**22BTCS316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To understand, analyze, and apply various Artificial Neural Network architectures. 2. To train algorithms for a range of applications in machine learning and deep learning.								
CO1	Understand the historical developments and potential applications of Artificial Neural Networks (ANN).								
CO2	Analyse Artificial Neural Network architectures based on connectivity and learning strategies.								
CO3	Apply training algorithms for discrete and continuous Perceptron networks in Feed Forward Networks.								
CO4	Apply backpropagation training and explore the architecture of Convolutional Neural Networks in Deep Learning.								
CO5	Evaluate the architecture and training algorithms of Bidirectional Associative Memory (BAM) and Hopfield Network in Associative Memories.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Neural Networks** Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.	**5**	To acquire foundational knowledge in Neural Networks.	1,2
II	**Essentials of Artificial Neural Networks** Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN– Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.	**7**	To understand Essentials of Artificial Neural Networks.	1,2
III	**Feed Forward Networks** Introduction, Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and		To apply various algorithms of Neural Networks.	1,2

	Continuous Perceptron Networks, ADALINE, MADALINE.	**6**		
IV	**Deep Learning** Introduction, Perceptron, Multilayer Perceptron, Delta Rule, Backpropagation Training, Learning Algorithm, Normalization, Limitations of the Perceptron Model, Convolutional Neural Network, Recurrent NN.	**6**	Analyzation of the concepts of Deep Learning.	1,2
V	**Associative Memories** General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm. Architecture of Hopfield Network.	**6**	Analyzation of BAM Training Algorithms.	1,2

TEXTBOOKS:

T1Simon Haykin,―Neural Networks–A Comprehensive Foundation, Macmillan Publishing Co., New York.

T2Neural Networks-James A Freeman David MSK, Pearson Publication

REFERENCEBOOKS:

R1 Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House

R2K. Mahrotra, C.K. Mohan and Sanjay Ranka,―Elements of Artificial Neural Networks, MIT Press

R3 S. Rajasekharanand G. A. Vijayalakshmipai,―Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications, PHI Publication.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the historical developments and potential applications of Artificial Neural Networks (ANN).	1,2,3,4,11,12
2	Analyse Artificial Neural Network architectures based on connectivity and learning strategies.	1,2,3,4,5,11,12
3	Apply training algorithms for discrete and continuous Perceptron networks in Feed Forward Networks.	1,2,3,4,5,9,10,11,12
4	Apply backpropagation training and explore the architecture of Convolutional Neural Networks in Deep Learning.	1,2,3,4,5,9,10,11,12

5	Evaluate the architecture and training algorithms of Bidirectional Associative Memory (BAM) and Hopfield Network in Associative Memories.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS316R	Neural Networks	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – V									
Course Title	**Techno Professional Skills IV**								
Course code	**22BTCS315R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	**1.** To have a detailed revision of Computer Science & Engineering concepts learned so far. 2. To become confident in Computer Science & Engineering concepts to solve problems in real-life situations.								
CO1	Develop highly skilled and knowledgeable development professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming	**7**	Develop basic skills of C programming	1,2
II	Analog and Digital Electronic Circuits	**8**	Develop analytical and research ability of Analog and Digital Electronic Circuits	1,2
III	Data Structure and Algorithms	**10**	Gather knowledge about various development concepts od Data Structure and Algorithms	1,2
IV	Computer Organization and Architecture	**12**	Analyzation of the concepts of Computer Organization and Architecture	1,2
V	Operating Systems	**8**	Analyzation of basic concepts of Operating systems	1,2

TEXT BOOKS/REFERENCE BOOKS:

T1: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

T2: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

T3: Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.
T4: M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
T5: Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.
T6: S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.
T7: Stallings, Computer Organization & Architecture, Pearson.
T8: Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1,2,3,4,5,9,10,11,12
2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.	1,2,3,4,5,9,10,11,12
3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,9,10,11,12
4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	1,2,3,4,5,9,10,11,12
5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS315R	Techno Professional Skills IV	CO1	2	2	3	2	2				3	2	3	3
		CO2	3	2	3	2	2				2	2	3	3
		CO3	3	2	3	3	3				3	2	3	2
		CO4	3	2	3	1	3				2	2	3	2
		CO5	3	2	3	3	3				2	2	2	2

SEMESTER – V									
Course Title	**COMPETENT ENGLISH FOR ENGINEERS**								
Course code	**22UBPD314R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Build a strong foundation in technical vocabulary related to engineering disciplines such as mechanical, electrical, civil, etc. 2. Improve written and spoken communication skills necessary for professional interactions, including emails, reports, presentations, and meetings. 3. Enhance the ability to understand and interpret technical documents, research papers, manuals, and industry-specific literature.								
CO1	Demonstrate proficient usage of English language skills in technical communication and documentation.								
CO2	Evaluate and critique engineering texts, extracting essential information and synthesizing complex ideas.								
CO3	Generate clear and effective technical reports, presentations, and documentation in English.								
CO4	Assess and refine oral communication skills for effective participation in engineering discussions and presentations.								
CO5	Comprehend advanced technical vocabulary and language structures necessary for engineering discourse and professional communication.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Email Etiquette i. Different parts of emails and usage of Magic Words & Wonder Phrases ii. Effective Email Communication, Responding effectively to a client's expectations	**8**	Develop basic skills of C programming	1,2
II	Time-Management Skills i. Introduction to Time Management, Purpose and Importance of Time Management ii. Time Management Matrix, Basic Tips to Maintain Time.	**8**	Develop analytical and research ability of Analog and Digital Electronic Circuits	1,2

	Practice Session: Preparing time management matrix			
III	Interview Skills i. Preparation before the interview ii. Non-verbal cues for interview skills, Interview dos and don'ts iii. Handling difficult questions in Interview	**10**	Gather knowledge about various development concepts od Data Structure and Algorithms	1,2
IV	Conflict Management i. Introduction to Conflict Management ii. Conflict Management Strategies	**10**	Analyzation of the concepts of Computer Organization and Architecture	1,2
V	Practice Sessions	**9**	Analyzation of basic concepts of Operating systems	1,2

TEXT BOOKS:

T1: Wren, P.C and Martin, H. 1995. High School English Grammar and Composition, S Chand Publishing.

T2: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press

REFERENCE BOOKS:

T1: Mccarthy. (2008) English Vocabulary in Use Upper - Intermediate with CD ROM, Cambridge University Press

T2: Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate proficient usage of English language skills in technical communication and documentation.	1,2,3,4,5,10,12

2	Evaluate and critique engineering texts, extracting essential information and synthesizing complex ideas.	1,2,3,4,5,10,12
3	Generate clear and effective technical reports, presentations, and documentation in English.	1,2,3,4,5,10,12
4	Assess and refine oral communication skills for effective participation in engineering discussions and presentations.	1,2,3,4,5,10,12
5	Comprehend advanced technical vocabulary and language structures necessary for engineering discourse and professional communication.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBPD314R	Competent English for Engineers	CO1	1	1	1	1	1					3		2
		CO2	1	1	1	1	1					3		2
		CO3	1	1	1	1	1					3		2
		CO4	1	1	1	1	1					3		2
		CO5	1	1	1	1	1					3		2

SEMESTER – V									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC311R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Computer science and Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions,	**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC221	CO CURRICULAR ACTIVITIES	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – V									
Course Title	**EXTRA-CURRICULAR**								
Course code	**22UBEC311R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 3. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and	**8**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	2,3

	national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	COs	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC311R	Extra-Curricular	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – V									
Course Title	**Predictive Analysis**								
Course code	**22BTCS316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**2**	**0**	**1**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To familiarize the students with various Statistical Data Analysis tools 2. Tools that can be used for effective decision making. 3. Provide students with the knowledge to apply predictive analytics techniques to solve practical business problems and improve decision-making processes.								
CO1	Understand and critically apply the concepts and methods of Predictive analytics.								
CO2	Understand and apply IBM SPSS Modeller in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.								
CO3	Applying and analysing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.								
CO4	Get exposed to the testing of hypothesis and solving assumptions								
CO5	Understanding of IBM Watson Studio with Machine Learning Model.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**ANALYTICS OVERVIEW** What is Predictive Analysis, how predictive model works, why predictive modeling, what are the models in Predictive Analysis. How Predictive analytics: Transforming data into future insights, Analytics trends: Past, Present & Future, Towards a Predictive enterprise.	**7**	**Understand basic analytics concepts and applications in business contexts.**	1,2,3
II	**Statistical Analysis** Define Statistics and its types, Measures of Central Value; Mean, Median and Mode, Measures of Dispersion: Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness, Kurtosis.	**8**	Understand fundamental statistical concepts, techniques, and their applications in data analysis to derive insights and support decision-making.	2,3,4
III	**DATA MINING**	**10**	Understand data mining concepts, algorithms, and their applications to extract patterns and	2, 3, 4

	What is a Data Mining applications? Strategy for data mining: CRISP-DM, Steps of Data Mining, Stages and tasks in CRISP-DM, Life Cycle of a Data Mining Project, Skills Needed for Data Mining. Identify nodes and streams, The framework of a Data – mining project, Brief the unit of analysis, Explain the type of dialog box.		knowledge from large data sets.	
IV	**UNIT OF ANALYSIS** Concepts of Unit of analysis (Distinct, Aggregate, SetToFlag), Integrate data, CLEM Expression, Role of Relationship between two fields, Identifying the modeling objective.	**12**	Understand the concept and importance of the unit of analysis in research and data analysis.	2,3, 4
V	**PREDICTIVE ANALYTICS WITH IBM WATSON STUDIO** Understanding of IBM Cloud, IBM Watson Studio, Watson studio Components, Creating a Machine Learning Model, Data preparation, Watson Machine learning, Data Refinery, Watson Studio Neural Network Modeler, IBM Watson Studio jobs, Use case with AutoAI.	**8**	Understand predictive analytics concepts and IBM Watson Studio features for building predictive models. (2 - Understand). Apply IBM Watson Studio tools to develop and deploy predictive models effectively	2, 3, 4
Practical Component				
Practical 1	Introduction to Predictive Analysis	3	Explain the concept of predictive analysis and its importance in decision-making.	2
Practical 2	Predictive Modeling	**3**	Describe how predictive models work and their applications in various domains.	2
Practical 3	Analytics Trends Over Time	3	Analyze past, present, and future trends in analytics and their impact on business strategies.	4
Practical 4	Measures of Central Tendency	**3**	Compute and interpret mean, median, and mode for a dataset.	3

Practical 5	Measures of Dispersion	3	Calculate and compare measures of dispersion such as range, standard deviation, and coefficient of variation.	4
Practical 6	Skewness and Kurtosis Analysis	**3**	Evaluate skewness and kurtosis to understand the shape and distribution of data.	3
Practical 7	CRISP-DM Framework Overview	3	Outline the stages and tasks in the CRISP-DM framework for data mining projects.	3
Practical 8	Experiment: Data Mining Project Life Cycle	**3**	Apply the stages of a data mining project life cycle to a practical case study.	4
Practical 9	Data Preparation Using Watson Studio	3	Utilize IBM Watson Studio's Data Refinery for data preparation tasks like cleaning and feature engineering.	3
Practical 10	Utilize IBM Watson Studio's Data Refinery for data preparation tasks like cleaning and feature engineering.	**3**	Differentiate between distinct, aggregate, and SetToFlag units of analysis in data mining contexts.	4

TEXT BOOKS:

IBM Courseware

T1 Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL

REFERENCE BOOKS:

R1 "Applied Predictive Modeling" by Max Kuhn and Kjell JohnsonDatabase Management Systems

R2 "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy

R3 "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" by Eric Siegel

Additional Resources:

1. https://www.ibm.com/topics/predictive-analytics
2. https://www.simplilearn.com/what-is-predictive-analytics-article
3. https://www.ibm.com/products/watson-studio

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different types of signals-continuous and discrete, odd and even, periodic and aperiodic etc.	1, 2, 3, 4, 5, 10, 12
2	Understand Classifications of the standard forms of Signals with respect to systems based on their properties.	1, 2, 3, 4, 5, 10, 12
3	Analyse the concepts of Laplace transform based continuous time and discrete time analysis of signals and systems.	1, 2, 3, 4, 5, 10, 12
4	Analyzation of the concepts of Fourier transform based continuous time and discrete time analysis of signals and systems.	1, 2, 3, 4, 5, 10, 12
5	Analyzation of Z-transform in continuous time signals and systems by using appropriate mathematical tools.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	Cos	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS316R	**Predictive Analysis**	CO1	2	2	1	1	1					1		2
		CO2	3	3	3	3	2					2		3
		CO3	3	2	3	3	3					2		3
		CO4	2	2	2	2	2					2		2
		CO5	2	2	3	2	2					2		3

SEMESTER – VI									
Course Title	**Compiler Design**								
Course code	**22BTCS321R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Theory of Computation**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	20. Discuss the process of translating a high-level language to machine code required for compiler construction. 21. Analyze the software tools and techniques used in compiler construction such as lexical analyser and parser generators 22. Discuss the data structures used in compiler construction such as abstract syntax trees, symbol tables, three address code and stack machines.								
CO1	Understand different phases of a compiler and explain lexical analysis principles.								
CO2	Apply parsing techniques to build a language-specific syntax analyser.								
CO3	Analyse syntax-directed translations, evaluation order, and type checking.								
CO4	Understand the association of runtime storage allocation with control flow and procedure calls.								
CO5	Apply code optimization on intermediate code for target code generation.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Compiler structure:** Analysis-synthesis model of compilation, Various phases of a compiler, Tool based approach to compiler construction. Lexical analysis: Interface with input, Parser and symbol table, Token, Lexeme and patterns, Regular definition, Transition diagrams, LEX.	**8**	Understand the analysis-synthesis model of compilation and the role of lexical analysis in converting source code into tokens using tools like LEX.	**1,2,3**
II	**Syntax analysis:** CFG's, Ambiguity, Associativity, Precedence, Top-down parsing, Recursive descend parsing, Transformation on the grammars, Predictive parsing, Bottom-up parsing, Operator precedence grammars, LR parsers (SLR, Canonical, LALR), YACC	**8**	Grasp the concepts of context-free grammars (CFGs) and develop skills in various parsing techniques including top-down and bottom-up parsing methods, utilizing tools like YACC.	**3,4**
III	**Syntax directed translation:** Inherited and synthesized attributes, Dependency graph, Evaluation order,Bottom up evaluation of S-attributed definitions L- attributed definitions and top down translation of attributes Type checking: Type system, Type expressions, Structural	**10**	Learn to design and implement syntax-directed translation schemes, focusing on attribute grammars and type checking mechanisms, and understand the differences between structural and	**3,4**

	and name equivalence of types, Type conversion.		name equivalence of types.	
IV	**Run time environments:** Storage organization, Storage-allocation strategies, Access to nonlocal names, Activation tree, Activation record, Parameter passing, Symbol table and dynamic storage allocation Intermediate code generation: Intermediate representations, Translation of declarations, Assignments, Control flow, Boolean expressions and procedure calls.	**10**	Comprehend the organization and management of run-time storage, including activation records and parameter passing techniques, and learn the principles of intermediate code generation.	**4**
V	**Code generation:** Issues in the design of a code generator, Basic blocks and flow graphs, Next use information, Register allocation, Code generation algorithm, Dag representation of programs, Code generation from dags, Peephole optimization and code generator generators.	**9**	Acquire knowledge on the design and implementation of a code generator, emphasizing optimization techniques, basic blocks, flow graphs, and register allocation strategies.	**4**
Practical Component				
Practical 1	Design a lexical analyser for a simple programming language using LEX.	2	Understand the basics of lexical analysis and the use of tools like LEX to create lexical analysers.	3
Practical 2	Implement a program to identify different tokens, lexemes, and patterns in a given source code.	2	Ability to recognize and classify tokens, lexemes, and patterns within a source code.	2
Practical 3	Create a transition diagram for a given regular expression and simulate its working.	2	Comprehend the conversion of regular expressions to transition diagrams and their usage in lexical analysis.	2
Practical 4	Write a recursive descent parser for a given context-free grammar (CFG).	2	Develop and implement top-down parsing techniques using recursive descent methodology.	3
Practical 5	Implement an SLR parser for a specified grammar and test it with various input strings.	2	Understand and apply bottom-up parsing techniques, specifically SLR parsing.	3
Practical 6	Using YACC, create a parser for a small language and demonstrate its usage with sample inputs.	2	Gain practical experience with parser generators like YACC and their integration with lexical	3

			analysers.	
Practical 7	Construct a dependency graph for a given annotated parse tree and determine the order of attribute evaluation.	2	Understand the relationship between parse trees and attribute evaluation orders.	4
Practical 8	Develop an attribute grammar for a simple language construct and implement its evaluation using synthesized and inherited attributes.	2	Understand and implement syntax-directed translation using attribute grammars.	3
Practical 9	Write a type checker for a language that includes basic types, type expressions, and type conversions.	2	Implement type checking mechanisms and understand type systems and conversions.	3
Practical 10	Simulate the activation record creation and management for a simple recursive function.	2	Understand the structure and management of activation records in a runtime environment.	3
Practical 11	Implement intermediate code generation for a given set of language constructs (e.g., if-else, loops).	2	Develop skills in generating intermediate representations of high-level language constructs.	3
Practical 12	Create a symbol table management system that handles scope and lifetime of variables.	2	Design and implement a symbol table for managing variable scopes and lifetimes.	3
Practical 13	Design and implement a basic block and flow graph generator for a given intermediate code.	2	Understand the concepts of basic blocks and control flow graphs in code generation.	3
Practical 14	Develop a register allocation algorithm using graph coloring techniques.	2	Apply graph coloring techniques for efficient register allocation during code generation.	3
Practical 15	Implement a peephole optimization technique for a given intermediate code and demonstrate its effectiveness.	2	Understand and apply optimization techniques at the code generation level.	3

TEXT BOOKS:

T9: A.V. Aho, R. Sethi, J.D. Ullman, "Compilers: Principles, Techniques and Tools", Addison – Wesley.

T10: Steven S. Muchnick, "Advanced Compiler Design and Implementation", Elsevier

REFERENCE BOOKS:

R6: W. Appel, "Modern Compiler Implementation in C: Basic design", Cambridge Press

R7: Fraser and Hanson, "A Retargetable C Compiler: Design and Implementation", Addison-Wesley

R8: Dhamdhere, “Compiler Construction”, McMillan

OTHER LEARNING RESOURCES:

1. www.vssut.ac.in/lecture_notes/lecture1422914957.pdf
2. 2.http://csenote.weebly.com/principles-of-compiler-design.html
3. http://www.faadooengineers.com/threads/32857,Compiler-Design-Notes-full-book-pdf-download
4. https://www.vidyarthiplus.com/vp/thread,37033.html#.WF0PhlMrLD

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand different phases of a compiler and explain lexical analysis principles.	1,2,3,4,5,10,12
2	Apply parsing techniques to build a language-specific syntax analyser.	1,2,3,4,5,10,12
3	Analyse syntax-directed translations, evaluation order, and type checking.	1,2,3,4,5,10,12
4	Understand the association of runtime storage allocation with control flow and procedure calls.	1,2,3,4,5,10,12
5	Apply code optimization on intermediate code for target code generation.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS321R	**Compiler Design**	CO 1	**3**	**2**	**1**	**2**	**2**					**2**		**3**
		CO 2	**3**	**3**	**3**	**3**	**2**					**2**		**3**
		CO 3	**3**	**3**	**3**	**3**	**2**					**2**		**3**
		CO 4	**3**	**1**	**2**	**2**	**2**					**2**		**3**
		CO 5	**3**	**3**	**3**	**3**	**2**					**2**		**3**

SEMESTER – VI									
Course Title	**Computer Networks**								
Course code	**22BTCS322R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Programming Skills**	**Co-requisite**	**Linux**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	23. Understand the fundamentals of data communications principles of media access, switching, routing and flow control. 24. Understand the basics of network protocol design and analysis. 25. Be familiar with the TCP/IP protocol suite and with application layer protocols. 26. Be able to write network-capable programs using the socket libraries. 27. Understand the structure of client-server systems and be able to build client-server programs.								
CO1	Understand the basics of data communication, networking, internet, physical layer techniques, and circuit switching.								
CO2	Analyze data link layer techniques, flow control, and error protocols.								
CO3	Analyse network layer protocols along with routing issues.								
CO4	Summarize transport and application layer operations and protocols along with QoS services.								
CO5	Design and execute computer network programming projects, showcasing advanced skills in network application development.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to networks, internet, protocols and standards, the OSI model, layers in OSI model, TCP/IP suite, Addressing, Analog and digital signals. Physical Layer: digital transmission, multiplexing, transmission media, circuit switched networks, Datagram networks, virtual circuit networks, switch and Telephone network.	**8**	Understand the OSI model, TCP/IP suite, and basic concepts of addressing, signals, and transmission media.	**2**
II	Data link layer: Introduction, Block coding, cyclic codes, checksum, framing, flow and error control, Noiseless channels, noisy channels, HDLC, point to point protocols	**8**	Learn error detection and correction techniques, framing, and protocols like HDLC and point-to-point protocols.	**2,3**
III	Network Layer: Logical addressing, internetworking, tunnelling, address mapping, ICMP, IGMP, forwarding, uni-cast routing protocols, multicast routing protocols.	**10**	Gain knowledge on logical addressing, routing protocols, and address mapping techniques.	**2,4**
IV	Transport Layer: Process to process delivery, UDP and TCP protocols,	**10**	Comprehend the fundamentals of process-	**2,3**

	SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks.		to-process delivery, TCP/UDP protocols, and congestion control mechanisms.	
V	Application Layer – Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multi-media, network security	**9**	Understand domain name space, DNS operations, email protocols, FTP, HTTP, and basics of network security.	**2**
Practical 1	Configure a simple network consisting of multiple devices such as routers, switches, and computers. Test connectivity and troubleshoot any issues encountered.	**2**	Demonstrate the ability to configure basic network settings and troubleshoot connectivity problems.	**3**
Practical 2	Use network analysis tools like Wireshark to capture and analyze network traffic. Identify different protocols, their headers, and their roles in the OSI model.	**2**	Gain proficiency in protocol analysis and understanding of the OSI model layers.	**4**
Practical 3	Use oscilloscopes or signal analysers to examine analog and digital signals transmitted over the network. Interpret signal characteristics and identify any anomalies.	**2**	Understand the fundamentals of analog and digital signals in networking and their analysis	**2**
Practical 4	Implement a block coding technique such as Hamming codes to detect and correct errors in transmitted data frames. Analyse its effectiveness in error detection and correction.	**2**	Gain hands-on experience in implementing error detection and correction mechanisms in the data link layer.	**3**
Practical 5	Implement CRC error detection mechanism in a data link layer protocol such as Ethernet. Calculate CRC values for given data frames and verify error detection capability.	**2**	Understand the theory and practical implementation of CRC for error detection.	**3**
Practical 6	Implement and analyze flow control mechanisms such as Stop-and-Wait and Sliding Window protocols. Measure throughput and efficiency under different network conditions.	**2**	Understand the concepts of flow control and error control in data link layer protocols.	4
Practical 7	Configure IP addresses using both IPv4 and IPv6 addressing schemes for a network topology. Verify connectivity and troubleshoot addressing conflicts.	**2**	Demonstrate proficiency in configuring logical addresses andunderstanding IP addressing schemes.	**3**
Practical 8	Implement and compare different routing protocols such as RIP,	**2**	Understand the operation of routing protocols and	**4**

	OSPF, and BGP in a simulated network environment. Analyze routing tables and convergence times.		their impact on network performance.	
Practical 9	Configure Address Resolution Protocol (ARP) and Neighbor Discovery Protocol (NDP) for mapping network layer addresses to data link layer addresses. Verify mappings and troubleshoot resolution issues.	**2**	Gain practical experience in address resolution and mapping techniques.	**3**
Practical 10	Capture and analyse UDP and TCP traffic using packet analysis tools. Compare their characteristics, such as connection establishment, reliability, and overhead.	**2**	Understand the differences between UDP and TCP protocols and their suitability for different applications.	**4**
Practical 11	Configure QoS mechanisms such as traffic prioritization, traffic shaping, and congestion management in a network. Measure and analyze QoS metrics under different traffic loads.	**2**	Understand the importance of QoS in ensuring reliable and efficient network performance.	**5**
Practical 12	Implement and evaluate congestion control algorithms such as TCP's congestion avoidance and congestion control mechanisms. Measure throughput and packet loss under congested conditions.	**2**	Gain practical insights into congestion control mechanisms and their impact on network performance.	**4**
Practical 13	Configure and troubleshoot DNS servers and clients. Analyze DNS queries and responses using network diagnostic tools.	**2**	Understand the operation of DNS and its role in translating domain names to IP addresses.	**3**
Practical 14	Set up email servers (SMTP, IMAP) and FTP servers. Demonstrate the exchange of emails and file transfers between clients and servers. Implement security measures such as encryption and authentication.	**2**	Gain practical experience in configuring and securing email and FTP services.	**3**
Practical 15	Deploy web servers (HTTP, HTTPS) and web applications. Implement security measures such as SSL/TLS encryption, HTTPS, and web application firewalls to protect against common attacks.	**2**	Understand the principles of web service security and implement security measures to protect against threats.	**3**

TEXT BOOKS:

T11: Data Communications and Networking–Behrouz A. Forouzan, Fourth EditionTMH,2006.

T12: Computer Networks—Andrew S Tanenbaum, 4th Edition, Pearson Education.

REFERENCE BOOKS:

R9: An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
R10: UnderstandingcommunicationsandNetworks,3rd Edition, W.A. Shay, Cengage Learning.
R11: Computer and Communication Networks, Nader F. Mir, Pearson Education
R12: Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross,3rd Edition, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the basics of data communication, networking, internet, physical layer techniques, and circuit switching.	1,2,3,4,5,12
2	Analyze data link layer techniques, flow control, and error protocols.	1,2,3,4,5,12
3	Analyse network layer protocols along with routing issues.	1,2,3,4,5,12
4	Summarize transport and application layer operations and protocols along with QoS services.	1,2,3,4,5,12
5	Design and execute computer network programming projects, showcasing advanced skills in network application development.	1,2,3,4,5,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
22BTCS322R	**Computer Networks**	CO 1	3	1	2	1	1							3
		CO 2	3	2	3	1	1							3
		CO 3	3	2	3	1	1							3
		CO 4	3	2	3	1	2							3
		CO 5	3	3	3	3	2					1		3

SEMESTER – VI									
Course Title	**Professional Elective-II: Data Mining**								
Course code	**22BTCS317R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Learn the basics of data mining, including its applications, challenges, and various types of data attributes. 2. Gain proficiency in association rule mining techniques, such as frequent itemset generation and association rule extraction algorithms. 3. Study clustering, prediction, and classification methods, including algorithms, evaluation metrics, and ensemble methods.								
CO1	Understand diverse real-life data, mastering statistical foundations, and identifying challenges in data mining.								
CO2	Utilize Association Rule Mining to address practical problems, demonstrating understanding and proficiency in application.								
CO3	Apply Cluster analysis in unsupervised learning to real-world datasets, showcasing competence in data clustering techniques.								
CO4	Implement popular methodologies for prediction using Data Mining techniques, demonstrating practical application skills.								
CO5	Apply Classification techniques in supervised learning for Machine Learning applications, showcasing proficiency in categorizing and classifying data.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Data Mining:** What is data mining, applications of data mining, issues and challenges faced in data mining, types of data attributes – nominal, binary, ordinal, numeric, discrete and continuous, basic statistical descriptions of data – measures of central tendency and dispersion, major tasks in data pre-processing	**8**	Understand data mining concepts, types of data attributes, and basic statistical descriptions.	**2**
II	**Association Rule Mining:** Definitions of frequent itemset, maximal frequent itemset, closed frequent itemset, association rules, Frequent itemset generation – Apriori algorithm, DIC algorithm and FP-growth algorithm, Generating association rules from frequent item sets	**8**	Comprehend frequent itemset generation algorithms like Apriori, DIC, and FP-growth, and association rule generation.	**2,3**
III	**Clustering:** what is cluster analysis, need for cluster analysis, data matrix,	**10**	Grasp cluster analysis concepts, dissimilarity measures, and various	**2,4**

	dissimilarity matrix, proximity and dissimilarity measures for different data attribute types, partitioning based clustering methods, density-based clustering methods and hierarchical clustering methods, measuring cluster quality		clustering methods including partitioning, density-based, and hierarchical.	
IV	**Prediction**: What is prediction, application areas of prediction, Simple linear regression, Multiple linear regression, Predictor Error measures, Common techniques for assessing accuracy – holdout, random sampling, cross-validation, bootstrap	**10**	Understand prediction concepts, regression techniques, predictor error measures, and methods for assessing accuracy.	**2,3**
V	**Classification**: what is classification, differences between classification and prediction, applications of classification, Some classification algorithms - Decision Trees, Naïve Bayes Classification, Logistic Regression and K-nearest Neighbour Classification, Confusion matrix and metrics for evaluating classifier performance, Overview of ensemble methods – Bagging and Boosting, Ensemble-based classifier - Random Forest	**9**	Understand classification vs. prediction, classification algorithms like decision trees, Naïve Bayes, logistic regression, and evaluation metrics.	**2,4**

TEXT BOOKS:

T13: Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, India

T14: AK Pujari, Data Mining Techniques, University Press, India

REFERENCE BOOKS:

R13: Han, Manilla and Smyth, Principles of Data Mining, PHI, India

R14: Tan, Steinbach,Vipin Kumar, Introduction to Data Mining, Pearson Education Inc.

OTHER LEARNING RESOURCES:

1. https://www.geeksforgeeks.org/data-mining/
2. https://www.javatpoint.com/data-mining

3. https://www.tutorialspoint.com/data_mining/index.htm

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand diverse real-life data, mastering statistical foundations, and identifying challenges in data mining.	1,2,3,4,10,12
2	Utilize Association Rule Mining to address practical problems, demonstrating understanding and proficiency in application.	1,2,3,4,10,12
3	Apply Cluster analysis in unsupervised learning to real-world datasets, showcasing competence in data clustering techniques.	1,2,3,4,5,10,12
4	Implement popular methodologies for prediction using Data Mining techniques, demonstrating practical application skills.	1,2,3,4,10,12
5	Apply Classification techniques in supervised learning for Machine Learning applications, showcasing proficiency in categorizing and classifying data.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTCS317R	**Data Mining**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**Professional Elective-II: Artificial Intelligence**								
Course code	**22BTCS317R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills, Data structures**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Describe the field of AI and its subfields machine learning, NLP and computer vision 2. Learn and implement key NLP algorithms and models, such as virtual agents, chatbots, sentiment classifiers, and language translators, to solve a variety of natural language understanding tasks. 3. Explore Practical Applications of Computer Vision,Investigate real-world applications of computer vision in various fields, including autonomous vehicles, surveillance systems, medical imaging, and augmented reality.								
CO1	Remember and understand relevance of AI in today's world.								
CO2	Gain an idea about Machine Learning application in real world problem.								
CO3	Develop an understanding deep learning concept in AI.								
CO4	Apply and Analyze data by applying various machine learning algorithms.								
CO5	Enhance problem-solving abilities with IBM Cloud service.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Artificial Intelligence:**Overview of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL), Natural Language Processing (NLP), Computer Vision. Describe the types of AI,Explain what the main focus of AI is,List of practical applications of AI,Describe the eras of computing,Explain the difference between deterministic and probabilistic systems, Road Map of AI.	**8**	Understand the types of AI, the main focus of AI, practical applications, computing eras, deterministic vs. probabilistic systems, and the road map of AI.	**2,4,5**
II	**Introduction to Machine Learning:** Introduction to Machine Learning, Supervised Learning & Unsupervised Learning. Supervised Learning Algorithms: Linear Regression, Logistic Regression, Suppor Vector Machine, Decision Tree,Random Forest, KNN. Unsupervised Learning Algorithms: K-Means Clustering, Hierarchical	**8**	Grasp the concepts of supervised and unsupervised learning, and understand and implement various supervised and unsupervised learning algorithms.	**2,3**

	Clustering.			
III	**Introduction to Deep Learning:** Introduction to Deep Learning: Neural Networks, Layers, and Activation Functions, Back Propagation, Optimizers, Deep Learning Algorithm: ANN, CNN, RNN, LSTM with Tensor flow and Keras, Introduction to Autoencoders, Generative Adversarial Networks (GANs), Restricted Boltzmann Machines (RBMs) and Applications.	**10**	Understand the basics of neural networks, activation functions, backpropagation, and deep learning algorithms like ANN, CNN, RNN, LSTM, GANs, and RBMs.	**2,3**
IV	**Introduction to Natural Language Processing and Computer Vision:** Introduction to Natural Language Processing, NLP application in real world, components of NLP, Vartual Agents overview, Chatbot and its parts, Tokenization, Stemming & Lemmatization in NLP, BagofWords,TF-IDF,Word2Vec, Word Embedding in NLP. Introduction to Computer Vision, Image Classification and Object Recognition, Feature Detection and Description algorithms with Open CV.	**10**	Understand the components and applications of NLP, and grasp the basics of computer vision, image classification, and object recognition.	**2,3**
V	**Evolution from DeepQA to Watson services on IBM Cloud:** Explain the DeepQA architecture was;Explain why IBM decided to commercialize Watson and Describe the evolution of Watson services from the original DeepQA architecture to the present. Introduction to IBM Watson: explore Watson Studio, IBM's integrated environment for data scientists, developers, and domain experts, to build and deploy ML models.	**9**	Understand the evolution of Watson services from DeepQA architecture, explore IBM Watson services, and create chatbots using Watson Assistant.	**2,3**

	Creating Chatbots using Watson Assistant: learn the basics of Watson Assistant, including intents, entities, dialog flows, and integration capabilities. Natural Language Understanding (NLU), Language Translator, Text to Speech, Speech to Text on IBM Cloud.			

TEXT BOOKS:

T15: Introduction to Data Science: B.UmaMaheswari& R. Sujata.

T16: Deep Learning with TensorFlow and Keras by Amita Kapoor, Antonio Gulli& Sujit pal.

T17: Artificial Intelligence by Stuart J. Russell & Peter Norvig.

T18: Hands-On Artificial Intelligence for IBM Watson: Explore the Power of AI to Innovate and Transform Business Processes" by Dr. Harish Garg.

REFERENCE BOOKS:

R15: Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence" by Jon Krohn, Grant Beyleveld, and AglaéBassens.

R16: Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth.

R17: Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow :AurelienGeron.

OTHER LEARNING RESOURCES:

Python & Machine Learning -https://www.w3schools.com/python/python_ml_getting_started.asp

1. AI with IBM - https://developer.ibm.com/technologies/artificial-intelligence/
2. IBM Cloud - https://cloud.ibm.com/docs

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Remember and understand relevance of AI in today's world.	1,2,3,4,10,12
2	Gain an idea about Machine Learning application in real world problem.	1,2,3,4,10,12
3	Develop an understanding deep learning concept in AI.	1,2,3,4,5,10,12

4	Apply and Analyze data by applying various machine learning algorithms.	1,2,3,4,10,12
5	Enhance problem-solving abilities with IBM Cloud service.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS317R	**Artificial Intelligence**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**PE-III: Machine Learning**								
Course code	**22BTCS318R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Programming Skills**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To provide fundamental theoretical foundations knowledge of various learning algorithms 2. Apply suitable machine learning techniques for data handling and knowledge extraction 3. To gain the fundamental knowledge and understand the context of supervised and unsupervised learning through real-life examples.								
CO1	Recognize the characteristics of machine learning strategies								
CO2	Demonstrate proficiency in data analytics and apply advanced tools to work on dimensionality reduction and mathematical operations.								
CO3	Analyze and Apply the suitable supervised learning and unsupervised learning methods for real-world problems and for handling unknown patterns.								
CO4	Understand the concept of ensemble learning and its applications.								
CO5	Evaluate the performance of various algorithms.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**IntroductiontoMachineLearning** WhatisMachineLearning?,Typesof Machine Learning: Supervised,Unsupervised,andReinforcementLearning,ApplicationsofMachineLearningin Various Fields.	**8**	Understand the concept of machine learning, its types (supervised, unsupervised, reinforcement learning), and applications in various fields.	**2**
II	**Data Preprocessing and Exploratory DataAnalysis** DataCollectionandCleaning,HandlingMissingValues,FeatureScalingandNormalization,DataVisualizationTechniques,ExploratoryDataAnalysis (EDA),statisticalmeasures,Basictools(plots,graphsandsummarystatistics)of EDA.	**8**	Gain skills in data collection, cleaning, handling missing values, feature scaling, normalization, and visualization techniques for exploratory data analysis (EDA).	**2,3**
III	**SupervisedLearningandUnsupervisedLearning** LinearandNon-Linearexamples– Multi–Class & Multi-Label Support,Clusteringbasics(Partitioned,HierarchicalandDensitybased)-K-Meanslustering–KModeclustering–	**10**	Learn various supervised and unsupervised learning algorithms including linear regression, decision trees, k-NN, logistic regression, clustering basics, and principal component	**2,4**

	Self organizing maps , Expectationmaximization – Principalomponent Analysis		analysis.	
IV	**EnsembleLearning** Bagging-CommitteeMachinesandStacking-Boosting-Ranking	**10**	Understand ensemble learning techniques such as bagging, boosting, stacking, and ranking-based aggregation for improving model performance.	**2,3**
V	**ModelEvaluationandOptimization** ModelValidationTechniques:Train/TestSplit,Cross-Validation,PerformanceMetrics,ConfusionMatrix,Accuracy,Precision, Recall, F1-Score	**9**	Learn model validation techniques including train/test split, cross-validation, and performance metrics like confusion matrix, accuracy, precision, recall, and F1-score.	**2,5**

TEXT BOOKS:

T19: T1 S. Shalev-Shwartz, S.Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

T20: T2 EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India,

REFERENCE BOOKS:

R18: MehryarMohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.

R19: Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997..

R20: Data Mining: Concepts and Techniques", Third Edition, 2 Jiawei Han, Micheline Kamber and Jian Pei, ISBN 0123814790,(2011).

R21: Duda, Richard, Peter Hart, and David Stork, "Pattern Classification," 2 nd Edition, John Wiley & Sons, Hoboken, 2000.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Recognize the characteristics of machine learning strategies	1,2,3,4,10,12

2	Demonstrate proficiency in data analytics and apply advanced tools to work on dimensionality reduction and mathematical operations.	1,2,3,4,10,12
3	Analyze and Apply the suitable supervised learning and unsupervised learning methods for real-world problems and for handling unknown patterns.	1,2,3,4,5,10,12
4	Understand the concept of ensemble learning and its applications.	1,2,3,4,10,12
5	Evaluate the performance of various algorithms.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS318R	**Machine Learning**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		Co3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VI									
Course Title	**PE-III: Big Data Analytics**								
Course code	**22BTCS318R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**DBMS**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	4. Gain foundational knowledge of Big Data, including its characteristics, technologies, and real-world applications across various domains. 5. Learn the architecture and components of Hadoop and Spark, and develop practical skills in data ingestion, processing, and management. 6. Develop the ability to perform analytics on Big Data, apply machine learning techniques, and utilize visualization tools for insightful data representation.								
CO1	Understand the characteristics and real-world applications of Big Data, differentiating it from traditional data.								
CO2	Demonstrate the use of Hadoop and Spark frameworks by executing basic data processing tasks.								
CO3	Analyze and compare various NoSQL databases and their suitability for different types of Big Data storage requirements.								
CO4	Evaluate different data preprocessing techniques and machine learning tools for effective Big Data analytics.								
CO5	Design a real-time Big Data analytics pipeline using cloud-based solutions and ensuring data security and privacy.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Big Data:** Overview of Big Data: Definition and characteristics of Big Data (Volume, Velocity, Variety, Veracity, and Value), Differences between traditional data and Big Data. Big Data in the Real World: Applications in various domains (healthcare, finance, social media, e-commerce, etc.), Case studies of Big Data applications. Big Data Technologies: Introduction to Hadoop ecosystem, NoSQL databases overview (e.g., MongoDB, Cassandra). Big Data Challenges: Data storage and management issues, Privacy and ethical considerations in Big Data. Data Generation Sources: Structured vs. Unstructured data, Data from sensors, social media, and other digital platforms.	**8**	Understand the definition, characteristics, and real-world applications of Big Data, as well as the technologies and challenges associated with it.	**2,4**

II	**Big Data Processing Frameworks:** Hadoop Fundamentals: Architecture of Hadoop, Hadoop Distributed File System (HDFS), MapReduce programming model. Hadoop Ecosystem Components: Introduction to Pig, Hive, HBase, and other related tools, Use cases and applications of each component. Data Ingestion Tools: Overview of Sqoop and Flume, Real-time data processing with Apache Kafka. Spark Framework: Introduction to Apache Spark, Spark vs. Hadoop MapReduce, Spark RDDs (Resilient Distributed Datasets). Hands-On Exercises: Basic HDFS commands, Writing and running a simple MapReduce program.	**8**	Grasp the fundamentals of Hadoop ecosystem, including HDFS, MapReduce, and related tools, as well as Spark framework and its comparison with Hadoop.	**2,3**
III	**Data Storage and Management:** NoSQL Databases: Types of NoSQL databases: Document, Key-Value, Column Family, Graph, CAP theorem and BASE properties. MongoDB: Features and architecture of MongoDB, CRUD operations in MongoDB, Indexing and aggregation. Cassandra: Features and architecture of Cassandra, Data modeling in Cassandra, Querying in Cassandra using CQL. HBase: Introduction to HBase and its architecture, HBase data model and operations, Integration of HBase with Hadoop. Data Warehousing Solutions: Introduction to Big Data warehousing solutions like Amazon Redshift and Google BigQuery.	**10**	Gain knowledge of NoSQL databases, focusing on MongoDB, Cassandra, HBase, and Big Data warehousing solutions, and their features, architecture, and operations.	**2,3**
IV	**Big Data Analytics and Tools:** Introduction to Big Data Analytics: Importance of analytics in Big Data, Types of analytics: Descriptive, Diagnostic, Predictive, Prescriptive. Data Pre-processing Techniques: Data cleaning, transformation, and reduction, Handling missing data and outliers. Machine Learning with Big Data:	**10**	Understand the importance of analytics in Big Data, pre-processing techniques, machine learning algorithms, and data visualization tools.	**2,3,5**

	Overview of machine learning algorithms used in Big Data, Introduction to scalable machine learning tools like MLlib. Big Data Visualization: Importance of data visualization, Tools for Big Data visualization (e.g., Tableau, D3.js).			
V	**Advanced Topics in Big Data Analytics:** Real-Time Big Data Analytics: Stream processing with Apache Storm and Spark Streaming, Real-time data pipelines and architectures. Big Data Security and Privacy: Security challenges in Big Data, Techniques and tools for securing Big Data, Cloud-Based Big Data Solutions: Overview of Big Data solutions on AWS, Azure, and Google Cloud, Case studies on cloud-based Big Data implementations. Future Trends in Big Data: Emerging technologies and trends in Big Data, The impact of AI and IoT on Big Data.	**9**	Explore real-time Big Data analytics, security and privacy challenges, cloud-based Big Data solutions, and future trends in Big Data technologies.	**2,4,5**

TEXT BOOKS:

T21: "Big Data: Principles and Best Practices of Scalable Realtime Data Systems" by Nathan Marz, James Warren, Manning Publications.

T22: "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost, Tom Fawcett, O'Reilly Media.

T23: "Big Data: A Revolution That Will Transform How We Live, Work, and Think" by Viktor Mayer-Schönberger, Kenneth Cukier, Eamon Dolan/Mariner Books.

REFERENCE BOOKS:

R22: "Hadoop: The Definitive Guide" by Tom White, O'Reilly Media.

R23: "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems" by Martin Kleppmann, O'Reilly Media.

R24: "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" by Pramod J. Sadalage, Martin Fowler, Addison-Wesley.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the characteristics and real-world applications of Big Data, differentiating it from traditional data.	1,2,3,4,10,12
2	Demonstrate the use of Hadoop and Spark frameworks by executing basic data processing tasks.	1,2,3,4,10,12
3	Analyze and compare various NoSQL databases and their suitability for different types of Big Data storage requirements.	1,2,3,4,5,10,12
4	Evaluate different data preprocessing techniques and machine learning tools for effective Big Data analytics.	1,2,3,4,10,12
5	Design a real-time Big Data analytics pipeline using cloud-based solutions and ensuring data security and privacy.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS318R	**Big Data Analytics**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

<table>
<tr><th colspan="9">SEMESTER – VI</th></tr>
<tr><td>Course Title</td><td colspan="8">Project I</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTCS323R</td><td rowspan="2">Total credits: 4
Total hours: 120P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>8</td><td>0</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>Pre-requisite</td><td colspan="2">NIL</td><td>Co-requisite</td><td colspan="6">NIL</td></tr>
<tr><td>Programme</td><td colspan="8">Bachelor of Technology in Computer Science & Engineering</td></tr>
<tr><td>Semester</td><td colspan="8">Winter/ II semester of the third year of the program</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="8">1. Develop advanced technical skills through individual or group project work in engineering domains.
2. Enhance project management abilities, including workload management and meeting project deadlines effectively.
3. Improve presentation skills through seminar presentations and public demonstrations of project outcomes.</td></tr>
<tr><td>CO1</td><td colspan="8">Apply IT principles to solve real-world problems.</td></tr>
<tr><td>CO2</td><td colspan="8">Contribute to complex projects as a team member.</td></tr>
<tr><td>CO3</td><td colspan="8">Apply programming languages and platforms to develop software and hardware solutions.</td></tr>
<tr><td>CO4</td><td colspan="8">Demonstrate personal and team management skills in software development.</td></tr>
<tr><td>CO5</td><td colspan="8">Cultivate employability skills and professionalism commitment.</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to:
1. Perform a literature search to review current knowledge and developments in the chosen technical area;
2. Undertake detailed technical work in the chosen area using one or more of:
a. theoretical studies
b. computer simulations
c. hardware construction;
3. Produce progress reports or maintain a professional journal to establish work</td><td>120</td><td colspan="3">Demonstrate proficiency in conducting literature reviews, performing technical work, maintaining progress reports, delivering seminars, preparing formal reports, and presenting project outcomes effectively.</td><td>2,3,4,5,6</td></tr>
</table>

	completed, and to schedule additional work within the time frame specified for the project; 4. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 5. Prepare a formal report describing the work undertaken and results obtained so far; and 6. Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.			

REFERENCE BOOKS:

R25: "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams

R26: "Doing Your Research Project: A Guide for First-Time Researchers" by Judith Bell and Stephen Waters

R27: "How to Write a Thesis" by Umberto Eco

R28: "Effective Project Management: Traditional, Agile, Extreme" by Robert K. Wysocki

R29: "Writing for Computer Science" by Justin Zobel

R30: "The Elements of Style" by William Strunk Jr. and E.B. White

R31: "Python Crash Course" by Eric Matthes (if applicable for coding projects)

R32: "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett (if applicable for data science projects).

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply IT principles to solve real-world problems.	1,2,3,4,5,6,7,8,9,10,11,12
2	Contribute to complex projects as a team member.	1,2,3,4,5,6,7,8,9,10,11,12

3	Apply programming languages and platforms to develop software and hardware solutions.	1,2,3,4,5,6,7,8,9,10,11,12
4	Demonstrate personal and team management skills in software development.	1,2,3,4,5,6,7,8,9,10,11,12
5	Cultivate employability skills and professionalism commitment.	1,2,3,4,5,6,7,8,9,10,11,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS323R	**Project**	CO1	3	3	2	3	2	1	1	2	3	2	2	3
		CO2	3	3	3	3	2	1	1	2	3	2	2	3
		CO3	3	2	3	2	3	1	1	2	3	3	2	3
		CO4	3	2	2	2	2	1	1	2	3	3	3	3
		CO5	3	3	3	3	3	1	3	2	3	3	2	3

SEMESTER – VI									
Course Title	**Techno Professional Skills V**								
Course code	**22BTCS324R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Technology in Computer Science & Engineering**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To reinforce fundamental Computer Science & Engineering concepts ensuring a strong foundation in core concepts. 2. To enhance problem-solving skills through practical exercises and applications. 3. To foster critical thinking and creativity, promoting analytical and research abilities.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming, Data Structure and Algorithms.	**6**	Develop proficiency in implementing algorithms and data structures in C programming language, enhancing problem-solving skills.	**2,3**
II	Analog and Digital Electronic Circuits.	**6**	Gain understanding of analog and digital electronic circuits, their design principles, and practical applications.	**2,4**
III	Computer Organization and Architecture, Operating Systems.	**6**	Comprehend the organization and architecture of computers, including CPU, memory, and I/O devices, as well as the fundamentals of operating systems.	**2,4**
IV	Database Management Systems, Object Oriented Programming.	**6**	Acquire knowledge of database management systems, object-oriented programming principles, and their integration in software development.	**2,3**
V	Formal Language and Automata.	**6**	Understand formal languages, automata theory, and their applications in computer science, enhancing theoretical understanding.	**2,4**

REFERENCE BOOKS:

R33: "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

R34: Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

R35: Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.

R36: M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.

R37: Horowitz andSahni, Fundamentals of Data Structures in C, University Press.

R38: S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.

R39: Stallings, Computer Organization & Architecture, Pearson.

R40: Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.

R41: C. K. Nagpal, Formal Languages and Automata Theory, Oxford University Press.

R42: Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, McGraw Hill.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses.	1,2,3,4,5,9,10,11,12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice.	1,2,3,4,5,9,10,11,12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,9,10,11,12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,9,10,11,12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,9,10,11,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCS32 4R	**Techno Professio nal Skills V**	CO 1	2	2	3	2	2				3	2	3	3
		CO 2	3	2	3	2	2				2	2	3	3
		CO 3	3	2	3	3	3				3	2	3	2
		CO 4	3	2	3	1	3				2	2	3	2
		CO 5	3	2	3	3	3				2	2	2	2

SEMESTER – VI									
Course Title	**CORPORATE PROFICIENCY FOR ENGINEERS (Communicative English & Soft Skills)**								
Course code	**22UBPD324R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**22UBPD314R Competent English For Engineers**	**Co-requisite**	**NIL**						
Programme	**B.Tech in Civil Engineering/B.Tech in Mechanical Engineering/B.Tech in Computer Science and Engineering/ B.Tech in Computer Science and Engineering (B)/ B.Tech in Mechanical Engineering (B)/ B.Tech in Civil Engineering (B)/ B.Tech in Computer Science and Engineering on Cloud Technology and Information Security**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. To introduce students with the various tools of effective presentation. 2. To instruct, influence, engage, educate, or entertain the listeners. 3. Students will be having corrected resumes &will be having a better knowledge about how to upload data in social media also how to promote self. 4. To find new, innovative ways of developing and managing people. 5. To prepare the students for the campus drives & walking interviews. 6. To gain confidence with the chance to reflect on their non-verbal and verbal communication abilities.								
CO1	Construct coherent and concise technical reports, demonstrating advanced written communication skills in English.								
CO2	Apply effective verbal communication strategies in professional settings, such as meetings and presentations.								
CO3	Evaluate and analyze complex technical documents, showcasing a high level of English language comprehension.								
CO4	Demonstrate proficiency in using appropriate corporate English vocabulary and language conventions in engineering contexts.								
CO5	Synthesize and communicate engineering concepts clearly and persuasively in English, fostering effective collaboration in a corporate environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Presentation Skills** i. Introduction ii. Essential characteristics of a good presentation iii. Preparation of a good presentation	**12**	Develop the ability to prepare and deliver effective presentations by understanding essential characteristics and techniques.	**2,3**

II	**Leadership & Management Skills** i. Concepts of Leadership, ii. Leadership Styles, iii. Manager VS Leader, iv. How to be an Effective Leader, v. Mock/ Practice Session, vi. Doubt Clearing Session.	**12**	Gain insights into leadership concepts, styles, and the differences between managers and leaders, and learn how to be an effective leader.	**2,3,4**
III	LinkedIn Profile	**12**	Understand the importance of a professional LinkedIn profile and learn how to optimize it to enhance career opportunities.	**2**
IV	Emotional Intelligence	**12**	Develop emotional intelligence by recognizing and managing emotions effectively, leading to improved interpersonal relationships.	**2,3**
V	Mock Screening	**12**	Gain practical experience and feedback through mock screening sessions, enhancing interview skills and confidence.	**3,5**

TEXT BOOKS:

T1: Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.
T2: McDowell, Gayle Laakmann. 2008. Cracking the Coding Interview (IndianEdition)
T3: Adair, John.(2013)Develop Your Leadership Skills (Creating Success, 134), KoganPage

REFERENCE BOOKS:

R43: Picardi, Dr. Carrie. (2021) Leadership Essentials You Always Wanted to Know , Vibrant Publishers
R44: Whetten D. (2011) Developing Management Skills, Prentice Hall India Learning Private Limited

OTHER LEARNING RESOURCES:

1. https://youtu.be/4vetoRA3WUA
2. https://youtu.be/bgFNTuRYtKE

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Construct coherent and concise technical reports, demonstrating advanced written communication skills in English.	1,2,3,4,5,10,12
2	Apply effective verbal communication strategies in professional settings, such as meetings and presentations.	1,2,3,4,5,10,12
3	Evaluate and analyze complex technical documents, showcasing a high level of English language comprehension.	1,2,3,4,5,10,12
4	Demonstrate proficiency in using appropriate corporate English vocabulary and language conventions in engineering contexts.	1,2,3,4,5,10,12
5	Synthesize and communicate engineering concepts clearly and persuasively in English, fostering effective collaboration in a corporate environment.	1,2,3,4,5,10,12

MAPPING TABLE

Course code	Course Name	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22UBPD324R	**Corporate Proficiency For Engineers**	CO 1	1	1	1	1	1					3		2
		Co 2	1	1	1	1	1					3		2
		CO 3	1	1	1	1	1					3		2
		CO 4	1	1	1	1	1					3		2
		CO 5	1	1	1	1	1					3		2

SEMESTER – VI									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC321**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15P	0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**All UG Programmes**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Foster social and soft skills: Develop interpersonal abilities and enhance communication and collaboration among learners. 2. Promote holistic development: Encourage overall growth by engaging students in diverse extracurricular activities and experiences. 3. Cultivate 360-degree learning: Implement a comprehensive approach to education that integrates academics with practical experiences and skill development.								
CO1	Active participation in club activities: Students engage in various clubs like dance, music, and photography, fostering their interests and talents.								
CO2	Representation in competitions: Students represent the institution at inter-university, state, and national competitions, showcasing their skills.								
CO3	Exposure to expert guidance: Learners benefit from workshops conducted by renowned personalities, enhancing their knowledge and skills.								
CO4	Skill development through workshops: Students gain practical insights and expertise in their fields of interest through hands-on workshops.								
CO5	Overall growth and development: The course facilitates the holistic development of students, nurturing their talents and capabilities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the	**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

	platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Active participation in club activities: Students engage in various clubs like dance, music, and photography, fostering their interests and talents.	1,2,3,4,5,6,10,12
2	Representation in competitions: Students represent the institution at inter-university, state, and national competitions, showcasing their skills.	1,2,3,4,5,6,10,12
3	Exposure to expert guidance: Learners benefit from workshops conducted by renowned personalities, enhancing their knowledge and skills.	1,2,3,4,5,6,10,12
4	Skill development through workshops: Students gain practical insights and expertise in their fields of interest through hands-on workshops.	1,2,3,4,5,6,10,12
5	Overall growth and development: The course facilitates the holistic development of students, nurturing their talents and capabilities.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBCC321	**CO CURRICULAR ACTIVITIES**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – VI									
Course Title	**EXTRA CURRICULAR ACTIVITIES**								
Course code	**22UBEC321**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**NIL**	**Co-requisite**	**NIL**						
Programme	**All UG Programmes**								
Semester	**Winter/ II semester of the third year of the program**								
Course Objectives (Minimum 3)	4. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 5. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 6. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**60**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	**2,3**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,6,10,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,6,10,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,6,10,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,6,10,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,6,10,12

MAPPING TABLE

Course code	Course Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22UBEC321	**EXTRA CURRICULAR ACTIVITIES**	CO1	2	2	2	1	2	2				2		2
		CO2	2	2	2	1	2	3				2		2
		CO3	1	1	2	1	2	2				3		3
		CO4	2	2	2	1	2	2				2		2
		CO5	1	1	1	1	2	1				1		3

SEMESTER – VI									
Course Title	**Data Science**								
Course code	**22BTCS325R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**2**	**0**	**1**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**VI semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Develop Proficiency in Key Data Science Tools and Programming Languages. 2. Understand and apply Fundamental Statistical and Machine Learning Methods. 3. Cultivate Critical Thinking and Problem-Solving Skills in a Data-Driven Context.								
CO1	Master Core Data Science Concepts and Techniques.								
CO2	Develop Proficiency in Programming for Data Science.								
CO3	Apply Machine Learning and Predictive Analytics.								
CO4	Enhance Skills in Data Wrangling and Visualization.								
CO5	Execute a Capstone Data Science Project.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Foundations of Data Science:** Overview of data science, its significance, and application across various sectors. Introduction to the data science workflow: data collection, cleaning, analysis, and visualization.	**7**	Apply data analysis techniques to interpret, visualize, and make data-driven decisions	3, 4, 5, 6
II	**Statistical Methods and Data Manipulation:** Essential statistics for data science, probability theory, data summarization, and visualization techniques. Introduction to programming with Python and R for data manipulation using Pandas, NumPy, and dplyr.	**8**	Analyze and manipulate datasets using statistical methods to derive meaningful insights and inform decision-making.	4, 5, 6
III	**Machine Learning Techniques:** Supervised learning models (regression, decision trees, SVMs), unsupervised learning models (clustering, PCA), and model evaluation metrics. Introduction to machine learning algorithms implementation using scikit-learn.	**10**	Develop, implement, and evaluate machine learning models to solve real-world problems.	4, 5, 6
IV	**Advanced Data Science Concepts:** Deep learning with TensorFlow, natural language processing basics, and introduction to big data technologies like Hadoop and Spark. Real-world applications and case studies.	**12**	Master advanced techniques for analysing complex data, optimizing models, and deriving actionable insights.	5, 6

V	**Capstone Project in Data Science:** Application of data science processes to a real-world problem. Project phases include problem identification, data acquisition, pre-processing, modeling, analysis, and presentation of results.	**8**	Design, execute, and present a comprehensive data science project addressing a real-world problem.	5, 6
Practical Component				
Practical 1	Data Collection and Cleaning	3	Apply techniques to gather and pre-process data for analysis.	3
Practical 2	Data Visualization	**3**	Create visual representations to explore and present data insights.	3
Practical 3	Introduction to Data Science Workflow	3	Understand and apply the steps in the data science workflow.	3
Practical 4	Descriptive Statistics and Visualization	**3**	Compute summary statistics and visualize data distributions.	3
Practical 5	Probability Theory and Hypothesis Testing	3	Apply probability concepts and conduct hypothesis tests.	4
Practical 6	Data Manipulation with Pandas and NumPy	**3**	Use Pandas and NumPy for data manipulation and analysis.	3
Practical 7	Linear Regression	3	Implement and evaluate linear regression models.	4
Practical 8	Clustering with K-Means	**3**	Apply K-Means clustering for unsupervised learning tasks.	4
Practical 9	Decision Trees and Random Forest	3	Construct and compare decision tree and random forest models.	4
Practical 10	Deep Learning with TensorFlow	**3**	Develop and evaluate deep learning models using TensorFlow.	4

TEXT BOOKS:

T1 Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, Foster Provost and Tom Fawcett, 1st Edition, 2013.

T2 Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", Wes McKinney, 2nd Edition, 2017.

T3 Pattern Recognition and Machine Learning", Christopher M. Bishop, 1st Edition, 2006.

REFERENCE BOOKS:

R1 An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, 2nd Edition, 2021.

R2 Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 1st Edition, 2012.

R3 Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, and Christopher J. Pal, 4th Edition, 2016.

R4 Big Data: Principles and Best Practices of Scalable Realtime Data Systems, Nathan Marz and James Warren, 1st Edition, 2015

Additional Resources:

- SKaggle - https://www.kaggle.com/

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Master Core Data Science Concepts and Techniques.	1, 2, 3, 4, 10, 12
2	Develop Proficiency in Programming for Data Science.	1, 2, 3, 4, 10, 12
3	Apply Machine Learning and Predictive Analytics.	1, 2, 3, 4, 5, 10, 12
4	Enhance Skills in Data Wrangling and Visualization.	1, 2, 3, 4, 10, 12
5	Execute a Capstone Data Science Project.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS325R	Data Science	CO1	2	2	1	3						1		2
		CO2	2	2	1	3						1		2
		CO3	3	3	3	3	3					1		3
		CO4	3	3	3	3						1		3
		CO5	3	3	3	3	3					1		3

SEMESTER – VII									
Course Title	**Software Engineering**								
Course code	**22BTCS411R**	**Total credits: 3** **Total hours: 43** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basic Computer Science**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To help students to understand theories,methods, and technologies applied for professional software development. 2.To discussthe concepts of software products and software processes. 3. To make proper documentation for Software development work								
CO1	Demonstrate ethical software development practices								
CO2	Apply systems development lifecycle phases effectively.								
CO3	Elicit, analyze, and specify software requirements collaboratively								
CO4	Create and evaluate standard procedures and documentation.								
CO5	Collaborate productively in interdisciplinary software project teams.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction: Lifecyclemodels Function oriented software design: Structured analysis and structured design.	**13**	Compare and contrast various software development life cycle models and structured design techniques.	1,2
II	Software requirements, analysis and specification: Informal and formal specification.	**12**	Analyze and document software requirements using informal and formal specification methods.	1,2
III	ObjectOrientedDesign: User interface design, GUI design primitives, Window management system and the XWindows system Coding and Testing: Codingstandardandunit testing.	**7**	Design object-oriented systems, develop user interfaces, apply coding standards, and conduct unit testing.	1,2
IV	Projectmanagement: Estimation, scheduling, risk management and configuration management.	**6**	Estimate resources, create schedules, manage risks, and implement configuration management in projects.	1,2
V	Softwarereliabilityandqualityassurance Reliability metrics and growth modelling, ISO-9000,SEIand CMM.	**5**	Apply reliability metrics, growth models, and quality assurance standards like ISO-9000 and CMM.	1,2

TEXT BOOKS:

T1. An IntegratedApproachtoSoftwareEngineeringbyJalote.NarosaPublishingHouse.

T2. SoftwareEngineeringbyR.Mall,PHI.

REFERENCE BOOKS:

R1. SoftwareEngineeringbyR.S.Pressman, McGraw Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate ethical software development practices	1,2,3,4,5,9,11 and 12
2	Apply systems development lifecycle phases effectively.	1,2,3,4,5,9,11 and 12
3	Elicit, analyze, and specify software requirements collaboratively	1,2,3,4,5,9,11 and 12
4	Create and evaluate standard procedures and documentation.	1,2,3,4,5,9,11 and 12
5	Collaborate productively in interdisciplinary software project teams.	1,2,3,4,5,9,11 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS411R	**Software Engineering**	CO 1	2	2	3	2	2				3		3	3
		CO 2	3	2	3	2	2				2		3	3
		CO 3	3	2	3	3	3				3		3	2
		CO 4	3	2	3	1	3				2		3	2
		CO 5	3	2	3	3	3				2		2	2

SEMESTER – VII									
Course Title	**PE- IV: Data Handling and Visualization**								
Course code	**22BTCS414R**	**Total credits: 5** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. Gain understanding of the significance of data visualization in IT applications. 2. Develop proficiency in using R programming and Python for data analysis and visualization. 3. Learn to utilize data visualization libraries such as ggplot2 (R) and Matplotlib (Python).								
CO1	Understand the importance of data visualization in IT applications and its role in decision-making processes.								
CO2	Demonstrate proficiency in using R programming and Python for data analysis and visualization tasks.								
CO3	Utilize data visualization libraries like ggplot2 (R) and Matplotlib (Python) to create customized visualizations.								
CO4	Design clear and persuasive visualizations using principles of effective data presentation and storytelling..								
CO5	Utilize interactive data visualization tools like Cognos to create dynamic visualizations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Data Visualization and R Programming:** Understanding the importance of data visualization in IT applications. Overview of R programming for data analysis and visualization. Introduction to data visualization libraries: ggplot2 (R) and Matplotlib (Python). Basic plotting techniques and data representation in R and Python. Hands-on exercises with simple plots and data visualization examples.	**12**	Understand the importance of data visualization, and basic plotting techniques using R and Python.	1,2 and 3

II	**Advanced Data Visualization Techniques:** Advanced Features of ggplot2 for Customized Plots in R. Customizing Plot Aesthetics and Themes in ggplot2.. Introduction to Interactive Data Visualization Tools: Cognos. Creating Interactive Visualizations using Cognos. Hands-on Exercises: Advanced Plotting Techniques and Interactive Visualizations.	**12**	Utilize advanced features of ggplot2 and interactive tools like Cognos for customized and interactive visualizations.	3
III	**Maps, Geospatial Data Visualization, Export Features:** Introduction to Folium. Maps with Markers, Choropleth Maps. Export Feature – Data Visualization. Generating a PNG picture. Generating PDF documents Multiple graphs plotting and export. Inserting subfigure Hypothesis and Gradient Descent. Understanding Hypothesis. Implementation of hypothesis in Python. Gradient Descent Implementation	**8**	Create geospatial visualizations using Folium and export visualizations as images and documents.	1,2,3
IV	**Visualization by using Seaborn Library:** Relational plot: Dist Plot, Line Plot, Lmplot . Categorical plot: Stripplot, Swarmplot,Barplot, Countplot, Boxplot, Violinplot, Stripplot Distribution plot: Joinplot, Distpot, Pairplot, Rugplot. Regression plot: Simple Linear plot with additional parameters (hue and markers), Setting size and color of the plot, Displaying multiple plots, Size and aspect ratio of plots. Matrix plot: Heatmaps, Cluster Maps. Style and Color: Set the background to be white, Set the background to be ticks, Set the background to be darkgrid, Set the background to be whitegrid. Remove axes spine: Despine Size and aspect: Non grid plot, Grid type plot Scale and Context: Poster,	**4**	Implement various types of plots and customize visualizations using Seaborn in Python.	1,2,3,4

	paper, notebook and talk			
V	**Application of Data Visualization in Engineering:** Case studies demonstrating data visualization . Visualizing datasets & Creating dashboards for analysis Real-world applications and projects.	**4**	Apply data visualization techniques to real-world engineering problems and create dashboards for data analysis.	3,5,6

TEXT BOOKS:

T1: Data Visualization with R" by Carson Sievert and Chris Parmer

T2: Python Data Visualization Cookbook" by Igor Milovanović

REFERENCE BOOKS:

R1: Interactive Data Visualization for the Web" by Scott Murray

R2: Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole NussbaumerKnaflic.

OTHER LEARNING RESOURCES:

1. IBM Cognos Analytics
2. R Programming Tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the importance of data visualization in IT applications and its role in decision-making processes.	1,2,3,4,10 and 12
2	Demonstrate proficiency in using R programming and Python for data analysis and visualization tasks.	1,2,3,4,10 and 12
3	Utilize data visualization libraries like ggplot2 (R) and Matplotlib (Python) to create customized visualizations.	1,2,3,4,5,10 and 12

4	Design clear and persuasive visualizations using principles of effective data presentation and storytelling..	1,2,3,4,10 and 12
5	Utilize interactive data visualization tools like Cognos to create dynamic visualizations.	1,2,3,4,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS414R	**PE- IV: Data Handling and Visualization**	CO 1	2	2	1	3						1		2
		CO 2	2	2	1	3						1		2
		CO 3	3	3	3	3	3					1		3
		CO 4	3	3	3	3						1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VII									
Course Title	**Professional Elective-IV: Computer Vision**								
Course code	**22BTCS414R**	**Total credits: 5** **Total hours: 45** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. Introduce the fundamental problems of Computer Vision and image formation. 2. Provide understanding of techniques, mathematical concepts and algorithms used in computer vision to facilitate further study in this area. 3. Provide pointers into the literature and exercise a project based on a literature search and one or more research papers.								
CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.								
CO2	Describe known principles of human visual system and computer vision system.								
CO3	Describe methods of computer vision related to multi-scale representation, edge detection and detection of other primitive.								
CO4	Use computer vision algorithm for 3D construction, stereo, motion and object recognition.								
CO5	Develop proficiency in object recognition principles, applying machine learning for detection, training deep learning models, evaluating performance metrics, and utilizing relevant frameworks for practical computer vision applications.								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	Introduction: Image Processing & Computer Vision, What is Computer Vision - Low-level, Mid-level, High-level. Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.		**7**	Understand the fundamentals of computer vision and explore diverse applications such as object recognition and medical image analysis.					1
II	Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular		**10**	Describe image formation models including monocular and binocular systems, camera calibration, and 3D model					1,2

	imaging systems, Multiple views geometry, Structure determination, shape from shading, Depth from Defocus, Construction of 3D model from images.		construction from images.	
III	Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Edge detection. Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.	**10**	Implement image preprocessing techniques, edge detection, and motion estimation methods like optical flow and stereo vision.	2,3
IV	Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis	**8**	Apply various shape representation and segmentation techniques including contour-based, region-based, and deformable models like snakes and level sets.	2,3
V	This unit covers principles and techniques of object recognition and the application of machine learning in computer vision. Topics include feature extraction methods for object detection, classification algorithms, and training of recognition models. Students will explore supervised and unsupervised learning techniques, neural networks, and deep learning architectures specifically designed for image analysis. The unit also addresses the evaluation of model performance using various metrics and validation techniques, providing hands-on experience with popular machine learning frameworks and libraries.	**10**	Understand and apply object recognition techniques and machine learning algorithms in computer vision applications.	1,2,3,4

TEXT BOOKS:

T1:Szeliski R., "Computer Vision: Algorithms and Applications", Springer, 2010.
T2. Richard Szeliksy., "Computer Vision: Algorithms and Applications", Springer, 2020.
T3. Davies, E.Roy., "Computer and machine vision: theory, algorithms, practicalities" Academic Press, 2017.

REFERENCE BOOKS:

R1: "Concise computer vision" by R. Klette, Reinhard, Springer, London, 2014.

R2. “Digital Image Processing”, by R. Gonzalez and R. Woods, 4th edition, Pearson, 2017.
R3. “Computer Vision: Advanced Techniques and Applications” , by S. Holden, CLANRYE International, 2019.

OTHER LEARNING RESOURCES:

1. https://nptel.ac.in/courses/117105079
2. https://nptel.ac.in/courses/106105216/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.	1,2,3,4,5,10 and 12
2	Describe known principles of human visual system and computer vision system.	1,2,3,4,5,10 and 12
3	Describe methods of computer vision related to multi-scale representation, edge detection and detection of other primitive.	1,2,3,4,5,10 and 12
4	Use computer vision algorithm for 3D construction, stereo, motion and object recognition.	1,2,3,4,5,10 and 12
5	Develop proficiency in object recognition principles, applying machine learning for detection, training deep learning models, evaluating performance metrics, and utilizing relevant frameworks for practical computer vision applications.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS414R	**Professional Elective-IV: Computer Vision**	CO 1	3	3	3	2	3					1		3
		CO 2	2	2	2	2	2					1		2
		CO 3	3	2	3	2	3					1		3
		CO 4	3	3	3	2	3					1		3
		CO 5	3	3	3	3	3					1		3

SEMESTER – VII									
Course Title	**PE-V: Predictive Analysis**								
Course code	**22BTCS416R**	**Total credits: 5** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming knowledge**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To familiarize the students with various Statistical Data Analysis tools 2. Tools that can be used for effective decision making. 3. To make student handle data with various meters								
CO1	Understand and critically apply the concepts and methods of Predictive analytics.								
CO2	Understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.								
CO3	Applying and analysing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.								
CO4	Get exposed to the testing of hypothesis and solving assumptions								
CO5	Understanding of IBM Watson Studio with Machine Learning Model.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**ANALYTICS OVERVIEW** What is Predictive Analysis, how predictive model works, why predictive modeling, what are the models in Predictive Analysis. How Predictive analytics: Transforming data into future insights, Analytics trends: Past, Present & Future, Towards a Predictive enterprise.	**8**	Understand predictive analysis principles, predictive models, and their application in transforming data into future insights.	1,2
II	**Statistical Analysis** Define Statistics and its types, Measures of Central Value; Mean, Median and Mode, Measures of Dispersion: Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness, Kurtosis.	**8**	Define statistics, its types, and key measures such as mean, median, mode, and various measures of dispersion.	1,2

III	**DATA MINING** What is a Data Mining applications? Strategy for data mining: CRISP-DM, Steps of Data Mining, Stages and tasks in CRISP-DM, Life Cycle of a Data Mining Project, Skills Needed for Data Mining. Identify nodes and streams, The framework of a Data – mining project, Brief the unit of analysis, Explain the type of dialog box.	**8**	Explain data mining applications, strategy using CRISP-DM, stages in a data mining project, and required skills.	2,3
IV	**UNIT OF ANALYSIS** Concepts of Unit of analysis (Distinct, Aggregate, SetToFlag), Integrate data, CLEM Expression, Role of Relationship between two fields, Identifying the modeling objective.	**8**	Define unit of analysis concepts (distinct, aggregate, SetToFlag), integrate data using CLEM Expression, and identify modeling objectives.	2,3
V	**PREDICTIVE ANALYTICS WITH IBM WATSON STUDIO** Understanding of IBM Cloud, IBM Watson Studio, Watson studio Components, Creating a Machine Learning Model, Data preparation, Watson Machine learning, Data Refinery, Watson Studio Neural Network Modeler, IBM Watson Studio jobs, Use case with AutoAI.	**8**	Utilize IBM Watson Studio for machine learning model creation, data preparation, Watson Machine Learning, Data Refinery, Neural Network Modeler, and AutoAI use cases.	1,2,5,6

TEXT BOOKS:

T1: Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL

REFERENCE BOOKS:

R1: "Applied Predictive Modeling" by Max Kuhn and KjellJohnsonDatabase Management Systems
R2: "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
R3: "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" by Eric Siegel

OTHER LEARNING RESOURCES:

4. https://www.ibm.com/topics/predictive-analytics

5. https://www.simplilearn.com/what-is-predictive-analytics-article

6. https://www.ibm.com/products/watson-studio

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand and critically apply the concepts and methods of Predictive analytics.	1,2,3,4,5,10 and 12
2	Understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.	1,2,3,4,5,10 and 12
3	Applying and analysing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.	1,2,3,4,5,10 and 12
4	Get exposed to the testing of hypothesis and solving assumptions	1,2,3,4,5,10 and 12
5	Understanding of IBM Watson Studio with Machine Learning Model.	1,2,3,4,5,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
22BTCS41 6R	**PE-V: Predictive Analysis**	CO 1	2	2	1	1	1					1		2
		CO 2	3	3	3	3	2					2		3
		CO 3	3	2	3	3	3					2		3
		CO 4	2	2	2	2	2					2		2
		CO 5	2	2	3	2	2					2		3

SEMESTER – VII									
Course Title	**PE-V: Social Network Analysis**								
Course code	**22BTCS416R**	**Total credits: 3** **Total hours: 40** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To understand the concept of semantic web and related applications. 2. To learn knowledge representation using ontology. 3. To understand human behavior in social web and related communities. 4. To learn visualization of social networks. 5. To have access to a variety of descriptive measures for networks and software to calculate them, and have the ability to interpret the results.								
CO1	Understand the limitations of the current web and the rationale behind the development of the Semantic Web and Social Web.								
CO2	Demonstrate proficiency in ontology-based knowledge representation for the Semantic Web, using ontology languages such as RDF and OWL.								
CO3	Extract and analyze the evolution of web communities from web archives, apply community detection algorithms, and evaluate community structures in dynamic social networks.								
CO4	Analyze and predict human behavior within social communities, manage user data securely, and address privacy concerns.								
CO5	Apply graph theory, centrality measures, clustering techniques, and various visualization methods to analyze and interpret social networks.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**INTRODUCTION** Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.	**15**	Understand the evolution from the current web to the Semantic Web and Social Web, and apply key concepts in social network analysis to electronic discussion networks and online communities.	1

II	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION** Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.	**7**	Explain the role of ontology in the Semantic Web and apply ontology languages (RDF, OWL) for modeling social individuals and relationships, and advanced data representation techniques.	3
III	**EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS** Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities.	**6**	Extract and analyze web community evolution from archives, employ community detection algorithms, and evaluate community structures in dynamic social networks.	5
IV	**PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES** Understanding and predicting human behavior for social		Predict human behavior in social networks, manage user data, address privacy concerns, and implement trust models and security measures in online social	4

	communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and counter measures.	**6**	environments.	
V	**VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS** Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks..	**6**	Apply graph theory, centrality measures, and clustering techniques to visualize and interpret online social networks, using various visualization methods for collaboration, co-citation, and community welfare applications.	3

TEXT BOOKS:

T1 Peter Mika, ―Social Networks and the Semantic Web, First Edition, Springer 2007.

T2 BorkoFurht, ―Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010

REFERENCE BOOKS:

R1 Guandong Xu ,Yanchun Zhang and Lin Li,-Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.

R2 Dion Goh and Schubert Foo,-Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.

R3 Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.

R4John G. Breslin, Alexander Passant and Stefan Decker, -The Social Semantic Web, Springer, 2009.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the limitations of the current web and the rationale behind the development of the Semantic Web and Social Web.	1,2,3,4,5,6,10 and 12
2	Demonstrate proficiency in ontology-based knowledge representation for the Semantic Web, using ontology languages such as RDF and OWL.	1,2,3,4,5,6,10 and 12
3	Extract and analyze the evolution of web communities from web archives, apply community detection algorithms, and evaluate community structures in dynamic social networks.	1,2,3,4,5,6,10 and 12
4	Analyze and predict human behavior within social communities, manage user data securely, and address privacy concerns.	1,2,3,4,5,6,10 and 12
5	Apply graph theory, centrality measures, clustering techniques, and various visualization methods to analyze and interpret social networks.	1,2,3,4,5,6,10 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS416R	**PE-V: Social Network Analysis**	CO 1	2	2	1	1	1	2				1		2
		CO 2	3	3	3	3	2	2				2		3
		Co 3	3	2	3	3	3	2				2		3
		CO 4	2	2	2	2	2	3				2		2
		Co 5	2	2	3	2	2	2				2		3

SEMESTER – VII									
Course Title	**Project II**								
Course code	**22BTCS412R**	**Total credits: 6** **Total hours: 156** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**12**	**0**	**0**	**0**	**6**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech. CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To develop the knowledge, skills and attitudes of a professional Computer engineering professional. 2. To become confident in designing engineering solutions to complex software problems utilising a systems approach.								
CO1	Apply IT principles for real-world problem-solving using programming languages and network solutions.								
CO2	Contribute to complex projects as a team member, demonstrating effective personal and team management.								
CO3	Develop programming skills to create and assess software, hardware, and network solutions								
CO4	Apply personal and team management skills as a professional software developer.								
CO5	Cultivate employability skills and uphold professionalism in software development.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to: 1. Perform a literature search to review current knowledge and developments in the chosen technical area; 2. Undertake detailed technical work in the chosen area using one or more of: o theoretical studies o computer simulations o hardware construction; 3. Produce progress reports or maintain a professional journal to establish work	**156**	This course is designed as an individual or small group project under the guidance of academic staff. Students will embark on projects aligned with their and their supervisors' common interests and expertise. The course entails several key components: firstly, conducting a thorough literature search to review current knowledge and developments in their chosen technical area. Secondly, students will engage in detailed technical work, utilizing theoretical studies, computer simulations, or hardware construction techniques as appropriate to their project goals. Throughout the course,	3,5 and 6

	completed, and to schedule additional work within the time frame specified for the project; 4. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 5. Prepare a formal report describing the work undertaken and results obtained so far; and Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.		students will document their progress through regular progress reports or a professional journal, ensuring they stay on track within the project's specified timeframe. Furthermore, students will deliver a seminar presentation to communicate their understanding of the general area of work and highlight their specific contributions to the field. They will also prepare a formal report detailing the scope of their work, methods employed, and results obtained thus far. Finally, the course culminates in a forum where students will present their work through poster presentations and demonstrations, showcasing operational hardware and software developed or utilized during their project. This integrated approach equips students not only with technical skills but also with essential communication and presentation abilities necessary for effectively sharing their research findings in an academic and professional context.	

CO PO Mapping

SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply IT principles for real-world problem-solving using programming languages and network solutions.	1,2,3,4,5,6,7,8,9,10,11 and 12
2	Contribute to complex projects as a team member, demonstrating effective personal and team management.	1,2,3,4,5,6,7,8,9,10,11 and 12
3	Develop programming skills to create and assess software, hardware, and network solutions	1,2,3,4,5,6,7,8,9,10,11 and 12
4	Apply personal and team management skills as a professional software developer.	1,2,3,4,5,6,7,8,9,10,11 and 12
5	Cultivate employability skills and uphold professionalism in software development.	1,2,3,4,5,6,7,8,9,10,11 and 12

MAPPING TABLE

Course code	**Course Name**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
22BTCS412R	**Project-II**	CO 1	3	3	2	3	2	1	1	2	3	2	2	3
		CO 2	3	3	3	3	2	1	1	2	3	2	2	3
		CO 3	3	2	3	2	3	1	1	2	3	3	2	3
		CO 4	3	2	2	2	2	1	1	2	3	3	3	3
		Co 5	3	3	3	3	3	1	3	2	3	3	2	3

<table>
<tr><td colspan="10">SEMESTER – VII</td></tr>
<tr><td>Course Title</td><td colspan="9">Summer Internship</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTCS413R</td><td rowspan="2">Total credits: 3
Total hours: 45T+30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">B. Tech. CSE</td></tr>
<tr><td>Semester</td><td colspan="9">7TH SEMESTER OF FOURTH YEAR OF PROGRAM</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. Equip students with practical experience in their field of study, ensuring they are prepared to transition smoothly into industry roles by mastering modern tools, technologies, and industry-standard practices.
2. Enhance students' soft skills, including presentation, interpersonal communication, and documentation, as well as office etiquette, to ensure they can effectively navigate and contribute to professional environments.
3. Foster a deep understanding of professional and ethical responsibilities in engineering, encouraging students to adhere to industry best practices, processes, and regulations.
4. Promote the ability to work effectively in teams, especially within multidisciplinary contexts, emphasizing collaboration, communication, and the integration of diverse perspectives and expertise.
5. Cultivate a professional work ethic characterized by productivity, consistency, and punctuality, preparing students to meet the demands and expectations of the industry.</td></tr>
<tr><td>CO1</td><td colspan="9">Apply modern tools and technologies in real-world scenarios to solve complex engineering problems.</td></tr>
<tr><td>CO2</td><td colspan="9">Analyse industry-standard reporting methods to produce technical documents adhering to professional guidelines.</td></tr>
<tr><td>CO3</td><td colspan="9">Develop solutions using design, development, and testing practices aligned with current industry standards.</td></tr>
<tr><td>CO4</td><td colspan="9">Demonstrate effective communication, teamwork, and interpersonal skills in a multi-disciplinary team environment.</td></tr>
<tr><td>CO5</td><td colspan="9">Evaluate professional and ethical responsibilities to make informed decisions in engineering practices.</td></tr>
<tr><td>Unit-No.</td><td colspan="4">Content</td><td>Contact Hour</td><td colspan="2">Learning Outcome</td><td>KL</td></tr>
<tr><td>I</td><td colspan="4">• Summer internship shall be at least 90 hours during the summer vacation only.
• Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
• The student must fill up and get approved a Summer Internship Acceptance form</td><td></td><td colspan="2"></td><td></td></tr>
</table>

	by the company and provide it to the Coordinator of the department within the specified deadline. • Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed. • During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and also those of the University. • Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later. • The student shall submit two documents to the Coordinator for the evaluation of the summer internship: o Summer Internship Report o Summer Internship Assessment Form • Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted to the Coordinator by the first day of the new term. • The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report			

	will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester. • If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.			

TEXT BOOKS:

REFERENCE BOOKS:

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply modern tools and technologies in real-world scenarios to solve complex engineering problems.	1,2,3,4,5,6,9,10 and 12
2	Analyse industry-standard reporting methods to produce technical documents adhering to professional guidelines.	1,2,3,4,5,6,9,10 and 12
3	Develop solutions using design, development, and testing practices aligned with current industry standards.	1,2,3,4,5,6,9,10 and 12
4	Demonstrate effective communication, teamwork, and interpersonal skills in a multi-disciplinary team environment.	1,2,3,4,5,6,9,10 and 12
5	Evaluate professional and ethical responsibilities to make informed decisions in engineering practices.	1,2,3,4,5,6,8,9,10 and 12

MAPPING TABLE

Course code	Course Name		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS413R	Summer Internship	CO 1	3	3	3	3	3	3			2	1		2
		CO 2	2	2	3	3	2	2			2	1		2
		CO 3	2	2	3	2	2	2			2	1		2
		CO 4	3	3	3	3	3	3			2	3		2
		CO 5	2	2	2	2	2	2		3	2	1		2
		AVG	2.4	2.4	2.8	2.6	2.4	2.4		3	2	1.4		2

SEMESTER – VII									
Course Title	**Techno Professional Skills VI**								
Course code	**22BTCS125R**	**Total credits: 1** **Total hours: 26** **45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech. CSE**								
Semester	**7TH SEMESTER OF FOURTH YEAR OF PROGRAM**								
Course Objectives (Minimum 3)	1. To have a detailed revision of Computer Science & Engineering concepts learnt so far. 2. To become confident in Computer Science & Engineering concepts to solve problems in real-life situations.								
CO1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses								
CO2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice								
CO3	Gather knowledge about various development concepts and the theories of development.								
CO4	Encourage the students towards Non-traditional thinking.								
CO5	Effectively communicate scientific and technical knowledge in a professional manner.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	C Programming, Data Structure and Algorithms	6	Students will become proficient in C programming, mastering advanced features like pointers and file handling, and implementing data structures such as arrays, linked lists, stacks, queues, trees, and graphs. They will also apply fundamental algorithms for sorting, searching, and hashing, enabling them to develop efficient and optimized programs.	2,3
II	Analog and Digital Electronic Circuits	4	Students will gain a thorough understanding of analog and digital electronics, learning the operation and design of fundamental analog components and circuits,	2,3

			as well as digital concepts like binary numbers, logic gates, and sequential logic circuits. This knowledge will equip them to analyze, design, and troubleshoot electronic systems.	
III	Computer Organization and Architecture, Operating Systems	6	Students will understand computer systems' structure and functioning, including the CPU, memory, and I/O devices, and will analyze instruction sets and performance optimization techniques. They will also explore operating system concepts like process and memory management, CPU scheduling, and storage management, equipping them to manage system resources efficiently.	2,3
IV	Database Management Systems, Object Oriented Programming	6	Students will develop a strong foundation in database design, SQL, and ensuring database integrity and security, while also gaining proficiency in object-oriented programming principles such as classes, inheritance, and polymorphism. This unit prepares them to design robust software systems and manage complex databases effectively.	2,3
V	Formal Language and Automata	4	Students will understand the theoretical foundations of computer science through formal languages, grammars, and automata theory, analyzing different types of automata such as finite automata and Turing machines. This knowledge provides a deep understanding of	2,3

			computation limits and the formal frameworks underpinning programming languages and algorithms.	

TEXT BOOKS:

REFERENCE BOOKS:

R1. "Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
R2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
R3. Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill; Standard Edition.
R4. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
R5. Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.
R6. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press.
R7. Stallings, Computer Organization & Architecture, Pearson.
R8. Silberschatz, Galvin and Gagne, Operating System Concepts, Willey.
R9. C. K. Nagpal, Formal Languages and Automata Theory, Oxford University Press.
R10. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, McGraw Hill.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop highly skilled and knowledgeable management professional who can deal with various areas and aspects of businesses	1,2,3,4,5,6,7,8,9,10,11 and 12
2	Develop analytical and research ability as management professional who can be more efficient and innovative in practice	1,2,3,4,5,6,7,8,9,10,11 and 12
3	Gather knowledge about various development concepts and the theories of development.	1,2,3,4,5,6,7,8,9,10,11 and 12
4	Encourage the students towards Non-traditional thinking.	1,2,3,4,5,6,7,8,9,10,11 and 12
5	Effectively communicate scientific and technical knowledge in a professional manner.	1,2,3,4,5,6,7,8,9,10,11 and 12

MAPPING TABLE

Course code	Course Name		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
22BTCS125R	Techno Professional Skills VI	CO 1	3	3	3	2	3	1	1	1	1	1	1	1
		CO 2	2	2	2	2	2	1	1	1	1	1	1	1
		CO 3	3	2	3	2	3	1	1	1	1	1	1	1
		CO 4	3	3	3	2	3	1	1	1	1	1	1	1
		CO 5	3	3	3	3	3	1	1	1	1	1	1	1
		AVG	2.8	2.6	2.8	2.2	2.8	1	1	1	1	1	1	1

SEMESTER – VII									
Course Title	**Artificial Intelligence**								
Course code	**22BTCS413R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**2**	**0**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Computer Science & Engineering**								
Semester	**VII semester of the fourth year of the program**								
Course Objectives (Minimum 3)	1.Understand the fundamentals of artificial intelligence, including machine learning, neural networks, and natural language processing. 2.Explore real-world applications such as computer vision, autonomous vehicles, virtual assistants, and healthcare diagnostics. 3.Discuss the ethical implications of AI technologies, including bias in algorithms, privacy concerns, and the impact on employment and society.								
CO1	Understand key AI concepts, including machine learning and neural networks.								
CO2	Apply AI techniques to solve real-world problems effectively.								
CO3	Develop chatbot using IBM Watson service.								
CO4	Enhance problem-solving abilities with IBM Cloud service.								
CO5	Apply EDA to real-world data.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to AI:** fundamental concepts of Artificial Intelligence (AI). define AI and trace its historical evolution, highlighting its profound impact on various societal domains, exploring the different types of AI, distinguishing between Narrow AI, tailored for specific tasks, and General AI, which aims to mimic human intelligence.	**7**	Understand basic AI concepts, algorithms, and applications to solve simple problems.	2,3, 4
II	**Advanced Python and Data Visualization:** Introducing Numpy: learn the NumPy attribute and method Pandas: Introducing Pandas for data manipulation and analysis, explore Series, data frames, and operations like cleaning, filtering, and merging datasets efficiently. Matplotlib: create diverse plots, customize visualizations, and depict data trends, distributions, and relationships effectively.	**8**	Develop advanced Python skills to create complex data visualizations for effective communication of insights.	4, 5, 6
III	**Introduction to Machine Learning and Algorithms:** Understanding Machine Learning: exploring its definition and basic principles and learning about the types of machine learning tasks,	**10**	Understand and apply basic machine learning algorithms to analyze data and solve problems.	2, 3, 4

	including supervised, unsupervised, and reinforcement learning. Supervised Learning: Linear Regression, Logistic Regression: Unsupervised Learning: K-Means Clustering Additional Algorithms: Decision Trees, k-nearest Neighbors (kNN), Random Forest			
IV	**IBM Watson for Machine Learning and Bot Creation:** Introduction to IBM Watson: explore Watson Studio, IBM's integrated environment for data scientists, developers, and domain experts, to build and deploy ML models. Creating Bots using Watson Assistant: learn the basics of Watson Assistant, including intents, entities, dialog flows, and integration capabilities.	**12**	Utilize IBM Watson to develop machine learning models and create intelligent bots for various applications.	3, 4, 5
V	**IBM Natural Language Processing (NLP):** Introduction to NLP: learn the basics of natural language processing, and IBM's NLP services, such as Watson Natural Language Understanding (NLU) and Watson Discovery, for extracting insights from unstructured text data.	**8**	Apply IBM NLP techniques to analyze, interpret, and extract insights from textual data.	3, 4, 5
Practical Component				
Practical 1	Introduction to NumPy	3	Apply NumPy arrays and operations for efficient numerical computing.	3
Practical 2	Data Manipulation with Pandas	**3**	Use Pandas to manipulate and analyze datasets, including cleaning, filtering, and merging.	3
Practical 3	Data Visualization with Matplotlib	3	Create customized plots to visualize data trends, distributions, and relationships.	4
Practical 4	Linear Regression with Supervised Learning	**3**	Implement and evaluate linear regression models for predictive analytics.	4
Practical 5	Logistic Regression with Supervised Learning	3	Apply logistic regression for binary classification tasks.	4

Practical 6	K-Means Clustering with Unsupervised Learning	**3**	Perform clustering analysis to group data points based on similarities.	4
Practical 7	Decision Trees for Classification	3	Construct decision trees and interpret results for decision-making.	4
Practical 8	Perform clustering analysis to group data points based on similarities.	**3**	k-Nearest Neighbors (kNN) Algorithm	4
Practical 9	Random Forest for Ensemble Learning	3	Build and assess random forest models for improved predictive accuracy.	4
Practical 10	Building a Chatbot with Watson Assistant	**3**	Create a functional chatbot using Watson Assistant, integrating intents, entities, and dialog flows.	4

TEXT BOOKS:

T1 Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
T2 Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth
T3 Hands-On Artificial Intelligence for IBM Watson: Explore the Power of AI to Innovate and Transform Business Processes" by Dr. Harish Garg
T4 AI and Machine Learning" by Christopher M. Bishop

REFERENCE BOOKS:
R1 Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
R2 Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth
R3 Hands-On Artificial Intelligence for IBM Watson: Explore the Power of AI to Innovate and Transform Business Processes" by Dr. Harish Garg

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand key AI concepts, including machine learning and neural networks.	1, 2, 3, 4, 10, 12
2	Apply AI techniques to solve real-world problems effectively.	1, 2, 3, 4, 10, 12
3	Develop chatbot using IBM Watson service.	1, 2, 3, 4, 5, 10, 12
4	Enhance problem-solving abilities with IBM Cloud service.	1, 2, 3, 4, 10, 12

5	Apply EDA to real-world data.	1, 2, 3, 4, 10, 12

MAPPING TABLE

Course code	Course Name		PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS413R	**Artificial Intelligence**	CO1	2	2	1	3						1		2
		CO2	2	2	1	3						1		2
		CO3	3	3	3	3	3					1		3
		CO4	3	3	3	3						1		3
		CO5	3	3	3	3	3					1		3

SEMESTER – 8									
Course Title	**PE-VI: Natural Language Processing**								
Course code	**22BTCS127R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Explore human language processing paradigms, NLP phases, and text representation in computers. 2. Learn to leverage linguistic resources like corpora, Tree Bank, and tools such as GATE and NLTK for NLP tasks. 3. Acquire proficiency in language modeling, parsing, semantics, and discourse analysis, applying them to real-world NLP applications.								
CO1	Define human languages and NLP paradigms, applying comprehension skills to identify text representation schemes.								
CO2	Evaluate linguistic resources, demonstrating XML management proficiency using GATE and NLTK.								
CO3	Construct word recognition systems using regular expressions and Finite State Automata, applying N-gram models with proficiency.								
CO4	Analyze natural language structures, employing context-free grammars for syntactic parsing								
CO5	Justify NLP applications, integrating semantic analysis and discourse resolution techniques for diverse tasks.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction to Natural Language Processing	12	Learn fundamentals of NLP, including text processing, language models, sentiment analysis, and machine learning applications for natural language understanding	2,3
II	Linguistic Resources and Tools	10	Master use of linguistic resources and tools for analyzing, processing, and understanding language data effectively and efficiently.	2, 3
III	Language Modeling and Analysis	8	Understand and apply techniques for building, evaluating, and utilizing language models for text analysis and generation.	3,4
IV	Syntax and Parsing	8	Learn principles of syntax and techniques for parsing sentences to analyze grammatical structure and dependencies.	2,4
V	Semantics, Discourse, and Applications	8	Explore semantic theories, discourse analysis, and their practical applications in natural	4,5

			language understanding and generation	
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1 Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009

REFERENCE BOOKS:

R1 James A.. Natural language Understanding 2e, Pearson Education, 1994

R2 Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000

R3 Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS127R	**NLP**	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – 8									
Course Title	**PE-VI: Speech and Video Processing**								
Course code	**22BTCS127R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Grasp the basics of speech production, perception, and digital signal processing techniques for analysis and synthesis. 2. Explore automatic speech recognition systems, including HMM and deep learning approaches, for accurate speech recognition and speaker identification. 3. Gain insights into video signal processing, including capture, compression, motion estimation, and advanced topics like object tracking, deep learning, and AR/VR applications.								
CO1	Analyze speech production and perception mechanisms, applying DSP fundamentals to process speech signals effectively.								
CO2	Implement speech coding techniques and synthesis systems, utilizing features like MFCC and LPC for efficient speech processing.								
CO3	Evaluate the performance of ASR systems, employing HMM and deep learning approaches for accurate speech recognition and speaker verification.								
CO4	Create video processing systems, incorporating knowledge of video signals, compression standards, and motion estimation for quality video representation and summarization.								
CO5	Apply advanced techniques such as object tracking, deep learning, and surveillance applications to analyze and enhance videos, paving the way for AR and VR innovations.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Introduction to Speech Processing:** Basics of Speech Production and Perception. Speech Signal Characteristics. Phonetics and Phonology. Digital Signal Processing Fundamentals for Speech. Time-Domain Methods for Speech Processing. Short-Time Fourier Transform, Wavelet Transform.	12	Understand fundamentals of speech processing, including speech recognition, synthesis, and signal analysis techniques.	2,3
II	**Speech Analysis and Synthesis:** Feature Extraction: MFCC, LPC, PLP. Speech Coding Techniques. Speech Enhancement and Noise Reduction. Text-to-Speech (TTS) Systems. Speech Synthesis Techniques: Formant Synthesis, Concatenative Synthesis, Parametric Synthesis.	10	Learn techniques for analysing and synthesizing speech signals, focusing on practical applications and tools.	3,4
III	**Speech Recognition and Speaker Identification:** Automatic Speech Recognition (ASR) Systems. Hidden Markov Models (HMM) for Speech Recognition. Deep Learning Approaches in ASR. Language	8	Understand and implement techniques for automatic speech recognition and speaker identification, focusing on accuracy and efficiency.	3,4

	Models and Acoustic Models. Speaker Identification and Verification. Applications of Speech Recognition in Industry.			
IV	**B**asics of Video Signals and Systems. Video Capture and Representation. Color Spaces and Color Models. Video Compression Standards: H. **Introduction to Video Processing**264, HEVC. Motion Estimation and Compensation. Key Frame Extraction and Video Summarization.	8	Understand fundamentals of video signals including processing techniques and practical applications.	2,3
V	**Advanced Topics in Video Processing:**Video Segmentation and Object Tracking. Video Enhancement and Restoration. Deep Learning for Video Analysis. Action Recognition and Video Understanding. Video Surveillance and Security Applications. Introduction to Augmented Reality (AR) and Virtual Reality (VR) Applications	8	Master advanced video processing techniques, including segmentation, object tracking, enhancement, and restoration.	4,5
Practical	NA	**30**		1,2, 3,4

TEXT BOOKS:

T1Rabiner, L., & Schafer, R. (2007). *Introduction to Digital Speech Processing*. Foundations and Trends in Signal Processing.

T2 Gonzalez, R. C., & Woods, R. E. (2018). *Digital Image Processing*. Pearson.

T3 Gonzalez, R. C., & Woods, R. E. (2018). Digital Image Processing. Pearson.

REFERENCE BOOKS:

R1Jurafsky, D., & Martin, J. H. (2008). *Speech and Language Processing*. Pearson.

R2Szeliski, R. (2010). *Computer Vision: Algorithms and Applications*. Springer.

R3 Richardson, I. E. (2010). *The H.264 Advanced Video Compression Standard*. Wiley.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS127R	**Speech and Video Processing**	CO1	3	3	1	2							2	2
		CO2	3	3	1	2	2						2	1
		CO3	2	2	3	2	2				1	2	1	3
		CO4	2	2	3	2	2				1	1	1	2
		CO5	2	2	2	1	2				1	1	1	2

SEMESTER – 8									
Course Title	**PE-VII: Advanced Data Mining**								
Course code	**22BTCS128R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Understand and apply supervised and unsupervised learning algorithms along with evaluation metrics and model selection. 2. Gain proficiency in graph mining algorithms, sentiment analysis, topic modeling, and web mining techniques. 3. Learn advanced data mining methods like deep learning, transfer learning, and address ethical concerns in data mining practices.								
CO1	Apply decision trees, SVMs, and neural networks in practical examples to understand how supervise d learning works.								
CO2	Evaluate K-means and DBSCAN clustering algorithms to learn about unsupervised data mining and how to interpret results effectively.								
CO3	Analyze network structures using graph theory principles and algorithms like PageRank to find important insights in graph data.								
CO4	Use sentiment analysis, topic modeling, and web mining techniques to extract and analyze information from text and web data.								
CO5	Evaluate time series data, use deep learning models, and consider ethical aspects to demonstrate advanced data mining skills in real-world scenarios.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Supervised Data Mining and Evaluation	12	Master supervised data mining methods and evaluate their effectiveness in solving predictive modeling and classification tasks.	4,5
II	Unsupervised Data Mining and Evaluation	10	Master unsupervised data mining techniques and evaluate their efficacy in clustering and pattern discovery tasks.	4, 5
III	Graph Data Mining	8	Utilize graph data mining techniques to analyze complex relationships and patterns in interconnected data structures.	4, 5
IV	Text and Web Mining	8	Apply text and web mining techniques to extract insights from unstructured data and online sources.	3, 4
V	Advanced Applications of Data Mining	8	Implement advanced data mining techniques for complex problem-solving, focusing on innovative applications and methodologies.	5, 6

Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1"Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei

REFERENCE BOOKS:

R1"Pattern Recognition and Machine Learning" by Christopher M. Bishop

R2 "Introduction to Data Mining" by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS128R	**Advanced Data Mining**	CO1	3	2	2	2	1					1		3
		CO2	3	3	3	3	1					1		3
		CO3	3	2	2	2	1					1		3
		CO4	3	2	2	2	1					1		3
		CO5	3	3	2	2	1					1		3

SEMESTER – 8									
Course Title	**PE-VII: Data Modelling and Simulation**								
Course code	**22BTCS128R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1.Equip students with a comprehensive understanding of the fundamental principles of data modelling and simulation, including various model types and their applications. 2.Enable students to develop, validate, and assess mathematical and statistical models using real-world data, ensuring accuracy and reliability. 3.Provide practical experience in applying diverse simulation techniques and tools to solve complex engineering and industry-specific problems.								
CO1	Understand the fundamental concepts of data modelling and simulation, including types of models and their applications, through analysis of case studies.								
CO2	Develop and validate mathematical and statistical models using probability distributions, hypothesis testing, and regression analysis for real-world data scenarios.								
CO3	Implement discrete-event, continuous, and Monte Carlo simulations using simulation software, ensuring accurate model building and output analysis.								
CO4	Analyze complex systems using advanced simulation techniques such as system dynamics, agent-based modelling, and optimization methods like genetic algorithms.								
CO5	Apply data modelling and simulation techniques to solve industry-specific problems, demonstrating ethical and practical considerations in real-world projects.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Introduction to Data Modelling and Simulation:** Overview of Data Modelling. Types of Models: Physical, Mathematical, Statistical, and Simulation Models. Introduction to Simulation: Definition and Importance. Steps in a Simulation Study. Applications of Modelling and Simulation in Engineering. Case Studies of Successful Modelling and Simulation Projects.	12	Understand fundamental concepts of data modeling and simulation for analysing and predicting complex systems.	2, 3
II	**Mathematical and Statistical Modelling:** Mathematical Modelling: Deterministic and Stochastic Models. Statistical Modelling: Probability Distributions, Hypothesis Testing, Regression Analysis. Model Development: Assumptions, Formulation, and Validation. Data Collection and Preparation for Modelling. Model Fitting and Parameter Estimation. Goodness-of-Fit Tests.	10	Apply mathematical and statistical modeling techniques to solve real-world problems and interpret data.	2, 3
III	**Simulation Techniques and Tools:** Types of Simulations: Discrete-Event, Continuous, and Monte Carlo Simulations. Simulation	8	Learn to analyze data and data modelling algorithms though simulations	4, 5

	Methodologies: Time-Driven, Event-Driven, and Process-Oriented Approaches. Introduction to Simulation Software: MATLAB, Simulink, Arena, AnyLogic. Building Simulation Models: Entity, Attribute, Event, and Queue Concepts. Verification and Validation of Simulation Models. Output Analysis and Interpretation.			
IV	**Advanced Topics in Simulation:** System Dynamics and Agent-Based Modelling. Hybrid Simulation Techniques. Optimization in Simulation: Genetic Algorithms, Simulated Annealing. Simulation of Complex Systems: Supply Chains, Healthcare, Manufacturing Systems. Real-Time and Parallel Simulations. Case Studies of Advanced Simulations in Industry.	8	Learn to analyze data and data modelling algorithms through simulations	3, 4
V	**Real-world Applications:** Application of Data Modelling and Simulation in Real-World Scenarios. Industry-Specific Simulation Projects: Finance, Engineering, IT, Environmental Systems. End-to-End Modelling and Simulation of a Given Problem. Ethical and Practical Considerations in Data Modelling and Simulation.	8	Apply data modelling techniques and algorithms to solve real world problems	3, 4
Practical	NA	**30**		1,2, 3,4

TEXT BOOKS:

T1 Law, A. M., & Kelton, W. D. (2015). *Simulation Modeling and Analysis*. McGraw-Hill.

T2 Banks, J., Carson, J. S., Nelson, B. L., & Nicol, D. M. (2010). *Discrete-Event System Simulation*. Pearson.

REFERENCE BOOKS:

R1Ross, S. M. (2014). *Introduction to Probability Models*. Academic Press.

R2 Jain, R. (2010). *The Art of Computer Systems Performance Analysis*. Wiley.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOME

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS128R	**Data Modelling and Simulation**	CO1	3	2	2	2	1					1		3
		CO2	3	3	3	3	1					1		3
		CO3	3	2	2	2	1					1		3
		CO4	3	2	2	2	1					1		3
		CO5	3	3	2	2	1					1		3

SEMESTER – 8									
Course Title	**PE-VIII: Introduction to Virtual and Augmented Reality**								
Course code	**22BTCS129R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1.Understand core concepts, historical context, and hardware, preparing for practical development and application. 2. Acquire skills in environment setup, 3D modeling, and interaction design, using popular development tools like Unity or Unreal Engine. 3.Investigate diverse industry uses, ethical implications, and emerging trends, while delving into advanced development techniques and integration with AI.								
CO1	Understand key historical milestones and technological advancements in VR and AR evolution.								
CO2	Understand the fundamental principles of 3D modeling and interaction design for VR environments.								
CO3	Apply AR frameworks and design principles to create immersive AR experiences for mobile devices.								
CO4	Analyze the ethical implications and societal impacts of VR/AR applications across diverse industries.								
CO5	Design and develop an innovative VR/AR application integrating advanced techniques and technologies.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Foundations of Virtual and Augmented Reality	12	Understand the fundamental principles and technologies behind virtual and augmented reality applications.	2,3
II	Virtual Reality Development	10	Develop immersive virtual reality experiences using advanced tools and techniques for various applications.	3, 6
III	Augmented Reality Development	8	Create interactive augmented reality applications using advanced development tools and techniques for diverse real-world scenarios.	3,6
IV	Applications and Use Cases	8	Explore and implement practical applications of augmented reality across industries for enhancing user experiences and functionality.	4, 5

V	Advanced Topics: AR/VR Development Techniques, social VR experiences	8	Master development techniques for creating immersive social VR experiences, integrating AR/VR technologies for interactive social interactions.	4,6
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1"Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer

REFERENCE BOOKS:

R1"Virtual Reality Technology" by Grigore C. Burdea and Philippe Coiffet

R2"Virtual Reality: Concepts and Technologies" edited by Giovanna Calogiuri

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS129R	**Introduction to Virtual and Augmented Reality**	CO1	2	2	1	1	1					1		2
		CO2	3	3	3	3	2					2		3
		CO3	3	2	3	3	3					2		3
		CO4	2	2	2	2	2					2		2
		CO5	2	2	3	2	2					2		3

SEMESTER – 8									
Course Title	**PE-VIII: Cryptography &Network Security**								
Course code	**22BTCS129R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1.To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures. 2.To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes. 3.To familiarize Digital Signature Standard and provide solutions for their issues. 4.To familiarize with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message.								
CO1	Identify basic security attacks and services.								
CO2	Use symmetric and asymmetric key algorithms for cryptography.								
CO3	Design a security solution for a given application.								
CO4	Analyze Key Management techniques and the importance of number Theory.								
CO5	Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions work.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	INTRODUCTION: Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography.	12	Understand foundational concepts of cryptography and information security for securing digital communications and data.	3, 4
II	BLOCK CIPHER AND DATA ENCRYPTION STANDARDS: Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles. ADVANCED ENCRYPTION STANDARDS: Evaluation Criteria for AES, the AES Cipher. MORE ON SYMMETRIC CIPHERS: Multiple	10	Analyze and implement block cipher algorithms and encryption standards for secure data transmission and storage.	4,5

	Encryption, Triple DES, Block Cipher Modes of Operation, Stream Cipher and RC4.			
III	PUBLIC KEY CRYPTOGRAPHY AND RSA: Principles Public key crypto Systems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, Elliptic Curve Arithmetic, Elliptic Curve Cryptography. MESSAGE AUTHENTICATION AND HASH FUNCTIONS: Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs. HASH AND MAC ALGORITHM: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. DIGITAL SIGNATURE: Digital Signature, Authentication Protocol, Digital Signature Standard.	8	Understand and apply public key cryptography principles, including RSA algorithm, for secure communication and encryption. Implement message authentication techniques and analyze hash functions for ensuring data integrity and security.	4, 5
IV	AUTHENTICATION APPLICATION: Kerberos, X.509Authentication Service, Public Key Infrastructure. EMAILSECURITY: Pretty Good Privacy (PGP) and S/MIME. IPSECURITY: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Pay load, Combining Security Associations and Key Management.	8	Develop and evaluate authentication methods for secure access control and identity verification in various applications.	4, 5
V	WEB SECURITY: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. FIREWALL: Firewall Design principles, Trusted Systems	8	Understand and apply web security measures to protect against vulnerabilities and threats in online environments.	2,3
Practical	NA	**30**		1,2,3,4

TEXT BOOKS:

T1 William Stallings (2006), Cryptography and Network Security: Principles and Practice,4th edition, Pearson Education, India.

T2 William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.

REFERENCE BOOKS:

R1 Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd edition, Prentice Hall of India, New Delhi.

R2 Atul Kahate (2008), Cryptography andNetworkSecurity,2nd edition, Tata McGraw hill, India.

Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata McGraw-Hill, India.

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 10, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 10, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 10, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 10, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 10, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS129R	**Cryptography & Network Security**	CO1	2	2	1	1	1					1		2
		CO2	3	3	3	3	2					2		3
		CO3	3	2	3	3	3					2		3
		CO4	2	2	2	2	2					2		2
		CO5	2	2	3	2	2					2		3

SEMESTER – 8									
Course Title	**Project III**								
Course code	**22BTCS421R**	**Total credits: 7**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 156 P	**0**	**0**	**14**	**0**	**0**	**0**	**7**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Computer Science and Engineering**								
Semester	**8th semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Apply theoretical knowledge gained throughout the degree program to solve real-world problems or develop innovative solutions in computer science. 2. Demonstrate proficiency in project planning, execution, and management, including tasks such as requirement analysis, design, implementation, testing, and documentation. 3. Conduct independent research, explore new technologies or methodologies, and contribute to the advancement of knowledge in a specific area of computer science.								
CO1	Apply IT principles for real-world problem-solving using programming languages and network solutions.								
CO2	Manage complex projects as a team member, demonstrating effective personal and team management skills.								
CO3	Develop programming skills to create and assess software, hardware, and network solution.								
CO4	Apply personal and team management skills as a professional software developer.								
CO5	Cultivate employability skills and uphold professionalism in software development.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to: 6. Perform a literature search to review current knowledge and developments in the chosen technical area; 7. Undertake detailed technical work in the chosen area using one or more of: a) theoretical studies b) computer simulations c) hardware construction; 8. Produce progress reports or maintain a professional journal to	156	Independently conceive, design, implement, and present a significant computer science project, demonstrating advanced technical proficiency, problem-solving skills, and innovation.	5,6

	establish work completed, and to schedule additional work within the time frame specified for the project; 9. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 10. Prepare a formal report describing the work undertaken and results obtained so far; and Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.			
Practical	NA	**30**		1,2,3,4

OTHER LEARNING RESOURCES:

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
2	Able to explain the cell cycle and cell division.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
5	Demonstrate a comprehensive understanding of cell structure and function.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

MAPPING TABLE

Course code	Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCS421R	**Project III**	CO1	3	3	2	3	2	1	1	2	3	2	2	3
		CO2	3	3	3	3	2	1	1	2	3	2	2	3
		CO3	3	2	3	2	3	1	1	2	3	3	2	3
		CO4	3	2	2	2	2	1	1	2	3	3	3	3
		CO5												

Assam down town University

Curriculum and Syllabus

Bachelor of Computer Application

OUTCOME BASED EDUCATION FRAMEWORK

CHOICE BASED CREDIT SYSTEM

Version: 2.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Assam down town University
Guwahati-26
Panikhaiti

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, Dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

Programme Overview (not more than 100 words)

Understanding the fundamentals of computer programming languages and databases is of utmost importance in the field of computer science and information technology. The Bachelor of Computer Application (BCA) Programme has been designed in sync with the latest industry demands. This programme enriches the students with the necessary skills to build a successful career in the Information Technology sector. Through this programme, we intend to create a skilled workforce to take up future challenges in the industry. It aims at educating the students as expert programmers and computer professionals for the future.

I. Specific Features of the Curriculum

The Bachelor of Computer Application (BCA) programme is meticulously designed to align with current industry demands. It focuses on imparting a strong foundation in programming languages and database management. Students gain practical skills essential for the IT sector, preparing them for successful careers. The curriculum emphasizes hands-on experience, ensuring students are ready to tackle real-world challenges. By integrating the latest technological trends, the programme ensures relevance in a rapidly evolving field. It aims to produce expert programmers and computer professionals. Graduates are equipped to meet future industry challenges. Continuous updates keep the curriculum effective. The programme builds a skilled workforce for the future.

II. Eligibility Criteria: (To be aligned with the admission office)

Students should be secured 45 % in 10+2 in Arts/Science/Commerce from AHSEC or any other equivalent Examination recognized as such by the University with preferably Mathematics as one of the subjects in HS (Pass Marks).

Note: Candidate having (10+2) without mathematics/computer Science has to undertake additional bridge courses.

III. Program Educational Objectives (PEOs):

PEO1: To produce graduates who have a strong foundation of knowledge and skills in the field of Computer Applications.

PEO2: To produce graduates who can provide solutions to challenging problems in their profession by applying Computer Science theory and practices.

PEO3: To produce graduates who are employable in industries/public sector/Govt. organizations or work as an entrepreneur, as well as can provide leadership and are effective in a multidisciplinary environment

IV. Program Specific Outcomes (PSOs):

PSO 1: Ability to demonstrate a degree of mastery in the area of computer applications.

PSO 2: Ability to independently carry out research/investigation and developmental work to solve practical problems.

PSO 3: Develop sound knowledge and skill sets in fields related to human-computer interaction and management of industrial processes for the design and implementation of intelligent systems.

V. Program Outcome: (8-12)

PO1 Basic Mathematical Knowledge: Apply knowledge of Mathematics & Statistics to the solution of ICT problems.

PO2 Problem Analysis, Design/Development of Solutions: Analysis the IT problem and then design/develop the solutions using Software Engineering principles that meet specified needs with appropriate consideration for cultural, societal, and environmental considerations.

PO3 Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern ICT tools including prediction and modelling with an understanding of the limitations.

PO4 Environment and Sustainability: Understand the impact of professional IT solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO5 Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms.

PO6 Communication: Communicate effectively with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO7 Project Management and Finance: Demonstrate knowledge and understanding of Software Engineering and Project management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO8 Life-long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life-long learning in the broadest context of technological Change.

VI. Total Credits to be Earned:

Total credits: 135

VII. Career Prospects:

After completing a degree in one of the most desirable professions in the current times, Computer Application graduates have a wide array of options at their disposal. There is no one single career option but several after Computer Application -

a. Higher Studies in Technical Field: From there one could go into the research field or complete PhD and work as a faculty. In order to pursue M. Tech. in India, one will need to clear the GATE Examination, which will open a lot of opportunities to study Master's as well as work in PSUs. From here you can work in Government owned companies like DRDO, BARC, CSIR, ISRO, AAI, ONGC etc.
b. Technical Job: Graduates can work at a good company in various fields like Data science and Analysis, Machine Learning Engineer, Software Developer, Blockchain Developer and Engineer, Computer Network Architect, Database Administration and Management, Security Analyst, Game Development, Digital Marketing, etc.
c. Government Services: Along with pursuing technical government jobs after appearing for GATE, engineering graduates could also work in non-technical fields by applying and studying for various government exams like UPSC, SSC, Banking exams, Defence or IAS. These are very rewarding jobs as they are well paid, and very secure.

Entrepreneurship: If someone is filled with ideas with a need to create a change in the society, and like being one's own boss, one can even commence own start-up. For an entrepreneur, "opportunity" equates to something that solves a problem and addresses a need in a way that the entrepreneurs can profit from or further a cause.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

A. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination) *	30
2.	In-Sem Exam – II (ISE-II) (Written Examination) *	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in any of the components without any valid reason, he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absence.

2. The report of evaluation of an activity towards the in-semester (sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

B. SEMESTER END EXAMINATION:

Time table for the end semester examination is published at least 25 days prior to the start of Examination.

I. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

II. Admit Card:

Admit cards for the examination may be downloaded through ERP where the system will generate Unique ID Cards online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

III. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.

Table

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.
3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyse	Classify, outline, categorize, analyse, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on the basis of **all 6 knowledge levels.**

The format of the question paper across all the program follows a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl no	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

IV. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

V. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

VI. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the centre may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the exam with a new answer sheet or may expel the student from appearing on the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribed expulsion form. The student may not be allowed to write that examination.

VII. Instruction to the Students:

(i) The students shall not bring to the Examination Hall any electronic gadget used as a means of communication or record except electronic calculators, if required.

(ii) The students shall not receive any book or printed or handwritten or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during the course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to the examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

VIII. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by a Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

C. Credit Point:

It is the product of grade point and number of credits for a course, thus,

CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades 'O' to 'P' shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in Table 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrollment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrollment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the ith completed Course and Ci is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

D. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a university appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or viva voce and wish to appear again may apply to be evaluated and can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of the Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. **Student- centric / Constructivist Approach:**

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centred classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programmes the student has to undergo project-based learning at least 4 months duration. This approach will help the student to think critically, evaluate, analyse, make decisions, collaborate, and more.

b. Inquiry-Based Learning: The teacher/ students are supposed to list at least five questions in each contact hour and students solve these questions or search for answers which becomes the homework for the students "question-driven" learning approach. The teacher may look for the correctness of the solution or the best possible answer and discuss it in the successive class. This will help in the preparation for various competitive examinations and develop a habit for searching for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watch video or lectures prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are more passive to an approach where students are active participants. As a result, this approach is also a student-centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

The teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework: Breakdown of Credits (for 2022-23 Syllabus)

Sl. No	Category	Total number of Credits
1	University Core (UC)	9
2	University Elective (UE)	12
3	Program Core (PC)	102
4	Program Elective (PE)	6
5	Faculty Elective (FE)	6
Total number of credits		**135**

Breakdown by categories of courses

Sl no	Category	Credits	%
1	Science	8	5.92%
2	Engineering	126	93.34%
3	Commerce and Management	1	0.74%
Total		135	100%

SEMESTER WISE COURSE DISTRIBUTION

	Sl. No	Course Code	Course Title	Category I	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	TOTAL Marks
Semester I	**1**	22BCAO111R	DIGITAL ELECTRONICS	DSC (MINOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	22BCAO112R	PROGRAMING FOR PROBLEM SOLVING	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	3	22BCAO113R	MATHEMATICS –I	DSC (MINOR) / PC	4	3	1	0	0	0	0	40	60	0	100
	4	22BCAO114R	FUNDAMENTALS OF COMPUTER APPLICATIONS	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	5	22UBPD113R	INTRODUCTORY ENGLISH	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	6	22UBEC111	EXTRA CURRICULAR ACTIVITY	Co and extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	Total				**20**	**12**	**1**	**12**	**4**	**0**	**0**	**160**	**240**	**400**	**800**

	Sl. No	Course Code	Course Title	Category I	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	TOTAL Marks
Semester II	**1**	22BCAO121R	DATA STRUCTURE USING C	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	2	22BCAO122R	COMPUTER ORGANIZATION AND ARCHITECTURE	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	3	22BCAO123R	MATHEMATICS-II	DSC (MINOR) / PC	4	3	1	0	0	0	0	40	60	0	100
	4	22BCAO124R	INTRODUCTION TO WEB TECHNOLOGY	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	5	22UBES101R	ENVIRONMENTAL SCIENCE	VAC / UE	2	2	0	0	0	0	0	40	60	0	100
	6	22BCAO125R	TECHNO PROFESSIONAL SKILLS I	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	22UBPD123R	PDP II (IMPLICATIVE ENGLISH)	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	8	22MOSY121R/ 22MOSY122R/ **22MOSY123R**	MOOC I (ENHANCING STUDY SKILLS/ COMMUNITY ENGAGEMENT AND SOCIAL RESPONSIBILITY /**HTML**)	VAC / FE	2	0	0	0	0	0	0	0	0	100	100
	9	22UUHV101R	UNIVERSAL	VAC / UC	2	1	0	2	0	0	0	40	60	100	200

			HUMAN VALUE + PROFESSIONAL ETHICS												
	10	22UBCC121	CO-CURRICULAR	Co and extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	11	22UBEC121	EXTRA-CURRICULAR	Co and extra-Curricular / UC	1	0	0	0	4	0	0	0	0	100	100
	12	22UCDL103R	COMPUTATIONAL SYSTEMS AND DIGITAL WORLD	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	Total				**28**	**15**	**1**	**16**	**8**	**0**	**0**	**240**	**360**	**900**	**1500**

	Sl. No	**Course Code**	**Course Title**	**Category I**	**Credit**	**L**	**T**	**P**	**S**	**R**	**O/F**	**Max In-Sem Marks [Theory]**	**Max End-Sem Marks [Theory]**	**Max End Sem Practical Marks**	**TOTAL Marks**
Semester III	**1**	22BCAO211R	DATABASE MANAGEMENT SYSTEMS	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	2	22BCAO212R	OPERATING SYSTEMS	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	3	22BCAO213R	INTRODUCTION TO LINUX	DSC (MAJOR) / PC	4	3	0	2	0	0	0	40	60	100	200
	4	22BCAO214R	OBJECT ORIENTED PROGRAMMING PARADIGM	DSC (MAJOR) / PC	5	3	0	4	0	0	0	40	60	100	200
	5	22BCAO216R	GENERIC ELECTIVE I (INTRODUCTION TO DIGITAL MARKETING)	MDC / PC	2	2	0	0	0	0	0	0	100	0	100
	6	22BCAO215R	TECHNO PROFESSIONAL SKILLS II	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	7	22UBPD212R	ENGLISH LANGUAGE FOR EXCELLENCE	AEC / PC	2	0	0	4	0	0	0	0	0	100	100
	8	22MOSY211R/ 22MOSY212R/ 22MOSY213R	MOOC II (FOUNDATION OF CYBERSECURITY/ WRITING, RUNNING AND FIXING CODE IN C /FONDATIONS OF DIGITAL MARKETING AND E-COMMERCE)	SEC / FE	1	0	0	0	0	0	0	0	0	100	100
	9	22UBCC211	CO-CURRICULAR ACTIVITY	UC	1	0	0	0	4	0	0	0	0	100	100
	10	22UBEC211	EXTRA CURRICULAR ACTIVITY	UC	1	0	0	0	4	0	0	0	0	100	100
	11	22UUFL213R	PERSONAL FINANCIAL PLANNING	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	12	22UULS212R	BASIC LIFE SAVING SKILLS	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	Total				**27**	**14**	**0**	**20**	**8**	**0**	**0**	**160**	**340**	**1000**	**1500**

	Sl. No	Course Code	Course Title	Category I	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	TOTAL Marks
Semester IV	**1**	22BCAO221R	DESIGN AND ANALYSIS OF ALGORITHM	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	2	22BCAO222R	BASICS OF PYTHON PROGRAMMING	DSC (MAJOR) / PC	5	2	1	4	0	0	0	40	60	100	200
	3	22BCAO223R	COMPUTER NETWORKS	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	22BCAO225R	GENERIC ELECTIVE II (THE STRATEGY OF CONTENT MARKETING)	MDC / CBCS / FE	2	0	0	0	0	0	0	0	0	100	100
	5	22BCAO224R	TECHNO PROFESSIONAL SKILLS III	DSC (MAJOR) / PC	1	0	0	2	0	0	0	0	0	100	100
	6	22UBPD222R	PDP IV (ENGLISH FOR EMPLOYABILITY)	AEC / UE	2	0	0	4	0	0	0	0	0	100	100
	7	22MOSY221R /22MOSY222R/ 22MOSY223R	MOOC III (JAVASCRIPT, JQUERY, AND JSON/INTERMEDIATE POSTGRESQL/JSON AND NATURAL LANGUAGE PROCESSING IN POSTGRESQL)	MDC / CBCS / FE	2	0	0	0	0	0	0	0	0	100	100
	8	22UBCC221	CO-CURRICULAR	CO-CURRICULAR / UC	1	0	0	0	4	0	0	0	0	100	100
	9	22UBEC221	EXTRA-CURRICULAR	Extra-CURRICULAR / UC	1	0	0	0	4	0	0	0	0	100	100
	10	22UULS221R	BASIC ACLAMETIZING SKILLS	VAC / UE	1	0	0	2	0	0	0	0	0	100	100
	Total				**21**	**8**	**1**	**12**	**8**	**0**	**0**	**120**	**180**	**800**	**1100**

	Sl. No	Course Code	Course Title	Category I	Credit	L	T	P	S	R	O /F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	TOTAL Marks
Semester V	1	22BCAO311R	PROGRAMMING IN JAVA	DSC (MAJOR) / PC	4	3	0	2	0	0	0	40	60	100	200
	2	22BCAO312R	CLOUD COMPUTING	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	3	22BCAO313R	PROJECT-I	Research/ Industry Internship / PC	6	0	0	4	12	6	0	0	0	100	100
	4	22BCAO314R	TECHNO PROFESSIONAL SKILLS IV	SEC / PC	1	0	0	2	0	0	0	0	0	100	100
	5	22BCAO316R	PE I	DSC (MAJOR) / PE	3	3	0	0	0	0	0	40	60	0	100
	6	22BCAO317R	PE II	DSC (MAJOR) / PE	3	3	0	0	0	0	0	40	60	0	100
	8	22MOSY311R 22MOSY312R 22MOSY313R	MOOC IV (MEAN Stack Developer: MongoDB, ExpressJS, AngularJS & NodeJS/ DATA STRUCTURES & BACKEND WITH JAVA/ ADVANCED PROGRAMMIN IN KOTLIN)	SEC / FE	1	0	0	0	0	0	0	0	0	100	100
	9	22BCAO315R	INTERNSHIP	Summer Internship / PC	1	0	0	0	0	0	8	0	0	100	100
	Total				**22**	**12**	**0**	**8**	**12**	**6**	**8**	**160**	**240**	**500**	**900**

	Sl. No	Course Code	Course Title	Category I	Credit	L	T	P	S	R	O/F	Max In-Sem Marks [Theory]	Max End-Sem Marks [Theory]	Max End Sem Practical Marks	TOTAL Marks
Semester VI	1	22BCAO321R	COMPUTER VISION	DSC (MAJOR) / PC	5	2	1	4	0	0	0	40	60	100	200
	2	22BCAO323R	PE III	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	3	22BCAO324R	PE IV	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	4	22BCAO325R	PE V	DSC (MAJOR) / PC	3	3	0	0	0	0	0	40	60	0	100
	5	22BCAO322R	PROJECT II	Research/ Industry Internship / PC	6	0	0	6	8	6	0	0	0	100	100
	Total				**20**	**11**	**1**	**10**	**8**	**6**	**0**	**160**	**240**	**200**	**600**

***IA: Internal Assessment, SEE: Semester End Examination,**
PE: Practical Examination

SEMESTER – I									
Course Title	**Digital Electronics**								
Course code	**22BCAO111R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:30	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ I semester of the first year of the program**								
Course Objectives	1. To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems. 2. The course will help in design and analysis of the digital circuit and system. 3. To impart how to design Digital Circuits.								
CO1	Interpret different number systems, binary codes and Boolean algebra to minimize logic expressions								
CO2	Develop K-maps to minimize and optimize logic functions up to 5 variables								
CO3	Infer the knowledge about various logic gates and logic families and analyze basic circuits of these families								
CO4	Design and implement Combinational and Sequential logic circuits.								
CO5	Describe and compare various memory systems, shift registers and analog to digital and digital to analog conversion circuits								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Fundamentals of Digital Systems and logic families:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic	**10**	Remembering and understanding the different logic gates and applying them for different circuits.	1,2,3

II	**Combinational Digital Circuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical. Don't care conditions, Multiplexer, De Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry lookahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, QM method of function realization	**12**	Applying and analysing different digital circuits, K-map, minimization of logical. Don't care conditions, Multiplexer, De Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry lookahead adder, serial adder, ALU, elementary ALU design	3,4
III	**Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	**10**	Applying and analyzing different sequential circuits, clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops	3,4
IV	**A/D and D/A Converters:** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs	**7**	Describe, Differentiate, and analyzing A/D and D/A converters	2,4

V	**Semiconductor memories and Programmable logic devices:** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	**6**	Understanding, analyzing and explaining different memories and logic.	1,2,4

TEXT BOOKS:

1. Modern Digital Electronics, R. P. Jain, McGraw Hill Education, 2009.

REFERENCE BOOKS:

1. Digital logic and Computer design, M. M. Mano, Pearson Education India, 2016.
2. Fundamentals of Digital Circuits, A. Kumar, Prentice Hall India, 2016.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Interpret different number systems, binary codes and Boolean algebra to minimize logic expressions	**1 and 3**
2	Develop K-maps to minimize and optimize logic functions up to 5 variables	**2,3, and 4**
3	Infer the knowledge about various logic gates and logic families and analyze basic circuits of these families	**1,2, and 7**
4	Design and implement Combinational and Sequential logic circuits.	**1,2,4, and 7**
5	Describe and compare various memory systems, shift registers and analog to digital and digital to analog conversion circuits	**1,2,5, and 7**

SEMESTER – I									
Course Title	**Fundamentals of Computer Applications**								
Course code	**22BCAO114R**	**Total credits: 5** **Total hours: 45L+60P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ I semester of the first year of the program**								
Course Objectives	1. To acquire the basic knowledge of Computer Systems and their uses. 2. To know about Application Software and Programming environments 3. Identify and protect from computer viruses and online threats.								
CO1	Explain the working of a computer and its various components.								
CO2	Discuss the use of Software and programming in a computer system.								
CO3	Outline the basic concepts of Computer Networks and Internet Protocols.								
CO4	Develop Proficiency in Identifying different types of computer viruses, worms, and malware to enhance threat awareness.								
CO5	Apply the role of various Software packages for Office Automation								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basics of Computer** What is Computer and its History, Generation of Computers, Classification of Computers; Components of a Digital Computer: CPU, Memory, I/O devices; Storage Devices (RAMs, ROMs, Hard Disk etc.), Backup System and it is use.	**8**	Understand and explain the different types of computers, working of computers, and identify the various components.	1, 2
II	**Software and Languages** What is Computer Software and its need, Types of Computer Software's; Computer languages, Generation of Computer Languages, Classification of Computer Languages.	**8**	Understand the basics of software and programming concepts, identify different types of programming language.	1, 2
III	**Networks** LAN, MAN, WAN, Internet, Intranet, Browsers, Basic Internet Protocols (http, TELNET, FTP).	**8**	Understand the working of an Internet and Network. Identify and apply the different types of networks.	1, 2, 3
IV	**Computer Viruses and Security**. Type of Virus, Worms, Malware, Firewalls, Phishing, Anti-Virus.	**8**	Understand and identify different types of viruses and worms, firewall and phishing.	1, 2

V	**Software packages for Office Automation** (Any available standard Office Suite may be referred) Word Processing software, Spreadsheet software, Presentation software, Database software, Drawing and Graphics manipulation software.	**12**	Describe the different types of MS Office package. Apply and create different files using MS Office Software.	3, 5
Practical Components				
Practical 1	Identify the components of a computer	**2**	Identifying and understanding the components of a computer.	2
Practical 2	Showing and explaining the working process of the computer's components.	**2**	Remembering and understanding the working process of computers.	1,2
Practical 3	A computer is not powering on. List and demonstrate the steps you would take to diagnose and fix the issue.	**4**	Applying the knowledge of computers to fix some issues related to computers.	3
Practical 4	Access the BIOS/UEFI on a computer and describe how to change the boot order to prioritize booting from a USB drive.	**4**	Understanding and applying the knowledge on BIOS.	2,3
Practical 5	Demonstrate how to install an operating system (e.g., Windows, Linux) on a computer. Include partitioning the hard drive and configuring system settings.	**2**	Applying the knowledge of installation to install softwares.	3
Practical 6	Connect and configure a printer or a scanner to a computer. Install the necessary drivers and software, and demonstrate printing or scanning a document.	**2**	Applying the knowledge to configure a printer.	3
Practical 7	Install a software application (e.g., a web browser or office suite) on a computer and configure its basic settings.	**2**	Applying the configuration knowledge for software installation.	1,3
Practical 8	Write a simple program in a language of your choice (e.g., C, C++) that takes user input and performs a basic calculation or task.	**2**	Applying and creating a first program in any language.	3,5
Practical 9	Demonstrate how to use version control software (e.g., Git) to clone a repository, make changes, commit those changes, and push them to a remote repository.	**2**	Understanding and applying the Git knowledge to clone repositories, etc.	2,3

Practical 10	Use an Integrated Development Environment (IDE) to write, debug, and run a simple program. Explain the benefits of using an IDE.	**2**	Using different IDEs for creating, solving and running simple programs.	3
Practical 11	Set up a small local area network (LAN) with at least two computers. Ensure that they can communicate with each other by sharing files.	**2**	Identifying and applying the knowledge on different types of networking.	2,3
Practical 12	Explain the difference between static and dynamic IP addressing. Configure a computer with a static IP address.	**2**	Explaining and differentiating between static and dynamic IP addressing.	2,4
Practical 13	Use the ping and traceroute (or tracert on Windows) commands to diagnose network connectivity issues between two devices on a network.	**2**	Using ping and traceroute knowledge to diagnose networks.	3
Practical 14	Install an antivirus program on a computer. Perform a full system scan and demonstrate how to handle detected threats.	**2**	Understanding and demonstrating how to handle threats.	2,3
Practical 15	Explain safe browsing practices to avoid malware. Show how to configure a web browser with extensions and settings to enhance security.	**2**	Understanding and explaining safe browser practices.	2,3
Practical 16	Demonstrate how to create strong passwords and manage them using a password manager. Explain the importance of using different passwords for different accounts	**2**	Explaining and creating strong passwords using different characters and different passwords for different accounts.	2,5
Practical 17	Configure a software firewall on a computer to block all incoming connections except for a specific application (e.g., a web server).	**2**	Configuring a software firewall to block any connections from malicious users.	3,5
Practical 18	Make a Resume. It must include the features mentioned below— • Tables • Alignment • Bullets • At least 3 Font Styles and 3 Font Sizes • One picture	**2**	Applying and creating a resume with MS Word.	3,5
Practical 19	Create a time table in MS Word.	**2**	Applying and creating a time table in MS Word.	3,5
Practical 20	Create a University ID card in MS Word.	**2**	Applying different styles to create a University ID card.	3,5

Practical 21	Use MS-Word to create Project Reports or Thesis.	**2**	Applying and creating reports in MS Word.	3,5
Practical 22	Make a presentation of 3 slides in MS PowerPoint. The first slide should have a title and subtitle, the second slide an image with a caption, and the third slide a bulleted list.	**2**	Applying and building presentation with MS PowerPoint	3,5
Practical 23	Create time table in MS Excel	**2**	Creating time table in MS Excel	5
Practical 24	Prepare a stationary order for the month of March in MS Excel.	**2**	Applying the knowledge of MS Excel to create stationary order details.	3,5
Practical 25	Prepare a student marks distribution table in MS Excel	**2**	Creating a marks records using MS Excel	5
Practical 26	VLOOKUP and INDEX function in MS Excel	**2**	Using formulas like VLOOKUP and INDEX in MS Excel.	3,5
Practical 27	Joining two strings in MS Excel	**2**	Using excel formulas to join two strings.	3,5
Practical 28	Conditional Formatting in MS Excel	**2**	Applying conditional formatting for different data cells.	3

TEXT BOOKS:

1. Introduction of Computer Sc. ITL ESL, Pearson Education India.
2. Computer Fundamentals. Rajaraman, V.

REFERENCE BOOKS:

1. Computer Fundamentals: Concepts, Systems & Applications Priti Sinha, Pradeep K., Sinha, BPB Publications

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the working of a computer and its various components.	3, 8
2	Discuss the use of Software and programming in a computer system.	1, 2, 3, 8
3	Outline the basic concepts of Computer Networks and Internet Protocols.	2, 8
4	Develop Proficiency in Identifying different types of computer viruses, worms, and malware to enhance threat awareness.	2, 3, 8
5	Apply the role of various Software packages for Office Automation	2, 3, 8

SEMESTER – I								
Course Title	**PROGRAMMING FOR PROBLEM SOLVING**							
Course code	**22BCAO112R**	**Total credits: 5** **Total hours: 45T+60P**	**L**	**P**	**S**	**R**	**O/F**	**C**
			3	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**					
Programme	**Bachelor of Computer Application**							
Semester	**Fall/ I semester of the first year of the program**							
Course Objectives	1. To formulate simple algorithms for arithmetic and logical problems. 2. To test and execute the programs and correct syntax and logical errors. 3. To solve real-time problems using programming							
CO1	Explain the basic terminology used in computer programming to write, compile and debug programs in C programming language.							
CO2	Examine the syntax and semantics and be fluent in the use of various Operators of C Programming.							
CO3	Demonstrate the concept of Searching and Sorting in programming.							
CO4	Develop programs to describe the applications of derived data types such as arrays and strings etc.							
CO5	Illustrate the dynamics of memory by the use of pointers and Structures							

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction to C Programming:** Introduction, History, Features, Advantages and Disadvantages, Structure of C program, Compiling Process, C Pre-processor and Header Files, Library Function, Character Set, Comments, Tokens and its types. Data types, Escape Sequences, Preprocessors Directives.	**7**	Describe, illustrate, and explain computer, algorithms, flowchart	**1,2**
II	**Operators and Expressions** Arithmetic Operator, Relational Operator, Logical Operator, Assignment Operator, Increment/decrement Operator, Conditional Operator, Bitwise Operator, Comma Operator, Size of Operator, Operator Precedence and Associativity.	**10**	Describe, illustrate, and explain different operators	**1,2**
III	**Function: Functions** (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	**10**	Describe, illustrate, and explain function, recursive function.	**1,2**

IV	Structure: Structures, defining structures and Array of Structures Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)	**8**	Describe, illustrate, and explain structure, linked-list	**1,2**
V	File handling (only if time is available, otherwise should be done as part of the lab)	**10**	Describe, illustrate, and explain file handling	**1,2**
Practical				
Practical 1	C program to display "hello world".	**1**	Creating a first program to display hello world in C	**3, 5**
Practical 2	Create a simple program where we will Print Integer in C where variable value is pre- defined.	**1**	Creating and displaying a value of a variable in C	**3, 5**
Practical 3	Program where we will Print the Integer in C where the value of the variable is entered by the user.	**2**	Creating and displaying the value variable from user input.	**3, 5**
Practical 4	Input integer, float and character values using one scanf() statement in C.	**2**	Creating and displaying different types of data types.	**3, 5**
Practical 5	C Program to Find the Size of int, float, double and char.	**2**	Creating and finding the size of different data types.	**3, 5**
Practical 6	Perform addition, subtraction, multiplication and division of two numbers.	**2**	Creating and displaying the different types of calculation program using C	**3, 5**
Practical 7	C Program to Calculate Percentage of 5 Subjects.	**2**	Creating and calculating the percentage of five subject in C	**3, 5**
Practical 8	C Program to Calculate Simple interest.	**2**	Creating and calculating the simple interest.	**3, 5**
Practical 9	C Program to Calculate Compound interest.	**2**	Creating and finding the compound interest.	**3, 5**
Practical 10	C Program to Find Area and Perimeter of Rectangle.	**2**	Creating and finding the area and perimeter of the rectangle.	**3, 5**
Practical 11	Radius and Area of Circle program in C.	**2**	Creating and finding the radius and area of a circle.	**3, 5**
Practical 12	Swap numbers using temporary variables.	**2**	Creating a program to swap two numbers with the help of a temporary variable.	**3, 5**

Practical 13	Swap numbers without using temporary variables.	**2**	Creating a program to swap two numbers without using the temporary variable.	**3, 5**
Practical 14	C example to print "hello world" using if statement and without using semicolon.	**2**	Creating a C program for implementing the *if* statement.	**3, 5**
Practical 15	C Program to find the largest number among three numbers using the if statement.	**2**	Creating a C program to find the largest number among the three numbers.	**3, 5**
Practical 16	C Program to find the largest number among three numbers using the if else ladder.	**2**	Creating a C program to find the largest number among the three numbers using if-else statement	**3, 5**
Practical 17	C Program to find the largest number among three numbers using nested if-else statements.	**2**	Creating a C program to find the largest number among the three numbers using the nested if-else.	**3, 5**
Practical 18	C Program to check whether a number is even or odd.	**2**	Creating a C program to check whether the given number is odd or even.	**3, 5**
Practical 19	C Program to check whether a character is a Vowel or a Consonant.	**2**	Creating a program to check whether a character is a vowel or consonant.	**3, 5**
Practical 20	C program to check whether a number is Positive or Negative or Zero.	**2**	Creating a C program to check if the given number is positive or negative.	**3, 5**
Practical 21	C program to find the factorial of a number.	**2**	Creating a program to find the factorial of a number.	**3, 5**
Practical 22	C example to print "hello world" using switch statement and without using semicolon.	**2**	Creating a C program to display hello world using switch statement.	**3, 5**
Practical 23	C Program to Find Largest of Two Numbers using Switch Case.	**2**	Creating and finding the largest of two numbers using switch case statement.	**3, 5**
Practical 24	C Program to Find Largest of Two Numbers using Conditional Operator.	**2**	Creating a program to find the largest of two using conditional operators.	**3, 5**
Practical 25	C Program to print first 10 natural numbers using a for loop	**2**	Creating a C program to display the first 10 natural numbers using a for loop.	**3, 5**

Practical 26	C Program to calculate the sum of first n natural numbers using a for loop	2	Creating a C program to display the first n natural numbers using a for loop.	**3, 5**
Practical 27	C program to print all natural numbers in reverse in a given range using a for loop.	2	Creating a program to print all natural numbers in reverse	**3, 5**
Practical 28	C Program to print even and odd natural numbers using a for loop	2	Creating a program to print even and odd numbers using a for loop.	**3, 5**
Practical 29	C Program to check whether a number is a prime number or not.	2	Creating and displaying whether a given number is a prime number or not.	**3, 5**
Practical 30	Print prime numbers between 1 to n in c language using a for loop.	2	Creating a C program to check the prime numbers between 1-10 using a for loop.	**3, 5**
Practical 31	Write a c program to print Fibonacci series using a for loop.	2	Creating a C program to print Fibonacci series using a for loop.	**3, 5**
Practical 32	C example to print "hello world" using a while loop and without using a semicolon.	2	Creating a C program using a while loop.	**3, 5**
Practical 33	C Program to find the sum of the first and last digit using a while loop.	2	Creating a C program to demonstrate a while loop for finding the sum of the first and last digit.	**3, 5**
Practical 34	C program to reverse a number using a while loop.	2	Creating a program for reversing a number using a while loop.	**3, 5**
Practical 35	C Program to print the first 10 natural numbers using a while loop.	2	Creating a program to print the first 10 natural numbers using a while loop.	**3, 5**
Practical 36	C program to print all natural numbers in reverse from n to 1 using a while loop.	2	Creating a C program to print all natural numbers in reverse using a while loop.	**3, 5**
Practical 37	Write a c program to print Fibonacci series using while loop	2	Creating a program to display the Fibonacci series using a while loop.	**3, 5**
Practical 38	C example to print "hello world" using do while loop.	2	Creating a program to display the do while loop.	**3, 5**
Practical 39	C Program to print first n natural numbers using do while loop.	2	Creating a program to display the first n natural number using a	**3, 5**

			do while loop.	
Practical 40	C program to print all the numbers from 20 to 1 in reverse order on the screen using do while loop.	2	Displaying the natural numbers in reverse using a do while loop.	**3, 5**
Practical 41	C program to print all the even numbers from 10 to 20 on the screen using do while loop	2	Displaying the even numbers from 10-20 using a do while loop.	**3, 5**
Practical 42	C Program to print multiplication table using do...while loop.	2	Displaying the multiplication table using a do while loop.	**3, 5**
Practical 43	C program to input a 4-digit number and find the sum of its digits using do while loop.	2	Displaying the sum of 4-digit numbers and finding its sum using a do while loop.	**3, 5**

TEXT BOOKS:

1. Bal Guruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

REFERENCE BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the basic terminology used in computer programming to write, compile and debug programs in C programming language.	1,2 & 8
2	Examine the syntax and semantics and be fluent in the use of various Operators of C Programming.	1,2 & 8
3	Demonstrate the concept of Searching and Sorting in programming.	1,2 &8
4	Develop programs to describe the applications of derived data types such as arrays and strings etc.	1,2 ,4, 5,6,7 & 8
5	Illustrate the dynamics of memory by the use of pointers and Structures	1,2 ,4

SEMESTER – I									
Course Title	**MATHEMATICS –I**								
Course code	**22BCAO113R**	**Total credits: 4** **Total hours: 45T+15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ I semester of the first year of the program**								
Course Objectives	1. To make understanding to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma functions must be introduced. 2. To provide the application of differential and integral calculus. 3. To understand the convergence and divergence of sequence and series.								
CO1	Illustrate the foundation concepts in Mathematics like Matrices, Set, relations and functions								
CO2	Outline Differential Integration and Differentiation and with this background.								
CO3	Learn about Multivariable Calculus for Limit, continuity and partial derivatives								
CO4	Describe matrices like Inverse and rank of a matrix, rank-nullity theorem								
CO5	Apply the foundation concepts in programming and analytical subjects.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Calculus:** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**8**	Describe, illustrate, and explain Integrals and its applications	1,2
II	**Calculus:** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.	**12**	Describe, illustrate, and explain various theorems of calculus	1,2
III	**Sequences and series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.	**8**	Describe, illustrate, and explain numbers series	1,2
IV	**Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	**8**	Describe, illustrate, and explain multivariable calculus	1,2

V	**Matrices:** Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.	**9**	Describe, illustrate, and explain types of matrices	1,2

TEXT BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Illustrate the foundation concepts in Mathematics like Matrices, Set, relations and functions	1 & 6
2	Outline Differential Integration and Differentiation and with this background.	1 & 6
3	Learn about Multivariable Calculus for Limit, continuity and partial derivatives	1 & 6
4	Describe matrices like Inverse and rank of a matrix, rank-nullity theorem	1 & 6
5	Apply the foundation concepts in programming and analytical subjects.	1 & 6

SEMESTER – I									
Course Title	**INTRODUCTORY ENGLISH (Communicative English & Soft Skills)**								
Course code	**22UBPD113R**	**Total credits: 2** **Total hours:**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	Bachelor of Business Administration/Bachelor of Hotel Management and Catering Technology/Bachelor of Business Administration (I)/Bachelor of Business Administration (Industry Integrated)/Bachelor of Social Work/Bachelor of Arts in Sociology/Bachelor of Arts in Psychology/Bachelor of Trauma, Emergency and Disaster Management/Bachelor of Science in Biotechnology/Bachelor of Science in Microbiology/Bachelor of Science in Food Nutrition and Dietetics/Bachelor of Computer Application/ Bachelor of Computer Application (P)/Bachelor of Science in Information Technology (P)/ Bachelor of Science in Information Technology/Bachelor of Computer Application on Cloud Technology and Information Security/Bachelor of Computer Application on Artificial Intelligence and Machine Learning/Bachelor of Computer Application on Artificial Intelligence and Machine Learning								
Semester	**Fall/I or Winter/II Semester of First Year of the Programme**								
Course Objectives	1. To recognize and identify parts of a sentence and their significance in a language. 2. To enhance listening and speaking/skills for self-development. 3. To give insight into English pronunciation and into central concepts in phonetics. 4. Introduction to the various modes of communication will enhance their knowledge of communication.								
CO1	It enables learners to recognize the structure of a sentence and its variations as they learn to understand, speak and write.								
CO2	Introduction to Phonetics and its importance will improve the learners' pronunciation								
CO3	Students will be able to identify, pick and form different kinds of sentences.								
CO4	Knowledge of communication will be enhanced through practical examples.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Grammar:** Parts of Speech, Articles, Auxiliary Verbs, Affirmative and Negative Sentences	**4**	Understanding, identifying and analyzing part of speech, articles, auxiliary verbs, affirmative and negative sentences.	**1,2,4**
II	**Grammar:** Determiners, Sentence Construction, Types of Sentences (Assertive, Imperative etc.), Degree of Comparison, Comprehension Exercises	**4**	Understand, identify and construct clear sentences, determiners and degree of comparison.	**1,2,3**

III	**Listening Skills:** What is listening? The Process of Listening, Factors that adversely affect Listening, Difference between Listening and Hearing, Purpose and Importance of Effective Listening, How to Improve Listening Process	**6**	Understand and differentiate listening from hearing, comprehend the listening process and factors affecting it, recognize its purpose and importance, and apply strategies to improve their listening skills effectively.	**2,4**
IV	**Speaking Skills:** Introducing yourself, Self-discovery, Basics of Phonetics, pronunciation, Extempore speech, Video Recording for Self-Reflection	**6**	Develop the ability to effectively introduce themselves, engage in self-discovery, grasp the basics of phonetics and pronunciation, deliver extempore speeches, and use video recording for self-reflection to enhance their speaking skills.	**5**
V	**Communication Skills:** i. Introduction to Communication, ii. Importance of Communication Skills iii. Purpose of Communication iv. Types of Communication v. Formal and informal communication vi. Importance of Communication vii. Barriers to Communication viii. How to improve/ tips to improve Communication skills. ix. Responding to different questions in various situations (formal/informal)	**8**	Understand the fundamentals and importance of communication skills, identify the purpose and types of communication, differentiate between formal and informal communication	**2**

TEXT BOOKS:

1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.*Business Communication: Concepts, Cases and Applications*, second edition, Pearson, Noida.
2. Alex K., Chand, S, 2009. *Soft Skills: Know Yourself and Know the World*, first edition, S. Chand & Company Ltd.: New Delhi

REFERENCE BOOKS:

1. Quirk, Randolp. (2010*) A Comprehensive Grammar of the English Language* Randolph Quirk, Sidney Greenbaum, Pearson Education India
2. Marks, Jonathan. (2017) *IELTS Advantage Speaking and Listening Skills: A step-by- stepguide to a high IELTS speaking and listening score*. *Book + CD-ROM*, Delta Publishing by Klett

OTHER LEARNING RESOURCES:

1. https://youtu.be/bEB8- SWMYhIhttps://youtu.be/- zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	It enables learners to recognize the structure of a sentence and its variations as they learn to understand, speak and write.	1,2 and 3
2	Introduction to Phonetics and its importance will improve the learners' pronunciation	1,2, and 3
3	Students will be able to identify, pick and form different kinds of sentences.	1,2, and 3
4	Knowledge of communication will be enhanced through practical examples.	1,2 and 3

SEMESTER – I									
Course Title	**Extra-Curricular Activity**								
Course code	**22UBEC111**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the first year of the program**								
Course Objectives	1. To develop problem-solving abilities through coding challenges and hackathons. 2. To participate in app development contests and exhibitions. 3. To develop entrepreneurial skills and mindset.								
CO1	Importance of different activities under different clubs.								
CO2	Formulate regular activities like workshops, competitions as per their interest and hobbies.								
CO3	Adapt to represent ADTU in various inter university, state and national level competitions.								
CO4	Discuss with invited experts in their respective fields.								
CO5	Develop an appreciation for diverse forms of artistic expression.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts.	**2**	Demonstrate improved proficiency in programming, software development, and the use of various technological tools and platforms. Apply theoretical knowledge to real-world problems through projects, internships, and industry collaborations.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students engage in different activities under different clubs.	2,3,4,5,6,7
2	Role play in regular activities like workshops, competitions as per their interest and hobbies.	2,3,4,5,6,7
3	Adapt and trained to represent ADTU in various inter university, state and national level competitions.	2,3,4,5,6,7,8
4	The students will be given a platform to earn from invited experts in their respective fields.	2,3,4,5,6,7,8
5	Develop an appreciation for diverse forms of artistic expression.	2,3,5,6,7,8

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO111R	DIGITAL ELECTRONICS	1.75	2.5	2	2	1		1.33	
23BCAO112R	PROGRAMING FOR PROBLEM SOLVING	2.4	2.8	2	1	1.5	2	1	1.5
22BCAO113R	MATHEMATICS –I	3					3		
22BCAO114R	FUNDAMENTALS OF COMPUTER APPLICATIONS	1	1.75	2.25					1.6
22UBPD113R	INTRODUCTORY ENGLISH	2.33	2.33	1					
22UBEC111	EXTRA CURRICULAR ACTIVITY		1.2	2.2	1.75	2.2	2.6	1.6	2.33

SEMESTER – II									
Course Title	**Computer Organization & Architecture**								
Course code	**22BCAO122R**	**Total credits: 3** **Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. Discuss the organization and architecture of computer systems and electronic computers. 2. Analyze the basic components of computer systems besides the computer arithmetic. 3. Discuss input-output organization, memory organization and management, and pipelining.								
CO1	Outline the basics of instructions sets and their impact on processor design								
CO2	Examine the control unit design approaches, memory design technologies and I/O transfers.								
CO3	Explain the concepts of pipelining in Computer Architecture.								
CO4	Interpret and analyze Parallel Processing Principles and Applications.								
CO5	Demonstrate the concepts of Memory Organization Through Mapping Functions and Replacement Algorithms.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.	**9**	Infer the interaction of the components of a computer system with the instruction set architecture of a CPU and addressing modes	1,2,3
II	Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic. Introduction to x86 architecture.	**10**	Explain the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers. Examine the control unit design approaches, memory design technologies and I/O transfers. Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory.	3,4

III	CPU control unit design: hardwired and microprogrammed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB	**10**	Explain the various data representation techniques, perform computer arithmetic and discuss the various adders and multipliers Demonstrate the concepts of pipelining, parallel processing and concurrent access to memory. Summarize the concepts of memory organization with mapping functions and replacement algorithms	3,4
IV	Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	**8**	Summarize the concepts of memory organization with mapping functions and replacement algorithms.	4
V	Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	**8**	Summarize the concepts of memory organization with mapping functions and replacement algorithms	1,2

TEXT BOOKS:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

REFERENCE BOOKS:

1. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
2. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
3. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Outline the basics of instructions sets and their impact on processor design	3,5,6,8
2	Examine the control unit design approaches, memory design technologies and I/O transfers.	2,3,5,6,8
3	Explain the concepts of pipelining in Computer Architecture.	2,3,5,6,7,8
4	Interpret and analyze Parallel Processing Principles and Applications.	2,3,5,7,8
5	Demonstrate the concepts of Memory Organization Through Mapping Functions and Replacement Algorithms.	2,3,7,8

SEMESTER – II									
Course Title	**Data Structure using C**								
Course code	**22BCAO121R**	**Total credits: 5**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Fundamentals of programming logic**	**Co-requisite**	**C Programming**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To impart the basic concepts of data structures and algorithms. 2. To understand basic concepts about stacks, queues, lists, trees and graphs. 3. To understand concepts about searching and sorting techniques								
CO1	Illustrate the Basic concepts of Data Structures.								
CO2	Apply Data Structure techniques on computing problems.								
CO3	Analyse and develop algorithms to solve real world problems.								
CO4	Implement and develop a program for various concepts of data structures including array, stack, queue, graphs and trees.								
CO5	Demonstrate and analyze various sorting algorithms and hashing techniques.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.	**8**	Analyze the algorithms to determine the time and computation complexity and justify the correctness	1,2,3
II	**Stacks and Queues**: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.	**10**	Analyze the problem of stacks, queues and linked list to determine the time and computation complexity	2,3

III	**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**10**	Analyze the problem of stacks, queues and linked list to determine the time and computation complexity	3
IV	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis	**9**	Implement basic tree-based traversal and search algorithms, learn about applications using tree	1.3
V	**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	**8**	Summarize Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in terms of Space and Time complexity. Graph search and traversal algorithms and determine the time and computation complexity	2,3
Practical Component				
Practical 1	Array implementation of stack using C program	2	Understand the basics of stack	2,3
Practical 2	Array implementation of queue using C program	2	Understand the basics of queue	2,3
Practical 3	Array implementation of list using C program	2	Understand the basics of array implementation	2
Practical 4	Linked list implementation of list using C program [singly linked list]	2	Understand the basics of linked list	2,3

Practical 5	Linked list implementation of stack using C program	2	Understand and implement stack using linked list	2,3
Practical 6	Linked list implementation of queue using C program	2	Understand and implement queue using linked list	2,3
Practical 7	Applications of list polynomial Addition and subtraction using C program	2	Understand and apply polynomial addition and subtraction	4
Practical 8	Infix to postfix using C program	2	Understand and convert infix to postfix using C program.	3
Practical 9	Expression evaluation using C program	2	Evaluate expressions using a C program.	3,4
Practical 10	Implementation of avl trees using C program	2	Understand AVL tree and implement using arrays.	3
Practical 11	Implementation of heap using priority Queues using C program	2	Develop heap using priority queue.	3,4
Practical 12	Representation of graph using C program	2	Understand graph and its representation.	3
Practical 13	Graph traversal-breadth first traversal using C program	2	Understand the concepts of traversal breadth first traversal.	3
Practical 14	Graph traversal-depth first Traversal using C program	2	Understand and apply the concepts of traversal depth first traversal.	3
Practical 15	Linear search using C program	2	Understand and apply linear search	2,3,4
Practical 16	Binary search using C program	2	Understand and apply binary search	2,3,4
Practical 17	Insertion sort using C program	2	Implement and apply Insertion sort.	3,4
Practical 18	Bubble sort using C program	2	Implement and apply Bubble sort.	3,4
Practical 19	Quick sort using C program	2	Implement and apply Quick sort.	3,4
Practical 20	Merge sort using C program	2	Implement and apply Merge sort.	3,4

TEXT BOOKS:

1. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

REFERENCE BOOKS:

1. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by

Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Illustrate the Basic concepts of Data Structures.	1,2,3
2	Apply Data Structure techniques on computing problems.	1,2,3
3	Analyse and develop algorithms to solve real world problems.	1,2,3
4	Implement and develop a program for various concepts of data structures including array, stack, queue, graphs and trees.	1,2,3
5	Demonstrate and analyze various sorting algorithms and hashing techniques.	1,2,3,8

SEMESTER – II									
Course Title	**Introduction to Web Technology**								
Course code	**22BCAO124R**	**Total credits: 5** **Total hours: 45L+60P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To understand the Fundamental principle of Web design, hosting and maintenance. 2. To understand tools required for Web design.								
CO1	Illustrate elements and attributes of a web page.								
CO2	Build web pages using HTML and Cascading Style Sheets								
CO3	Develop XML documents and Schemas								
CO4	Design and implement static and dynamic website								
CO5	Analyse best technologies for solving web client/server problems								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basics of Internet:** Client/Server Computing: What is C/S Computing, Middleware, Fat client VS Fat Servers, N-tiered Software Architecture. Web's Robot global access to information, HTML, HTTP, IP address, DNS & ports; Accessing a web server, publishing on web server, secure HTTP, Secure Socket layer, WWW Proxies, IIS, Case study of Apache web server.	**10**	Illustrate elements and attributes of a web page.	1,2,3
II	**Searching and web casting Technique:** Popular web servers, basic features; bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines, architecture of search engines, search tools, web crawler, focused crawler, agent-based crawler, case study of any Web Browser.	**12**	Build web pages using HTML and Cascading Style Sheets Develop XML documents and Schemas Design and implement static and dynamic website	3,4

III	**Web page design:** Designing web pages with HTML- use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages. Use of Cascading Style Sheet in web pages. Introduction to DHTML.	**8**	Build web pages using HTML and Cascading Style Sheets. Design and implement static and dynamic websites. Analyse best technologies for solving web client/server problems	3,4
IV	**Creating interactive and dynamic web pages with JavaScript:** JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects. **Extensible Markup Language (XML):** Introduction- using user-defined tags in web pages; displaying XML contents; XML DTDs; use of XSL.	**8**	Analyse best technologies for solving web client/server problems	4
V	**Web Server:** Web services and web server functionality; web server composition; registration; conceptual architecture of some typical web servers. Server-side scripting: overview of server-side scripts like CGI, ASP, and JSP. Server-side scripting using PHP; Web database connectivity- introduction to ODBC; PHP with database connectivity. **Exposure to Advanced Web Technologies:** Distributed Object based models- DCOM, CORBA, EJB; Web services and Related Technologies- ISAPI, SOAP, UDDI, WSDL; Other Advanced Web Technologies- AJAX, ISAPI, .NET.	**7**	Analyse best technologies for solving web client/server problems	4
Practical Component				

Practical 1	Write a HTML program for the demonstration of Unordered Lists.	2	Learn to create Unordered Lists	2,3
Practical 2	Write a HTML program for the demonstration of ordered Lists	2	Learn to create Ordered Lists	2,3
Practical 3	Write a HTML program for the demonstration of Definition Lists	2	Learn to create Definition Lists	2
Practical 4	Write a HTML program for the demonstration of Nested Lists	2	Learn to create Nested Lists	2,3
Practical 5	Write a HTML program for demonstrating Hyperlinks. Navigation from one page to another and Navigation within the page.	2	Understand hyperlink and implement hyperlink navigation from one page to another and within the page	2,3
Practical 6	Write a HTML program for time-table using tables.	2	Understand and implement queue using linked list	2,3
Practical 7	Write a HTML program to develop a static Home Page using frames.	2	Understand and apply polynomial addition and subtraction	4
Practical 8	Write a HTML program to develop a static Registration Form	2	Understand and convert infix to postfix using C program.	3
Practical 9	Write a HTML program to develop a static Login Page.	2	Evaluate expressions using a C program.	3
Practical 10	Write a HTML program to develop a static Web Page for Catalog.	2	Understand AVL tree and implement using array.	3
Practical 11	Write a HTML program to develop a static Web Page for Shopping Cart.	2	Develop heap using priority queue.	3
Practical 12	Write HTML for demonstration of cascading Embedded stylesheets.	2	Understand graph and its representation.	3
Practical 13	Write HTML for demonstration of cascading External stylesheets	2	Understand the concepts of traversal breadth first traversal.	3
Practical 14	Write HTML for demonstration of cascading Inline styles.	2	Understand and apply the concepts of traversal depth first traversal.	3
Practical 15	Write a JavaScript program to validate the USER LOGIN page.	2	Develop a user login page	3
Practical 16	Write a program for implementing XML documents for CUSTOMER DETAILS.	2	Develop skills in creating well-formed XML documents.	3

Practical 17	Write an internal Document Type Definition to validate XML for CUSTOMER DETAILS	2	Learn how to create an internal DTD to define the structure and constraints of an XML document.	3
Practical 18	Write an external Document Type Definition to validate XML for CUSTOMER DETAILS	2	Develop skills in managing and maintaining DTD files for multiple XML documents.	3
Practical 19	Write a simple servlet that displays a message	2	Develop skills in handling HTTP requests and generating HTTP responses.	3
Practical 20	Write a servlet that reads parameters from employee login page	2	Understand how to read and process parameters from HTTP requests in a servlet.	3

TEXT BOOKS:

1. C. Xavier, "Web Technology & Design", New Age Publication, 2003
2. Austin and Pawlan, "Advanced Programming for JAVA2 Platform", Pearson, 2000

REFERENCE BOOKS:

1. Oliver, Dick; SAMS Teach Yourself Html 4 in 24 Hours; Techmedia.
2. Ashbacher, Charles; SAMS Teach Yourself XML in 24 Hours; Techmedia.

OTHER LEARNING RESOURCES:

1. https://books.google.co.in/books/about/Data_Structures_and_Algorithms.html?id=1lCHYj5eV-EC&redir_esc=y
2. https://techdevguide.withgoogle.com/paths/data-structures-and-algorithms/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Illustrate elements and attributes of a web page.	1,2,3,4,8
2	Build web pages using HTML and Cascading Style Sheets	1,2,3,4,7,8
3	Develop XML documents and Schemas	1,2,3,4,7,8
4	Design and implement static and dynamic website	1,2,3,4,7,8
5	Analyse best technologies for solving web client/server problems	1,2,3,4,7,8

SEMESTER – II									
Course Title	**MOOCS I (HTML)**								
Course code		**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To understand the basic structure and syntax of HTML. 2. To learn how to use HTML elements and attributes to create web pages. 3. To develop skills for structuring and organizing web content effectively. 4. To gain knowledge of best practices for creating accessible and SEO-friendly web pages. 5. To create and style static web pages using HTML.								
CO1	Create and structure basic HTML documents								
CO2	Use a variety of HTML elements and attributes to build web pages.								
CO3	Apply best practices for organizing content within web pages.								
CO4	Develop accessible and SEO-friendly web content.								
CO5	Construct and style static web pages that are visually appealing and functional								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Definition and purpose of HTML. History and evolution of HTML. Basic HTML Structure HTML document structure. Creating your first HTML file. HTML Elements and Tags Understanding tags and elements. Commonly used tags. Attributes and Their Usage Basic attributes: id, class, src, href, alt, title. Creating a Simple Web Page Combining elements and attributes to create a basic webpage.	**6**	Understand the basic structure of HTML documents	1,2
II	HTML Head Elements. Semantic HTML5 Elements. Importance of semantic elements for structure and accessibility. Grouping Content for images. Table, Forms and Input Creating forms.	**6**	Understand the HTML elements and attributes to create web pages	1,2,3

III	Images element and attributes. Audio and Video elements. Attributes and controls. Embedding Content for embedding other web content. Attributes: src, width, height, frameborder, allow Fullscreen. Using Media Responsively Responsive images with srcset. Making media content responsive for different devices.	**6**	Understand the images elements, and attributes	4,5
IV	Introduction to Web Accessibility Importance of accessibility. ARIA (Accessible Rich Internet Applications) roles and attributes. Accessibility Best Practices Using semantic HTML for better accessibility. Adding alt text for images. Ensuring proper focus order and keyboard navigation. SEO Basics Importance of SEO. Using appropriate HTML tags for SEO. Improving SEO with Structured Data Using schema.org vocabulary. Adding JSON-LD to HTML. Performance Optimization Reducing page load time. Using lazy loading for images and videos.	**7**	Understand the accessibility concept in website	3,4
V	Introduction to CSS. Inline, internal, and external CSS. Basic CSS Syntax Selectors, properties, and values. Colour, background, borders, and text styles. Layout Techniques Box model: margin, border, padding, content. Display property: block, inline, inline-block, none. Positioning: static, relative, absolute, fixed, sticky. Responsive Design Media queries. Flexible layouts with flexbox. Best Practices for CSS Organizing CSS. Avoiding common pitfalls.	**6**	Understand the style sheet like CSS.	4,5,6

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Create and structure basic HTML documents	2,3,8
2	Use a variety of HTML elements and attributes to build web pages.	2,3,8
3	Apply best practices for organizing content within web pages.	2,3,6,8
4	Develop accessible and SEO-friendly web content.	2,3,6,8
5	Construct and style static web pages that are visually appealing and functional	2,3,8

SEMESTER – II									
Course Title	**Environmental Science**								
Course code	**22UBES101R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30L	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To understand the fundamental concepts and principles of environmental science. 2. To analyse the impact of human activities on the environment. 3. To explore ecological processes and the importance of biodiversity. 4. To examine various environmental issues and their potential solutions. 5. To develop critical thinking skills to evaluate environmental policies and practices.								
CO1	Demonstrate the multidisciplinary nature of environmental studies								
CO2	Learning about natural resource, its importance and environmental impacts of Human activities on natural resource								
CO3	Explain environment and ecosystem, concept of biodiversity.								
CO4	Aware students about problems of environmental pollution, its impact and control measures.								
CO5	Illustrate the human population and the environment								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**KL**
I	**Multidisciplinary nature of environmental studies:** Definition, scope and importance Need for public awareness.		**8**		Understand basic ecological concepts and environmental processes.				**1,2**
II	**Natural Resources:** **Renewable and non-renewable resources:** Natural resources face over-exploitation, deforestation, and environmental degradation from activities like timber extraction, mining, and dam construction. Water overuse leads to floods, droughts, and conflicts. Agriculture and modern practices cause soil issues and food problems. Energy needs stress resources. Land degradation and sustainable use are critical for the future.		**10**		Identify and analyze the impact of human activities on the environment. Gain knowledge about environment and ecosystem. Understand the concept of biodiversity and respect them.				**2,3,4**

III	**Ecosystems:** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the Following ecosystem: - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**9**	Identify and analyze the impact of human activities on the environment. Gain knowledge about environment and ecosystem	**3,4**
IV	**Biodiversity and its conservation** Introduction – Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	**9**	Gain knowledge about the environment and ecosystem. Understand the concept of biodiversity and respect them Gain knowledge about the conservation of biodiversity and its importance. Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures	**4,5**

V	**The Interconnection Between Environmental Pollution and Social Issues: Impacts and Solutions:** Definition Cause, effects and control measures of: -Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. **Social Issues and the Environment:** From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Waste land reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.	**9**	Gain knowledge about the environment and ecosystem. Understand the concept of biodiversity and respect them Gain knowledge about the conservation of biodiversity and its importance. Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures	**4,5**

TEXT BOOKS:

1. Harucha E. B, Textbook of Environmental Studies, Orient Blackswan Publishing.
2. Tiwari V. K A Textbook of Environmental Studies, Himalaya Publishing House

3. Chatwal G. R. &Sharma H. Environmental Studies, Himalaya Publishing House

REFERENCE BOOKS:

1. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and
2. Stadards, Vol I and II, Enviro Media (R)
3. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
4. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
5. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the multidisciplinary nature of environmental studies	4
2	Learning about natural resource, its importance and environmental impacts of Human activities on natural resource	3,4
3	Explain the environment and ecosystem, concept of biodiversity.	3,4
4	Aware students about problems of environmental pollution, its impact and control measures.	4,5,6,7
5	Illustrate the human population and the environment	4,8

SEMESTER – II									
Course Title	**IMPLICATIVE ENGLISH** (Communicative English & Soft Skills)								
Course code	**22UBPD123R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To introduce the types of sentences and their significance. 2. To strengthen the vocabulary of the students to enhance student' vocabulary to enhance their speaking and writing skills it the importance of dress codes in various organizations. 3. To introduce the 3P's (Planning, prioritizing & performing) of Time Management.								
CO1	Illustrate student's sentence comprehension.								
CO2	Improve student's ability in framing different sentences while speaking and writing.								
CO3	Enhance writing skills in different areas including CV and cover letter writing.								
CO4	Develop student's self-management skills to plan their goals.								
CO5	Enhance their capacity in understanding and using different non-verbal communications throughout their communication.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Grammar:** Interchange of Interrogative and Assertive Sentences, Exclamatory and Assertive Sentences ii. Types of Tenses iii. Common Errors	**10**	Illustrate student's sentence comprehension.	**1,2,3**
II	**Vocabulary:** i. Synonyms ii. Antonyms iii. Homonyms	**14**	Improve student's ability in framing different sentences while speaking and writing. Enhance writing skills in different areas including CV and cover letter writing. Develop student's self-management skills to plan their goals.	**3,4**

III	**Reading Skills:** i. Techniques of Effective Reading ii. Gathering ideas and information from a text iii. TheSQ3RTechnique iv. Interpret the text	**12**	Improve student's ability in framing different sentences while speaking and writing. Develop student's self-management skills to plan their goals. Enhance their capacity in understanding and using different non-verbal communications throughout their communication.	**3,4**
IV	**Conflict Management:** i. Definition ii. Type of Conflict Management iii. Effects of Conflict Management iv. Methods to deal with Conflicts (Negative)	**12**	Enhance their capacity in understanding and using different non-verbal communications throughout their communication.	**4**
V	**Time-Management Skills:** i. Introduction To Time Management, ii. Purpose And Importance of Time Management, iii. Basic Tips to Maintain Time. **Activity:** Problem solving activity: A situation will be given to the students and they will have to tell us how to handle the situation or solve the problem.	**12**	Enhance their capacity in understanding and using different non-verbal communications throughout their communication.	**4**

TEXT BOOKS:

1. Wren, P.C and Martin, H. 1995. High School English Grammar and Composition, S Chand Publishing.
2. Barrett, Grant. 2016. Perfect English Grammar: The Indispensable Guide to Excellent Writing and Speaking, Zephyros Press

REFERENCE BOOKS:

1. McCarthy. (2008) English Vocabulary in Use Upper - Intermediate with CD ROM, Cambridge University Press

2. Tracy, Brian. (2018) Time Management: The Brian Tracy Success Library, Manjul Publishing House

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOME

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Illustrate student's sentence comprehension.	3,4,5,6,7,8
2	Improve student's ability in framing different sentences while speaking and writing.	3,4,5,6,7,8
3	Enhance writing skills in different areas including CV and cover letter writing.	2,3,4,5,6,7,8
4	Develop student's self-management skills to plan their goals.	2,34
5	Enhance their capacity in understanding and using different non-verbal communications throughout their communication.	2,3,4,5

SEMESTER – II									
Course Title	**Mathematics II**								
Course code	**22BCAO123R**	**Total credits: 4 Total hours: 45L +15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Mathematics**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. Describe the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems. 2. Apply the concept of graphs.								
CO1	Outline the basic principles of set theorem and apply them in solving different complex problems.								
CO2	Apply transform calculus in solving various complex problems.								
CO3	Demonstrate the concepts of proposition logic.								
CO4	Evaluate the limit of a function at a point or at infinity numerically by using L'Hospital's Rule.								
CO5	Implement the estimate maxima and minima of multivariable function								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**KL**
I	**Sets, relations and functions:** Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo-Boolean lattices.		**8**	Understand and identify different types of functions					**1,2**
II	**Propositional Logic:** Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.		**12**	Develop a deep understanding of the syntax and semantics of propositional logic, including proof systems and key logical properties such as satisfiability, validity, soundness, and completeness.					**2,3,4**

III	**Algebraic Structures:** Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations ring, integral domain, and field. Boolean algebra and Boolean ring (Definitions and simple examples only).	**8**	Develop Proficiency in the Analysis and Application of Various Algebraic Structures	**3,4**
IV	**Introduction to Counting:** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	**8**	Master Basic and Advanced Counting Techniques	**4,5**
V	**Introduction to Graphs:** Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	**8**	Develop Proficiency in Analyzing and Applying Fundamental Graph Theory Concepts:	**4,5**

TEXT BOOKS:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
2. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Outline the basic principles of set theorem and apply them in solving different complex problems.	1,2,3
2	Apply transform calculus in solving various complex problems.	1,2,3
3	Demonstrate the concepts of proposition logic.	1,2,3,4
4	Evaluate the limit of a function at a point or at infinity numerically by using L'Hospital's rule.	1,2,3
5	Implement the estimate maxima and minima of multivariable function	1,2,3

SEMESTER – II									
Course Title	**Techno Professional Skills I**								
Course code	**22BCAO125R**	**Total credits: 1** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To have a detailed revision of Computer Science & Information Technology concepts learnt so far. 2. To become confident in Computer Science & Information Technology concepts to solve problems in real-life situations.								
CO1	Implement programs that utilize file input/output operations to perform tasks like data storage, retrieval, and manipulation.								
CO2	Illustrate the importance of proper memory management and the potential risks associated with memory leaks.								
CO3	Demonstrate programs that utilize file input/output operations to perform tasks like data storage, retrieval, and manipulation.								
CO4	Outline the best practices for writing maintainable and efficient code.								
CO5	Apply coding skills and technical acumen to solve real-life problem scenarios								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Computer Application Fundamentals	**2**	Develop foundational knowledge and skills necessary to effectively use computer applications in both personal and professional contexts.	**1,2,3**
II	Office Automation	**2**	Develop the ability to efficiently manage and automate office tasks, leading to increased productivity and streamlined business operations.	**3,4**
III	C Programming	**2**	Understand the importance of writing efficient code and learn basic optimization techniques.	**3,4**

IV	Advanced C Programming	**2**	Understand and apply fundamental programming concepts, and develop problem-solving skills that are essential for advanced studies in computer science and software development.	**4**
V	Digital electronics	**2**	Understand digital systems and their applications.	**4**
Practical Component				
Practical 1	Write a program in C to implement the following. A bank stores the customer ids in a single dimensional array. The customer ids are generated using a random number generator. Each customer number is a 4-digit number. When a new customer id is to be entered, first the array needs to be checked sequentially. If the randomly generated 4-digit customer id already exists in the array, then the number to be regenerated (using a random number generator). This process is to be continued till it is ensured that the newly generated customer id does not already exist in the array. The new customer id is to be inserted into the array only if there is no repetition.	**2**	Develop proficiency in utilizing arrays to store and manage data. Learn to implement random number generation to create unique identifiers. Understand how to check for duplicates and ensure data uniqueness using iterative and conditional logic.	**2,3**

Practical 2	Write a program in C to do the following. Initialize all cells of a 5X5 matrix. Then enter a few positive numbers arbitrarily to some of the cells of the matrix. Now start from the middle cell of the top-most row i.e., 0th row and start entering the numbers 1,2, 3 etc. in sequence along the four diagonals (When one diagonal goes out of scope, change direction and move along the next lower/upper diagonal).	**4**	Develop skills in initializing and manipulating multi-dimensional arrays. Learn to traverse a matrix along its diagonals and implement complex traversal logic. Enhance problem-solving abilities by implementing specific traversal patterns and ensuring data is correctly placed in a matrix structure.	**2,3**
Practical 3	You want to keep track of the number of hours a worker in your company has worked per day. Note that Sundays are holidays. At the end of the month, you want to give awards to the following: a. Workers who have worked the maximum hours in a week. b. Workers who have worked the maximum hours in a month c. Workers who have not missed a single work day provided they have worked at leasts8 hours per day of the week.	**2**	Develop skills in collecting and storing data using arrays and data structures. Learn to perform data analysis to identify maximum values and meet specific conditions. Enhance problem-solving abilities by implementing algorithms to determine awards based on defined criteria.	**2**

Practical 4	Write a program in C to implement the following (using linked list). A bank stores the customer ids in a single dimensional array. The customer ids are generated using a random number generator. Each customer number is a 4-digit number. When a new customer id is to be entered, first the array needs to be checked sequentially. If the randomly generated 4-digit customer id already exists in the array, then the number to be regenerated (using a random number generator). This process is to be continued till it is ensured that the newly generated customer id does not already exist in the array. The new customer id is to be inserted into the array only if there is no repetition.	**2**	Acquire the ability to choose appropriate data structures based on problem requirements and constraints.	**2,3**

Practical 5	Write a program in C using linked list to implement the following: Store a route containing different stops/places one after another. A user will be asked to enter a start place and a destination place. The program will then print the route from the user given start point to the user given destination point in any direction. For e.g., supposed in our route, we have stored chandmari, silpukhuri, ghy club, ambary etc. Now the user should be able to give as start point – chandmari and destination as ambari and also, he must be able to give starting point as Ambari and destination as Chandmari. However, if the user given start point and /or destination does not exist in the stored route, then an appropriate message has to be displayed.	**2**	Acquire proficiency in dynamically allocating memory and managing linked list nodes to store and retrieve complex data structures effectively in a C environment.	**2,3**
Practical 6	Write a program to enter duplicate elements in an array. The program should then a. Print the duplicate elements only once. b. Print the array after removing any duplicated elements. Hint: you can use a second array for doing the necessary manipulation	**4**	Gain proficiency in algorithmic thinking by implementing logic to identify and manage duplicate elements in an array.	**2,3**

Practical 7	You are conducting a meeting for n people in a room where they sit in a circular table. Later you want to find out if any two people X and Y were sitting adjacent (i.e., immediately next) to reach other. What data structure will you use to implement this? The program should take as input the value of N, it should take as input the names of the N people and information as to who was sitting next to whom. After this, it should take as input a pair of names and then tell whether they were sitting adjacent to each other or not.	**2**	Develop a thorough understanding of circular data structures such as circular arrays or circular linked lists.	**4**

TEXTBOOKS:

1. C. Xavier, "Web Technology & Design", New Age Publication, 2003
2. Austin and Pawlan, "Advanced Programming for JAVA2 Platform", Pearson, 2000

REFERENCE BOOKS:

1. Oliver, Dick; SAMS Teach Yourself Html 4 in 24 Hours; Techmedia.
2. Ashbacher, Charles; SAMS Teach Yourself XML in 24 Hours; Techmedia.
3. Ashbacher, Charles; SAMS Teach Yourself XML in 24 Hours; Techmedia.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Implement programs that utilize file input/output operations to perform tasks like data storage, retrieval, and manipulation.	2,3,7,8
2	Illustrate the importance of proper memory management and the potential risks associated with memory leaks.	2,3,7,8
3	Demonstrate programs that utilize file input/output operations to perform tasks like data storage, retrieval, and manipulation.	2,3,7,8
4	Outline the best practices for writing maintainable and efficient code.	2,3,7,8
5	Apply coding skills and technical acumen to solve real-life problem scenarios	2,3,7,8

SEMESTER – II									
Course Title	**UNIVERSAL HUMAN VALUES (UHV) and PROFESSIONAL ETHICS**								
Course code	**22UUHV101R**	**Total credits: 2** **Total hours: 15L + 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**All UG and PG Programmes**								
Semester	**Fall/ II semester of the first year of the program**								
Course Objectives	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature								
CO1	Explain the significance of value inputs, following guidelines, and grasping the content and process of value education.								
CO2	Differentiate the Self from the Body, fostering awareness and understanding the meaning of harmony.								
CO3	Identify ethical and unethical practices, demonstrating increased awareness of ethical considerations.								
CO4	Develop strategies for a harmonious, ethical professional environment, promoting cooperation and ethical practices.								
CO5	Engage in critical decision-making, applying ethical principles to navigate challenges and contribute to a positive work environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	**12**	Understanding the need, basic guidelines, content and process for Value Education	**1,2**
II	Harmony in the Human Being - Harmony in Myself!	**8**	Understanding human being as a co-existence of the sentient	**2,3,4**
III	Harmony in the Family and Society- Harmony in Human- Human Relationship	**8**	Understanding values in human-human relationship	**3,4**
IV	Harmony in the Nature and Existence - Whole existence as Co-existence.	**6**	Understanding Existence as Co-existence (Sah-astitva) of mutually interacting unitsin all-pervasive space	**4,5**

V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	**8**	Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order	**4,5**

TEXT BOOKS:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values andprofessional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

REFERENCE BOOKS:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986,1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III,1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

OTHER LEARNING RESOURCES:

1. Value Education websites, http://uhv.ac.in, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the significance of value inputs, following guidelines, and grasping the content and process of value education.	**5**
2	Differentiate the Self from the Body, fostering awareness and understanding the meaning of harmony.	**5**
3	Identify ethical and unethical practices, demonstrating increased awareness of ethical considerations.	**5**
4	Develop strategies for a harmonious, ethical professional environment, promoting cooperation and ethical practices.	**6,7**
5	Engage in critical decision-making, applying ethical principles to navigate challenges and contribute to a positive work environment.	**4,5**

SEMESTER – II									
Course Title	**Extra-Curricular**								
Course code	**22UBEC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	**0**	**0**	**0**	**4**	**0**	**0**	**0.5**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Winter/ II semester of the second year of the program**								
Course Objectives	1. To develop problem-solving abilities through coding challenges and hackathons. 2. To participate in app development contests and exhibitions. 3. To develop entrepreneurial skills and mindset.								
CO1	Importance of different activities under different clubs.								
CO2	Formulate regular activities like workshops, competitions as per their interest and hobbies.								
CO3	Adapt to represent ADTU in various inter university, state and national level competitions.								
CO4	Discuss with invited experts in their respective fields.								
CO5	Develop an appreciation for diverse forms of artistic expression.								

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOME

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Importance of different activities under different clubs.	2,3,4,5,6,7
2	Formulate regular activities like workshops, competitions as per their interest and hobbies.	2,3,4,5,6,7
3	Adapt to represent ADTU in various inter university, state and national level competitions.	2,3,4,5,6,7,8
4	Discuss with invited experts in their respective fields.	2,3,4,5,6,7,8
5	Develop an appreciation for diverse forms of artistic expression.	2,3,5,6,7

SEMESTER – II									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC121**	**Total credits: 1** **Total hours:**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Winter/ II semester of the second year of the program**								
Course Objectives	It is to develop the social and soft skills and to promote a holistic development of the learners								
CO1	Connect and adapt cultural diversity among communities.								
CO2	Enhance team for working toward a shared vision								
CO3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals								
CO4	Learn to effectively communicate, delegate responsibilities and motivate team members.								
CO5	Develop strong teamwork and collaboration skills by engaging in group activities.								

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Connect and adapt cultural diversity among communities.	4,5,6,7,8
2	Enhance team for working toward a shared vision	4,5,6,7,8
3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals	4,5,6,7,8
4	Learn to effectively communicate, delegate responsibilities and motivate team members.	5,6,7,8
5	Develop strong teamwork and collaboration skills by engaging in group activities.	5,6,7,8

<table>
<tr><th colspan="9">SEMESTER – II</th></tr>
<tr><td>Course Title</td><td colspan="8">Computational Systems & Digital World</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UCDL103R</td><td rowspan="2">Total credits: 1
Total hours: 30P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pre-requisite</td><td>Digital Proficiency</td><td>Co-requisite</td><td colspan="6">Nil</td></tr>
<tr><td>Programme</td><td colspan="8">All UG and PG Programmes</td></tr>
<tr><td>Semester</td><td colspan="8">Fall/ II semester of the first year of the program</td></tr>
<tr><td>Course Objectives</td><td colspan="8">1. Students will be able to identify and analyse computer hardware, software and their uses.
2. Students will be able to use MS-Office suite for various purposes.
3. Students will be able to use the Internet efficiently for required information as well as for digital financial transactions.</td></tr>
<tr><td>CO1</td><td colspan="8">Demonstrate the Computer Hardware, Software and Computer handling</td></tr>
<tr><td>CO2</td><td colspan="8">Apply MS-Office to solve basic information management issues</td></tr>
<tr><td>CO3</td><td colspan="8">Operate the social media and e-commerce sites efficiently and ethically</td></tr>
<tr><td>CO4</td><td colspan="8">Analyze the merchants to facilitate easier transactions and accept a variety of digital payment methods.</td></tr>
<tr><td>CO5</td><td colspan="8">Use of computing technically ethically, safely, securely and legally for day-to-day use.</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="2">Learning Outcome</td><td>KL</td></tr>
<tr><td>I</td><td colspan="3">Fundamentals of Computer Systems and Internet Search
i. Components of a Computer and their functions.
ii. Office Automation using MS-Word, MS-Excel, and MS-PowerPoint.
iii. Data management, Statistical Data Analysis and Data Visualization with MS-Excel.
iv. Use of Functions, Graphs & Charts in MS-Excel.</td><td>6</td><td colspan="2">Develop an understanding of computer architecture and its relevance in the context of hardware and software interactions.</td><td>1,2</td></tr>
</table>

II	**Internet & Cyber World** i. Introduction to Computer Networks, Internet and World Wide Web, Websites and Web portals. ii. Creation and use of Email Accounts. iii. Web browsing, Web Searching, Different aspects of Web Searching- Search Keywords, conditions and combinations. iv. Study of different Search Engines like Google, Microsoft Bing, Yahoo, Yandex, Duck Duck Go, Ask.com etc. v. Cyber Crimes, Cyber Laws and IT Act 2000, India.	**8**	Equip learners with essential knowledge and skills to navigate the digital landscape effectively, understand web technologies, utilize online communication tools, conduct efficient web searches, and comprehend legal and ethical aspects related to information technology and cybersecurity.	**2,3,4**
III	**Introduction to social media and E-Commerce** i. Relevance of social media in present scenario. Posting different types of contents in social media. ii. Creating accounts and using some popular social media portals and Apps like WhatsApp, iii. Facebook, etc. Social Media Etiquettes & Crimes. iv. Definition of E-Commerce; E-Commerce versus traditional Commerce. v. Case studies of popular E-Commerce portals like Amazon. vi. E-commerce Etiquettes & Crimes.	**6**	Explore the nuances of social media etiquettes, learning appropriate online behaviour and effective interaction strategies across platforms like WhatsApp and Facebook.	**3,4**

IV	**Digital Payments and Digital Transactions** i. Introduction to Digital Payment Systems. ii. Creating accounts and using Digital Payment Systems like Credit Cards, Debit Cards, Net banking, UPI. iii. Digital payments Etiquettes & Crimes.	**6**	Develop a foundational understanding of digital payment systems, exploring the functionalities of credit cards, debit cards, net banking, and UPI (Unified Payments Interface).	**4,5**
V	**Basic Accounting and Utility Software** iv. Introduction to Basic accounting concepts, Introduction to an Accounting Software like GnuCash or Tally. Page 10 of 10 v. Introduction to Technical Document writing using LaTex. vi. Introduction to Data Visualization software – Sigma, Google Charts, Tableau.	**4**	Gain a foundational understanding of basic accounting principles and practices, including concepts such as double-entry bookkeeping and financial reporting.	**4,5**

TEXT BOOKS:

1. Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems & Applications. 3rd ed. New Delhi: BPB Publications.
2. Goel, A, 2010. Computer Fundamentals, Pearson India

REFERENCE BOOKS:

1. Bal Guruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.
2. Bal Guruswamy, 2014. E. Fund of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-Hill Education.
3. Lawson, C. 2022. Introduction to social media, Oklahoma State University.

OTHER LEARNING RESOURCES:

1. https://www.w3schools.com
2. https://edu.gcfglobal.org
3. https://www.tutorialspoint.com
4. https://www.javatpoint.com

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the Computer Hardware, Software and Computer handling	1,2,3
2	Apply MS-Office to solve basic information management issues	1,2,3
3	Operate the social media and e-commerce sites efficiently and ethically	1,2,3
4	Analyze the merchants to facilitate easier transactions and accept a variety of digital payment methods.	1,2,3,7
5	Use of computing technically ethically, safely, securely and legally for day-to-day use.	1,2,3,7

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO121R	DATA STRUCTURE USING C	2	3	1					1
22BCAO122R	COMPUTER ORGANIZATION AND ARCHITECTURE		2	2		2	2	1	2
22BCAO123R	MATHEMATICS-II	3	2	3	1				
22BCAO124R	INTRODUCTION TO WEB TECHNOLOGY	1	2	3	1	2		1	1
22UBES101R	ENVIRONMENTAL SCIENCE			1	3	2	1	1	2
22BCAO125R	TECHNO PROFESSIONAL SKILLS I		2	2				2	2
22UBPD123R	IMPLICATIVE ENGLISH		2	1	2	3	3	2	3
22MOSY123R	MOOC I(HTML)	-	1	2	-	-	1	-	2
22UUHV101R	UNIVERSAL HUMAN VALUE and PROFESSIONAL ETHICS				2	2	1	2	
22UBCC121	CO-CURRICULAR				2	1	3	2	2
22UBEC121	EXTRA-CURRICULAR		1	2	2	2	3	2	2
22UCDL103R	COMPUTATIONAL SYSTEMS AND DIGITAL WORLD	1	3	2				2	

SEMESTER – III									
Course Title	**Database Management Systems**								
Course code	**22BCAO211R**	**Total credits: 5**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. Understand the fundamental concepts and principles of Database Management Systems (DBMS) 2. To understand and use data manipulation language to query, update, and manage a database. 3. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency 4. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS 5. Solve problems related to data storage, retrieval, and management using DBMS principles and techniques.								
CO1	Understand the basic concepts of database management system.								
CO2	Discover the basic fundamentals of creating a database by using data definition, data manipulation and control languages.								
CO3	Develop a database application and retrieve the values with the help of queries using SQL.								
CO4	Design, analyze and evaluate the project developed for an application.								
CO5	Demonstrate the concepts of database security, distributed database systems and object-oriented databases								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations.	**6**	Understand Database System Architecture, Comprehend Data Abstraction Levels, Grasp Data Independence, Explore Various Data Models, Apply Entity-Relationship Model, Perform Data Manipulation Operations	1,2
II	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. **Query processing and optimization:**	**10**	Understand Relational Algebra, Comprehend Tuple and Domain Relational Calculus, Utilize SQL3, Differentiate Between Open Source and Commercial DBMS, Understand Domain and Data Dependency, Achieve Normal Forms,	1,2

	Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.		Ensure Dependency Preservation, Evaluate Relational Algebra Expressions, Understand Query Equivalence, Implement Join Strategies, Optimize Queries	
III	**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, multi-version and optimistic, Concurrency Control schemes, Database recovery.	**8**	Understand Transaction Processing, Comprehend Concurrency Control, Master the ACID Properties, Evaluate Serializability of Scheduling, Implement Locking-based Schedulers, Utilize Timestamp-based Schedulers, Explore Multi-version Concurrency Control, Understand Optimistic Concurrency Control Schemes, Implement Database Recovery Mechanisms, Apply Recovery Techniques	1,2
IV	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	**6**	Understand Authentication, Comprehend Authorization and Access Control, Differentiate Between DAC, MAC, and RBAC Models, Implement Access Control Models, Understand Intrusion Detection, Recognize and Mitigate SQL Injection Attacks	1,2
V	**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	**5**	Understand Object-Oriented Databases, Utilize Object-Relational Databases, Comprehend Logical Databases, Understand Web Databases, Understand Distributed Databases, Comprehend Data Warehousing, Understand	1,2

			Data Mining	
Practical Component				
Practical 1	**Consider the bank database given, where the primary keys are underlined. Construct the following SQL queries for this relational database.** a. Find the ID of each customer of the bank who has an account but not a loan. b. Find the ID of each customer who lives on the same street and in the same city as customer '12345'. c. Find the name of each branch that has at least one customer who has an account in the bank and who lives in "Harrison".	**2**	Describe, illustrate, explain, apply and develop DBMS Programming using commands.	1,2,3 ,4
Practical 2	**Create the below tables with the given attributes and enter some records.** a. Write a query to find the total number of marks obtained by each student. b. Write a query that gives the total marks obtained by Mohan. c. Write a query that displays the maximum marks of every subject. d. Write the SQL query which displays the name of those students who's total of all subjects is greater than 205. e. Display name of the students whose subjects total is greater than 205 and roll number is between 1 to 2. Pre-Experiment Questions 1. What is the use of sub-Queries? 2. Explain different types of Joins. Post Experiment Questions 1. How to alter Primary Key? 2. How to update a table by enforcing constraint?	**2**	Design and Create Database Tables, Write SQL Queries for Data Retrieval, Utilize SQL Functions, Implement Conditional Query Logic, Filter Data Based on Multiple Conditions, Understand and utilize subqueries, Alter table structures, Update data with constraints	2,3
Practical 3	**Create the table as given below, fill in the data.** Question: Which normal form in the table? After creating the table, create a second table (s) to convert the same into 2NF!	**2**	Understand Database Normalization, Design and Create Database Tables, Identify Normal Forms, Transform Tables to Achieve Higher Normal	2,3

			Forms, Implement Referential Integrity, Enhance Data Integrity and Reduce Redundancy	
Practical 4	**Write the SQL queries using Group by and having clause using following table.** Create the above tables with the given attributes and enter some records. I. Write a query to find the total number of marks obtained by each student. II. Write a query that gives the total marks obtained by Mohan. III. Write a query that displays the maximum marks of every subject. IV. Write the SQL query which displays the name of those students who's total of all subjects is greater than 205. V. Display name of the students whose subjects total is greater than 205 and roll number is between 1 to 2.	**2**	Understanding Table Creation and Data Insertion, Querying and Summarizing Data, Using Aggregate Functions, Filtering Grouped Data	1,2,3
Practical 5	**Create a table, fill it with customer details and do the following queries:** a. Find the total revenue for each customer b. List customers who have made more than one order c. Find the date of the most recent order for each customer d. Calculate the average order amount for each customer e. Retrieve the orders placed in January 2023 f. Find the top 3 customers with the highest total revenue g. Calculate the total revenue for each month in 2023 h. List orders with a total amount greater than the average total amount for all orders i. Find customers who have made orders on consecutive days j. Calculate the total revenue for each customer, including orders made by customers who haven't placed any	**2**	Table Creation and Data Insertion, summarizing customer revenue, Analyging ordering data, Filtering and Retrieving Specific Orders, Identifying High-Value Customers	3,4

	orders			
Practical 6	**Create the following tables:** **Books Table** CREATE TABLE Books (Book ID INT PRIMARY KEY, Title VARCHAR (255), Author ID INT, Genre VARCHAR (100), ISBN (20), Publication Year INT); -- Authors Table CREATE TABLE Authors (Author ID INT PRIMARY KEY, Author Name VARCHAR (255)); -- Members Table CREATE TABLE Members (Member ID INT PRIMARY KEY, Member Name VARCHAR (255), Membership Date DATE); -- Loans Table CREATE TABLE Loans (Loan ID INT PRIMARY KEY, Book ID INT, Member ID INT, Loan Date DATE, Return Date DATE, FOREIGN KEY (Book ID) REFERENCES Books (Book ID), FOREIGN KEY (Member ID) REFERENCES Members (Member ID)); Write the queries for the following: a. list all books with their authors b. find books by a specific author (e.g., author with ID 5) c. list all members who have borrowed at least one book d. get a list of all genres and the number of books in each genre e. update a loan return date for a	**2**	Database Design and Table Creation, Data Manipulation and Retrieval, Querying Data with Conditions, Aggregate Functions and Grouping, Updating Data,	3,4

	specific book and member			
Practical 7	**(**Exercise on updating records in table) Create Client master table with the following fields (Client NO, Name, Address, City, State, bal_due) (a) Insert five records (b) Find the names of clients whose bal_due>5000. (c) Change the bal_due of Client NO "C123" to Rs. 5100 (d) Change the name of Client master to Client12. (e) Display the bal_due heading as "BALANCE"	**4**	Table Creation and Data Insertion, summarizing customer revenue, analysing ordering data, Filtering and Retrieving Specific Orders	3,4
Practical 8	Rollback and Commit commands Create Teacher table with the following fields (Name, Dept No, Date of joining, Dept Name, Location, Salary) (a) Insert five records (b) Give Increment of 25% salary for Mathematics Department. (c) Perform Rollback command (d) Give Increment of 15% salary for Commerce Department (e) Perform commit command	4	Data Insertion, summarizing customer revenue, analysing ordering data, Filtering and Retrieving Specific Orders, using roll back and commit command	2,3,4
Practical 9	(Exercise on order by and group by clauses) Create Sales table with the following fields (Sales No, Sales name, Branch, Sales amount, DOB) (a) Insert five records (b) Calculate total sales amount in each branch (c) Calculate average sales amount in each branch. (d) Display all the salesmen, DOB who are born in the month of December as day in character format i.e., 21-Dec-09 (e) Display the name and DOB of salesman in alphabetical order of the month.	2	Creation and Insertion of records, use of group by Clouse	2,3,4
Practical 10	Create an Emp table with the following fields: (Emp No, Emp Name, Job, Basic, DA, HRA, PF, Gross Pay, Net Pay)	4	Database Design and Table Creation, Data Manipulation and Retrieval, Querying Data	2,3,4

	(Calculate DA as 30% of Basic and HRA as 40% of Basic) (a) Insert Five Records and calculate Gros Pay and Net Pay. (b) Display the employees who's Basic is lowest in each department. (c) If Net Pay is less than <Rs. 10,000 add Rs. 1200 as special allowances. (d) Display the employees whose Gross Pay lies between 10,000 & 20,000 (e) Display all the employees who earn maximum salary.		with Conditions, Aggregate Functions and Grouping, Updating Data,	
Practical 11	Create a table, fill it with customer details and do the following queries: a) Find the total revenue for each customer b) List customers who have made more than one order c) Find the date of the most recent order for each customer d) Calculate the average order amount for each customer e) Retrieve the orders placed in January 2023 f) Find the top 3 customers with the highest total revenue g) Calculate the total revenue for each month in 2023 h) List orders with a total amount greater than the average total amount for all orders i) Find customers who have made orders on consecutive days j) Calculate the total revenue for each customer, including orders made by customers who haven't placed any orders.	4	Table Creation and Data Insertion, summarizing customer revenue, Analyging ordering data, Filtering and Retrieving Specific Orders.	2,3,4
Practical 12	Employee Database An Enterprise wishes to maintain a database to automate its operations. Enterprise is divided into certain departments and each department consists of employees. The following two tables describes the automation schemas Dept (deptno, dname, loc) Emp (empno, ename, job, mgr, hiredate,	4	Database Design and Table Creation, Data Manipulation and Retrieval, Querying Data with Conditions, Aggregate Functions and Grouping, Updating Data,	2,3,4

	sal, comm, deptno) a) Update the employee salary by 15%, whose experience is greater than 10 years. b) Delete the employees, who completed 30 years of service. c) Display the manager who is having maximum number of employees working under him? d) Create a view, which contain employee names and their manager			
Practical 13	Using Employee Database perform the following queries a) Determine the names of employee, who earn more than their managers. b) Determine the names of employees, who take highest salary in their departments. c) Determine the employees, who are located at the same place. d) Determine the employees, whose total salary is like the minimum salary of any department. e) Determine the department which does not contain any employees.	4	Table Creation and Data Insertion, summarizing customer revenue, analysing ordering data, Filtering and Retrieving Specific Orders.	2,3,4
Practical 14	11. Write the SQL queries using Group by and having clause using following table. Create the above tables with the given attributes and enter some records. a) Write a query to find the total number of marks obtained by each student. b) Write a query that gives the total marks obtained by Mohan. c) Write a query that displays the maximum marks of every subject. d) Write the SQL query which displays the name of those students who's total of all subjects is greater than 205. e) Display name of the students whose subjects total is greater than 205 and roll number is between 1 to 2.	4	Design and Create Database Tables, Write SQL Queries for Data Retrieval, Utilize SQL Functions, implement group by clause Logic, Filter Data Based on Multiple Conditions, Understand and utilize subqueries, display data	2,3,4,5
Practical 15	Create the following tables: Book (accession-no, title, publisher, year,	4	Table Creation and Data Insertion, summarizing	2,3,4,5

	date-of-purchase, status) Member (member-id, name, number-of-books-issued, max-limit) Book-issue (accession-no, member-id, date-of-issue) (a) Create a form to accept the data from the user with appropriate validation checks. (b) Generate queries to do the following: (i) List all those books which are due from the students to be returned. A book is considered to be due if it has been issued 15 days back and yet not returned. (ii) List all those members who cannot be issued any more books.		customer revenue, Analyging ordering data, Filtering and Retrieving Specific Orders	

TEXT BOOKS:

1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

REFERENCE BOOKS:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.
2. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

OTHER LEARNING RESOURCES:

1. **https://www.jbiet.edu.in/coursefiles/cse/HO/cse2/DBMSI-III.pdf**
2. **https://cs.ulb.ac.be/public/_media/teaching/infoh303/dbmsnotes.pdf**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic concepts of database management system.	**2, 3, 7, 8**
2	Discover the basic fundamentals of creating a database by using data definition, data manipulation and control languages.	**2, 3, 7, 8**
3	Develop a database application and retrieve the values with the help of queries using SQL.	**2, 3, 7, 8**

4	Design, analyze and evaluate the project developed for an application.	**2, 3, 7, 8**
5	Demonstrate the concepts of database security, distributed database systems and object-oriented databases	**2, 3, 7, 8**

SEMESTER – III									
Course Title	**Object Oriented Programming using C++**								
Course code	**22BCAO214R**	**Total credits: 5**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L+60P	**3**	**0**	**4**	**0**	**0**	**0**	**5**
Pre-requisite	**Basic Programming**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To allow programmers to think in terms of the structure of the problem rather than in terms of the structure of the computer. 2. To teach how to decompose the problem into a set of objects. 3. To teach how Objects interact with each other to solve the problem. 4. To teach how to create new type of objects to model elements from the problem space								
CO1	Demonstrate the fundamental principles of OO programming, OO analysis, design and development.								
CO2	Explain the principles of data abstraction, encapsulation and inheritance in C++								
CO3	Describe the concepts of polymorphism and virtual functions on computing problem.								
CO4	Design applications for a range of problems using file and exception handling.								
CO5	Illustrate the process of data file manipulation using C++								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Principles of Objective Oriented Programming: Object Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of Object-Oriented Programming, Object Oriented Languages, Applications of Object-Oriented Programming, Beginning with C++. Token Expressions & Control Structures: Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables	**8**	Understand the OOP Paradigm, Understand Tokens in C++, Comprehend Keywords and Identifiers, Understand Constants, Understand Data Types, Comprehend Type Compatibility, Understand Variables, Understand Operators in C++, Comprehend Implicit Conversions, Understand Operator Overloading, Comprehend Operator Precedence, Understand Control Structures in C++, Implement Control Structures	**1,2**

	Operators in C++, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.,			
II	**Functions in C++:** The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Function Overloading, Friend and Virtual Functions. Specifying a class, Member Functions, Arrays within a class, Static Member Functions, Arrays of Objects, Friendly Functions. **Object and Classes:** Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces), Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. Returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes	**8**	Understand the Role of the Main Function, Understand Function Prototyping, Understand Call by Reference, Understand Return by Reference, Understand Inline Functions, Understand Function Overloading, Understand Friend Functions, Understand Virtual Functions, Specify a Class and Member Functions, Understand Arrays within a Class, Understand Static Member Functions, Understand Arrays of Objects, Understand Core Object Concepts, Implement Classes in C++, Understand C++ Objects as Physical Objects, Understand C++ Objects as Data Types, Understand Objects as Function Arguments, Understand Returning Objects from Functions, Understand the Relationship between Structures and Classes, Understand Classes, Objects, and Memory Management, Understand Const and Classes	**1,2**
III	**Constructors & Destructors, Operator Overloading**: Constructors, Parameterized Constructors, Copy Constructors, Dynamic Constructors, Destructors, Defining Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions. **Inheritance:** Concept of inheritance. Derived class and based class. Derived class	**8**	Understand Constructors, Understand Parameterized Constructors, Understand Copy Constructors, Understand Dynamic Constructors, Understand Destructors, Understand Operator Overloading, Understand Type Conversions, Understand the Concept of Inheritance, Understand Derived and Base Classes, Understand Derived Class Constructors, Understand Member Functions in Inheritance, Understand Inheritance in the English Distance Class, Understand Class Hierarchies, Understand	**1,2**

	constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development.		Inheritance and Graphics Shapes, Understand Public and Private Inheritance, Understand Aggregation, Understand Inheritance and Program Development	
IV	**Pointer:** Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. **Memory management:** New and Delete, pointers to objects, Name of the Course Object Oriented Programming Using C++ **Arrays and Strings:** Arrays and string arrays fundamentals. Arrays as class Member Data, Arrays of object, string, The standard C++ String class	**8**	Understand Addresses and Pointers, Use the Address of Operator, Manipulate Pointers, Understand Pointer and Arrays Relationship, Manipulate Arrays Using Pointers, Use Pointers in Functions, Understand Array and String Fundamentals, Implement Arrays as Class Member Data, Manipulate Strings	**1,2**
V	**Exception handling:** Try, throw, and catch, exceptions and derived classes, function exception declaration, unexpected exceptions, exception when handling exceptions, resource capture and release. **Streams and Files**: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output. **Templates and Exceptions**: Function templates, Class templates Exceptions.	**7**	Understand Exception Handling Mechanisms, Implement Exception Handling, Handle Derived Exceptions, Declare Function Exceptions, Manage Unexpected Exceptions, Handle Exceptions within Exception Handling, Ensure Resource Management, Understand Stream Classes, Perform Disk File I/O, Handle File I/O Errors, Use Memory Streams, Process Command Line Arguments, Implement Function Templates, Implement Class Templates, Handle Exceptions in Templates	**1,2**
Practical Component				

Practical 1	Program to find Area and Circumference of Circle.	**2**	Understand mathematical concepts, develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3,4**
Practical 2	Program to convert temperature from degree Centigrade to Fahrenheit.	**2**	Understand temperature conversion, develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2**
Practical 3	Program to calculate Sum of 5 subjects and find Percentage.	**2**	Understand basic arithmetic operations, develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2**
Practical 4	Program to show swap of two numbers by using third variable.	**2**	Understand how to use variables to store and manipulate data, develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2**
Practical 5	Program to show swap of two numbers by without using third variable.	**2**	Understand and apply logical operations, develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2**
Practical 6	Program to reverse a given number.	**2**	Understand iteration and string manipulation, develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3**
Practical 7	Program to find greatest among 3 Numbers.	**2**	Understand the concepts of conditional statements, develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3**
Practical 8	Program to show use of conditional operator.	**2**	Understand conditional operators, develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3**
Practical 9	Program to show leap year or not.	**2**	Understand the criteria for determining a leap year, develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3**
Practical 10	Program to find whether the given number is even or odd.	**2**	Learn to use the modulo operator '%', Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3**
Practical 11	Program to use switch	**2**	Understand the syntax and usage of	**3,4**

	statement.		switch statement, develop algorithm design skills, develop programming skills, Understand data types and variables	
Practical 12	Program to display arithmetic operation using switch statement.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**3,4**
Practical 13	Program to display first 10 natural number and their sum.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**3,4**
Practical 14	Program to print star pattern of the following: * * * * * * * * * * * * * * *	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**3,4**
Practical 15	Program to print star pattern for the following: * * * * * * * * * * * * * * *	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 16	Program to print star pattern for the following: * * * * * * * * * * * * * * *	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 17	Program to find Fibonacci series up to a range.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 18	Program to find factorial of a number.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 19	Program to count Number of digits.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 20	Program to check a given number is Armstrong or not.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 21	Program to check whether the given number is palindrome or not.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**1,2,3**
Practical 22	Program to find whether the	**2**	Develop algorithm design skills,	**2,3,4**

	given number is prime or not.		develop programming skills, Understand data types and variables	
Practical 23	Program to display 1+1/2+1/3+. . .+1/n.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 24	Program to display 1+3+5+. . .+n.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 25	Program to show sum of 10 elements of array and show the average.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 26	Program to find the maximum and minimum number in an array.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 27	Program to display matrix.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 28	Program to demonstrate constructor.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 29	Program to demonstrate constructor.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**
Practical 30	Program to demonstrate copy constructor.	**2**	Develop algorithm design skills, develop programming skills, Understand data types and variables	**2,3,4**

TEXT BOOKS:

1. Robert Lafore, Object Oriented Programming in C++, Techmedia Publication.

REFERENCE BOOKS:

1. Herbert shield, The complete reference C, Tata McGraw Hill Publication.
2. Saurav Sahay, Object Oriented Programming in C++, Oxford University Press.
3. R Rajaram, Object Oriented Programming in C++, New Age International Publishers

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the fundamental principles of OO programming, OO analysis, design and development.	2, 3, 4, 5, 6, 8
2	Explain the principles of data abstraction, encapsulation and inheritance in C++	2, 3, 4, 5, 6, 7, 8
3	Describe the concepts of polymorphism and virtual functions on computing problem.	2, 3, 4, 6, 8
4	Design applications for a range of problems using file and exception handling.	2, 3, 4, 5, 6, 8
5	Illustrate the process of data file manipulation using C++	2, 3, 4, 5, 6, 8

SEMESTER – III									
Course Title	**Introduction to Linux**								
Course code	**22BCAO213R**	**Total credits: 4** **Total hours: 45L+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters. 2. To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts. 3. To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's). 4. To facilitate students in understanding Processes, Inter process communication, and Shared Memory.								
CO1	Demonstrate the basic knowledge of Linux commands in linux shell environment								
CO2	Apply Linux commands to write Shell Programming for operating the files and folders								
CO3	Analyze the procedure for creating parent, child, zombie, orphan process and relationship between them								
CO4	Create Network Programming to make efficient use of various resources available on different machines in a network.								
CO5	Design various client server application using TCP and UDP protocols								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction To Linux and Linux Utilities:** A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio	**8**	Describe, illustrate, and explain Linux, Linux history and Linux architecture, features of Linux. Command path.	1,2

II	**Introduction to Shells:** Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes, concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files, Grep: Operation, grep Family, Searching for File Content. Sed: Scripts, Operation, Addresses, commands, Applications, grep and sed.	**8**	Describe, illustrate, and explain Shell Programming using Linux commands and manipulate system operations.	1,2
III	**Unix/Linux File Structure:** Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers. **File Management:** File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.	**8**	Describe, illustrate, and explain UNIX file system, device drivers and Design and write application.	1,2,3
IV	**Process And Signals:** Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.	**8**	Describe, illustrate, and explain process identifier and signals and develop IPC-API's.	1,2,3,4
V	**Inter Process Communication:** Pipe, process pipes, the pipe call,	**7**	Describe, illustrate, and explain and apply	1,2,3,4

	parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands. **Introduction To Sockets:** Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications**.**		inter process communication.	
Practical Component				
Practical 1	Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no:	**2**	Describe, Shell Programming using Linux commands.	2,3
Practical 2	Write a shell script that delete all lines containing a specified word	**2**	Illustrate, explain, Shell Programming using Linux commands	2,3
Practical 3	Write a shell script that displays a list of all the files in the current directory	**2**	Describe, illustrate, explain, apply and develop Shell Programming using Linux commands in current directory.	2,3
Practical 4	Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly, whenever the argument is a file or directory.	**2**	Compare and analyse different methods for checking file types in shell scripting.	2,3
Practical 5	Write a shell script that accept a list of file names as arguments count and report the occurrence of each word.	**2**	Evaluate the script's performance and reliability in different scenarios.	2,3,4
Practical 6	Write a awk script to find the number of characters, words and lines in a file? linked list respectively.	**2**	Evaluate the accuracy and efficiency of the AWK script in various scenarios.	2,3,4
Practical 7	Write a C Program that makes a copy of a file using standard I/O and system calls? using Cat command	**2**	Design a script that generates a detailed report of file and directory statuses, including permissions and sizes.	2,3,4
Practical 8	Implement in C the following Unix	**2**	Design a C program	2,3,4

	commands using system calls “mv”		that mimics other Unix commands, such as cp or rm, using similar system calls and techniques.	
Practical 9	Implement in C the following Unix commands using system calls “ls”	**2**	Explain the purpose and functionality of the ls command and its variations (ls -l).	2,3,4
Practical 10	Write a C program to emulate the Unix ls-l command?	**2**	Create more advanced programs that incorporate additional features of the ls command, such as sorting or filtering.	2,3,4
Practical 11	Write a C program to list for every file in a directory, its inode number and filename.?	**2**	Demonstrate the ability to use system calls to read directory contents and retrieve file information.	2,3,4
Practical 12	Write a C program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen	**2**	Assess the synchronization and communication between parent and child processes in a C program.	2,3,4
Practical 13	Write a C program to create a Zombie process.?	**2**	Create a more advanced script that includes additional functionalities such as recursive directory checks	2,3,4
Practical 14	Write a C program that illustrates how an orphan is created.	**2**	Evaluate the program's correctness in creating orphan processes and handling command execution with pipes.	4,5
Practical 15	Write a program that illustrates how to execute two commands concurrently with a command pipe.	**2**	esign a system that uses process control and pipes to perform more sophisticated tasks, such as a custom shell or command interpreter.	4,5

TEXT BOOKS:

1. W. Richard. Stevens, Advanced Programming in the UNIX Environment, Pearson Education, New Delhi, India.

2. UNIX and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson

REFERENCE BOOKS:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R. Stevens, Pearson Education.
3. UNIX Network Programming, W.R. Stevens, PHI.
4. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the basic knowledge of Linux commands in linux shell environment	1,2,3,4,5
2	Apply Linux commands to write Shell Programming for operating the files and folders	1,2,3,4,5
3	Analyze the procedure for creating parent, child, zombie, orphan process and relationship between them	1,2,3,4,5
4	Create Network Programming to make efficient use of various resources available on different machines in a network.	1,2,3,4,5
5	Design various client server application using TCP and UDP protocols	1,2,3

SEMESTER – III									
Course Title	**Operating Systems**								
Course code	**22BCAO212R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To learn the mechanisms of OS to handle processes and threads and their communication and the mechanisms involved in memory management in contemporary OS. 2. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 3. To know the components and management aspects of concurrency management.								
CO1	Explain the basic concepts of Operating Systems and related concepts.								
CO2	Summarize the concepts of processes and threads, process scheduling including Throughput, Turnaround Time, Waiting Time, Response Time.								
CO3	Identify the concept for optimally allocating memory to processes by increasing memory utilization and improving the access time.								
CO4	Demonstrate and implement the concepts of deadlocks and related concepts								
CO5	Implement various techniques of memory and file management.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.	**7**	Understand the Concept of Operating Systems, Trace the Generations of Operating Systems, Identify Types of Operating Systems, Comprehend OS Services, Utilize System Calls, Understand OS Structures, Conceptualize the Virtual Machine	1,2
II	**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, **Process Scheduling**: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time,	**8**	Understand the Definition of a Process, Comprehend Process Relationships, Identify Different States of a Process, Understand Process State Transitions, Explore the Process Control Block (PCB), Understand Context Switching, Define Threads, Identify Various States of Threads, Understand the Benefits of Threads, Conceptualize Multithreading, Understand	2,3

	Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling.		the Foundation and Objectives of Process Scheduling, Identify Types of Schedulers, Understand Scheduling Criteria, Explore Scheduling Algorithms, Comprehend Multiprocessor Scheduling	
III	**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution **Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery	**8**	Understand the Concept of Inter-Process Communication, Comprehend the Critical Section Problem, Identify Race Conditions, Understand Mutual Exclusion, Explore Hardware Solutions for Mutual Exclusion, Understand the Definition of Deadlock, Identify Necessary and Sufficient Conditions for Deadlock, Understand Deadlock Prevention, Explore Deadlock Avoidance, Comprehend Deadlock Detection and Recovery	2,3
IV	**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging. **Virtual Memory**: Basics of Virtual Memory – Hardware and control, l structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	**8**	Understand the Basic Concept of Memory Management, Comprehend Logical and Physical Address Mapping, Explore Memory Allocation Techniques, Identify Internal and External Fragmentation, Understand Compaction, Explore Paging, Understand the Basics of Virtual Memory, Comprehend Hardware and Control Structures for Virtual Memory, Explore the Concept of Locality of Reference, Understand Page Faults, Comprehend the Working Set Model, Understand Dirty Pages and Dirty Bits, Explore Demand	2,3

			Paging, Understand Page Replacement Algorithms,	
V	**I/O Hardware:** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure. **File Management**: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management. **Disk Management:** Disk structure, Disk scheduling, Disk reliability, Disk formatting, Boot-block, Bad blocks.	**6**	Understand the Different Types of I/O Devices, Comprehend Device Controllers, Understand Direct Memory Access (DMA), Comprehend the Goals of Interrupt Handlers, Understand Device Drivers, Explore Device-Independent I/O Software, Understand Secondary-Storage Structure, Understand the Concept of a File, Explore File Access Methods, Comprehend File Operations, Understand Directory Structure, Explore File System Structure, Understand File Allocation Methods, Comprehend Free-Space Management, Understand Disk Structure, Explore Disk Scheduling, Comprehend Disk Reliability, Understand Disk Formatting, Explore the Boot Block and Bad Blocks,	2,3

TEXT BOOKS:

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

REFERENCE BOOKS:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the basic concepts of Operating Systems and related concepts.	2, 3, 5,6,8
2	Summarize the concepts of processes and threads, process scheduling including Throughput, Turnaround Time, Waiting Time, Response Time.	1, 2, 3, 5, 6, 8
3	Identify the concept for optimally allocating memory to processes by increasing memory utilization and improving the access time.	2, 3, 5, 6, 8
4	Demonstrate and implement the concepts of deadlocks and related concepts	1,2
5	Implement various techniques of memory and file management.	1,2

SEMESTER – III									
Course Title	**ENGLISH LANGUAGE FOR EXCELLENCE (Communicative English & Soft Skills)**								
Course code	**22UBPD212R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To enable students to learn, understand and practice different ways of presentation and use of correct grammar. 2. To augment the writing skills in different areas including CV and cover letter writing. 3. To boost productivity and performance at work, which assists in the achievement of professional goals. 4. To evaluate the required attributes in a candidate.								
CO1	Develop better listening skills and enhance writing abilities.								
CO2	Identify both positive and negative nonverbal gestures and signs.								
CO3	Improve adept presentation skills by practicing delivery, refining communication techniques, and ensuring clarity of expression.								
CO4	Enhance writing abilities and develop the ability to recognize awkward expressions, correct grammatical errors, and enhance the overall coherence of your writing								
CO5	Plan efficiently for discussions in different platforms by enhancing their thought process and problem-solving skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Grammar:** I. Use of Prepositions II. Tag questions III. Simple, complex, compound sentences	**10**	Describe, illustrate, and explain Prepositions, types of sentences	1,2
II	**Grammar:** I. Active and Passive Voice II. Direct and Indirect Speech	**15**	Describe, illustrate, and explain Voice, Types of voice, Speech	1,2
III	**Writing Skills:** The Basics of Writing; avoid ambiguity and vagueness I. Paragraph Writing II. Letter Writing III. Resume, CV and Cover Letter	**15**	Describe, illustrate, and explain about Paragraph writing, letter writing, Creation of resume, cover letter.	1,2,3
IV	**Self- Management Skills** SWOT Analysis Self- Regulation Personal Hygiene	**10**	Describe, illustrate, and explain and apply Self-management skills	1,2,3,4
V	**Non- Verbal Communication- Sciences of Body Language** i. What is Non- Verbal Communication & Body Language,	**10**	Describe, illustrate, and explain and apply Non-verbal communication.	1,2,3,4

	ii. Elements of Communication, iii. Types of Body Language, iv. Importance and Impact of Body Language, v. Types of Communication through Body Language, vi. Body Language Do's and Don'ts, Doubt Clearing Session.			

TEXT BOOKS:

1. What Employers Want: The Work skills Handbook- Karen Holmes, 2011
2. English Grammar in Use, Raymond Murphy 4th edition, CUP

REFERENCE BOOKS:

1. Professional Communication, 2015, by Dr. Prachi Dr. S. K. Singh

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop better listening skills and enhance writing abilities.	5, 6, 8
2	Identify both positive and negative nonverbal gestures and signs.	5, 6, 8
3	Improve adept presentation skills by practicing delivery, refining communication techniques, and ensuring clarity of expression.	3,5,6,7,8
4	Enhance writing abilities and develop the ability to recognize awkward expressions, correct grammatical errors, and enhance the overall coherence of your writing	5,6,8
5	Plan efficiently for discussions in different platforms by enhancing their thought process and problem-solving skills.	2, 3, 5, 6, 7, 8

SEMESTER – III									
Course Title	**Generic Elective I (Introduction to Digital Marketing)**								
Course code	**2BCAO216R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To understand the transition from traditional to digital marketing strategies and its significance in modern business. 2. To learn about key digital marketing technologies and platforms, including search engines and social media. 3. To analyze the customer journey and how digital marketing influences purchase decisions. 4. To develop skills for creating compelling digital content that resonates with consumers. 5. To explore strategies for businesses to differentiate themselves using digital marketing in competitive markets.								
CO1	Explain the shift from traditional to digital marketing and its impact on business practices.								
CO2	Utilize key digital marketing platforms and technologies effectively in marketing campaigns.								
CO3	Analyze and map the customer journey to optimize marketing strategies and improve conversion rates.								
CO4	Create engaging digital content tailored to target audiences that enhances brand presence.								
CO5	Implement digital marketing strategies that help businesses stand out in competitive environments.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Search Engine Marketing - Can Customers Find You?** Welcome to Module 1. Search Engine Marketing, (SEM), allows businesses to be found online. With millions of businesses out there vying for the same eyeballs, SEM's two main elements, Search Engine Optimization (SEO) and Pay-per-click (PPC) strategies can lead to online marketing success through discovery.	**8**	Describe, illustrate, and Explain Search Engine, SEM, SEO	**1,2**
II	**Social Media - Two-Way Communication with Customers:** social media facilitates the sharing of ideas,	**8**	Describe, illustrate, and explain social media, Communication with customer.	**1,2**

	thoughts, and information through the building of networks. It is two-way communication between the brand and its audience. In this module, you will learn techniques to effectively communicate and engage with audiences through social media			
III	**Reputation Management - You Are Who Your Customers Think You Are:** While marketing is essential for communication with audiences, "word of mouth" remains the most powerful voice. Online reviews are today's "digital word of mouth". It's easier than ever for customers to tell others about their best (and worst) experiences, which can make or break a business. In this module you will explore how to harness this tool.	**8**	Describe, illustrate, and explain map customer journey, optimize marketing strategy.	**1,2,3**
IV	**Content Marketing - Storytelling is the Key to Great Content:** The key to any effective marketing is to capture and keep the attention of an audience. Digital stories incorporate essential communication and marketing elements to create a compelling narrative. Stories about a brand can attract a target audience by differentiating it in the marketplace. Digital sharing is the key, and is the foundation to good storytelling and digital marketing.	**8**	Describe, illustrate, and explain Content Marketing, enhance brand presence.	**1,2,3**

TEXT BOOKS:

1.Digital Marketing: Strategy, Implementation and Practice by Dave Chaffey and Fiona Ellis-Chadwick

REFERENCE BOOKS

1.Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Hermawan Kartajaya, and Iwan Setiawan

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the shift from traditional to digital marketing and its impact on business practices.	2,3,4,5,6,7,8
2	Utilize key digital marketing platforms and technologies effectively in marketing campaigns.	2,3,4,5,6,7,8
3	Analyze and map the customer journey to optimize marketing strategies and improve conversion rates.	2,3,5,6,7
4	Create engaging digital content tailored to target audiences that enhances brand presence.	2,3,4,5,6,7,8
5	Implement digital marketing strategies that help businesses stand out in competitive environments.	2,3,4,5,6,7,8

SEMESTER – III									
Course Title	**Techno Professional Skills II**								
Course code	**22BCAO215R**	**Total credits: 1** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To understand the basic syntax, semantics, and structure of the C programming language. 2. To understand fundamental programming constructs such as variables, data types, operators, control flow statements, and function 3. To understand and implement complex data structures such as arrays, linked lists, trees, and hash tables. 4. To develop strong problem-solving skills by tackling a variety of programming challenges and real-world scenarios. 5. To implement algorithms and data structures to solve complex computational problems efficiently.								
CO1	Demonstrate a comprehensive understanding of the properties, advantages, and limitations of each data structure.								
CO2	Apply algorithmic analysis to assess the efficiency of various data structure operations.								
CO3	Develop hands-on skills by implementing complex algorithms and solving practical problems using a combination of data structures.								
CO4	Outline the trade-offs and use cases for different sorting and searching techniques.								
CO5	Build hands-on skills by solving practical problems using a combination of data structures.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Advanced C Programming** Review of C Basics. Data types, operators, and control flow. Functions, pointers, and memory allocation. Standard libraries and I/O operations Environment Setup • Development environments and tools • Compiler options and debugging techniques	**6**	Describe, illustrate, and explain Advance C programming, Remembering the basic concept of C programs, Understand the environment set up.	1,2
II	**Functions** Function Definition and Declaration • Return types and parameters • Scope and lifetime of variables	**6**	Describe, illustrate, and explain Function of C, understand parameter passing, Recursion Function.	1,2,3

	Parameter Passing ● Call by value vs. call by reference Recursion ● Understanding and implementing recursive functions			
III	**Arrays and Strings** Arrays ● Declaration, initialization, and access ● Multidimensional arrays Strings ● String handling functions (strlen, strcpy, strcat, strcmp) ● Common string manipulation techniques	**6**	Describe, illustrate, and explain Data types in C, Arrays, String.	1,2,3
IV	**Pointers** Basics of Pointers ● Pointer declaration and initialization ● Pointer arithmetic Pointers and Arrays ● Pointer to arrays and array of pointers Function Pointers ● Declaring and using function pointers ● Practical applications of function pointers	**6**	Describe, illustrate, and explain Pointers in C,Types of Pointers.	1,2,3,4
V	**Structures and Unions** Structures ● Defining and using structures ● Nested structures and arrays of structures Unions	**6**	Describe, illustrate, and explain and apply Structures, Unions in C programming.	1,2,3,4

	• Defining and using unions • Differences between structures and unions			
Practical Component				
Practical 1	Write a program in C to implement the following. A bank stores the customer ids in a single dimensional array. The customer ids are generated using a random number generator. Each customer number is a 4-digit number. When a new customer id is to be entered, first the array needs to be checked sequentially. If the randomly generated 4-digit customer id already exists in the array, then the number to be regenerated (using a random number generator). This process is to be continued till it is ensured that the newly generated customer id does not already exist in the array. The new customer id is to be inserted into the array only if there is no repetition.	**2**	Differentiate between different random number generation methods and their use cases. Examine the efficiency of the program in handling the addition of new customer IDs.	1,2,3
Practical 2	Write a program in C to do the following Initialize all cells of a 5X5 matrix. Then enter a few positive numbers arbitrarily to some of the cells of the matrix. Now start from the middle cell of the top- most row i.e. 0^{th} row and start entering the numbers 1,2, 3 etc. in sequence along the four diagonals (When one diagonal goes out of scope, change direction and move along the next lower/upper diagonal). Note that along the diagonals, you are allowed to overwrite a cell if it contains 0. Otherwise you need to jump the cell and go to the next cell on the diagonal	**2**	Design an algorithm to fill the matrix with sequential numbers along diagonals, considering constraints. Evaluate the effectiveness of the algorithm in correctly filling the matrix as per the specified rules	1,2,3,4

Practical 3	You want to keep track of the number of hours a worker in your company has worked per day. Note that Sundays are holidays. At the end of the month, you want to give awards to the following: i. Workers who have worked the maximum hours in a week. i. Workers who have worked the maximum hours in a month i. Workers who have not missed a 2single work day provided they have worked at leasts8 hours per day of the week. Implement the above using a suitable data structure. Also explain in brief why you have chosen that data structure for your program.	**2**	Apply the chosen data structure to store and manage the workers' daily working hours. Use loops and conditional statements to calculate weekly and monthly working hours. Implement the logic to check if a worker has worked at least 8 hours every day in a week.	1,2,3,4
Practical 4	Write a program in C to implement the following (using linked list) A bank stores the customer ids in a single dimensional array. The customer ids are generated using a random number generator. Each customer number is a 4-digit number. When a new customer id is to be entered, first the array needs to be checked sequentially. If the randomly generated 4-digit customer id already exists in the array, then the number to be regenerated (using a random number generator). This process is to be continued till it is ensured that the newly generated customer id does not already exist in the array. The new customer id is to be inserted into the array only if there is no repetition.	**2**	Differentiate between various methods of data storage and retrieval for dynamic datasets. Design a program that utilizes linked lists to store unique customer IDs. Integrate random number generation and duplication checks into a cohesive solution. Develop an algorithm to handle the insertion of unique customer IDs into the linked list.	1,2,3,4,5
Practical 5	Write a program in C using linked list to implement the following: Store a route containing different stops/places one after another. A user will be asked to enter a start place and a destination place. The program will then print the route from the user given start point to the user given destination point in any direction. For eg, supposed in our route, we have stored chandmari, silpukhuri, ghy club, ambary etc. Now the user should be able to give as start point – chandmari and destination as	**2**	Design a linked list structure to represent the route with stops/places as nodes. Integrate user input handling and linked list traversal into a cohesive program. Develop a function to print the route between the specified start and destination points in	1,2,3,4,5

	ambari and also, he must be able to give starting point as Ambari and destination as Chandmari. However, if the user given start point and /or destination does not exist in the stored route, then an appropriate message has to be displayed.		both forward and reverse directions.	
Practical 6	You are conducting a meeting for n people in a room where they sit in a circular table. Later you want to find out if any two people X and Y were sitting adjacent (i.e. immediately next) to reach other. What data structure will you use to implement this? The program should take as input the value of N, it should take as input the names of the N people and information as to who was sitting next to whom. After this, it should take as input a pair of names and then tell whether they were sitting adjacent to each other or not.	**3**	Design a data structure and algorithm to effectively manage and query adjacency in a circular table setup. Develop a program that provides accurate responses regarding whether two specified individuals were adjacent to each other during a meeting.	1,2,3,4,5

TEXT BOOKS:

1. Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

REFERENCE BOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
2. Archana Kumar, Computer Basics with Office Automation, Willey.
3. Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.
4. Stallings, Computer Organization & Architecture, Pearson.
5. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
6. Godbole and Khate, Web Technologies, McGraw Hill Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate a comprehensive understanding of the properties, advantages, and limitations of each data structure.	**1,2,7,8**
2	Apply algorithmic analysis to assess the efficiency of various data structure operations.	**1,2,7,8**

3	Develop hands-on skills by implementing complex algorithms and solving practical problems using a combination of data structures.	**1,2,7,8**
4	Outline the trade-offs and use cases for different sorting and searching techniques.	**1,2,7,8**
5	Build hands-on skills by solving practical problems using a combination of data structures.	**1,2,7,8**

SEMESTER – III									
Course Title	**MOOCS II (Writing, Running, and Fixing Code in C)**								
Course code	**22MOSY211R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To understand the basic syntax and structure of the C programming language. 2. To learn how to write, compile, and execute C programs. 3. To develop skills for debugging and fixing common errors in C code. 4. To gain proficiency in using control structures, functions, arrays, and pointers in C. 5. To understand memory management and dynamic memory allocation in C.								
CO1	Explain syntactically correct and efficient C programs.								
CO2	Analyse Compile and execute C programs using different compilers.								
CO3	Debug C programs and fix common syntax and logic errors.								
CO4	Utilize control structures, functions, arrays, and pointers effectively in C code.								
CO5	Develop C programs that effectively manage dynamic memory and handle memory-related issues gracefully.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Writing Code:** In this module, you will learn to write code and do your first assignment in the Practice Programming Environment. You have practiced the first four steps of the Seven Steps in the previous course, and you will review them here before learning Step 5: Translating Your Algorithm to Code. Expert programmers spend most of their time planning before they begin writing code, and you will learn to do the same.	**4**	Learn to write code, Describe writing of C program.	1,2
II	**Compiling and Running:** Now that you know how to plan an algorithm and translate it to code, you need to learn how to compile and run it! You will learn about the compiler, which takes the code you wrote and translates it into instructions a machine can execute, which you can then run. You will also learn about different options you can give the compiler, as well as different ways to run your program that give you debugging information	**4**	Describe, illustrate, and explain different compiler, algorithm.	1,2
III	**Testing and debugging:** Two skills that are crucial to good programming are testing—finding problems with your code, and debugging—fixing them. In this module you will learn	**4**	Describe, illustrate, and explain debugging of C programs, common syntax and	1,2,3

	systematic ways to identify problems in your code, as well as how to apply the scientific method to fix your program when you do find a bug.		logic errors.	
IV	**Project:** In this module you will begin the project you will complete over the course of the rest of the specialization. At the end of each course, you will write a piece of a program that will calculate the odds of different poker hands winning with a Monte Carlo simulation—a way to calculate complicated probabilities by generating random data.	**3**	Describe, illustrate, and explain control structures, functions, arrays, and pointers effectively in C code, understand memory-related issues in C.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain syntactically correct and efficient C programs.	**1,2,3,8**
2	Analyse Compile and execute C programs using different compilers.	**2,3,8**
3	Debug C programs and fix common syntax and logic errors.	**2,3,8**
4	Utilize control structures, functions, arrays, and pointers effectively in C code.	**2,3,8**
5	Develop C programs that effectively manage dynamic memory and handle memory-related issues gracefully.	**2,3,8**

SEMESTER – III									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 4 hrs		**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To develop the social and soft skills 2. To promote a holistic development of the learners 3. To Provide opportunities to apply theoretical knowledge in real-world scenarios.								
CO1	Connect and adapt cultural diversity among communities.								
CO2	Developed team for working toward a shared vision								
CO3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals								
CO4	Build effectively communicate, delegate responsibilities and motivate team members.								
CO5	Improve strong teamwork and collaboration skills by engaging in group activities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages activities that are aimed to develop the social and soft skills of students and promote a holistic development of the learners. Keeping in mind the 360-degree learning methodology, the students are engaged in different activities other than their regular classes. Experts are invited to conduct workshops that benefit the students. Technical quizzes are conducted to enhance the knowledge of the students. Technical seminars help them to develop their public speaking abilities.	**4**	Demonstrate improved proficiency in programming, software development, and the use of various technological tools and platforms. Apply theoretical knowledge to real-world problems through projects, internships, and industry collaborations.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
CO1	Connect and adapt cultural diversity among communities.	4,5,6,7,8
CO2	Developed team for working toward a shared vision	4,5,6,7,8
CO3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals	4,5,6,7,8
CO4	Build effectively communicate, delegate responsibilities and motivate team members.	6,7,8
CO5	Improve strong teamwork and collaboration skills by engaging in group activities.	6,7,8

SEMESTER – III									
Course Title	**Extra-Curricular Activity**								
Course code	**22UBEC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 4	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To develop problem-solving abilities through coding challenges and hackathons. 2. To participate in app development contests and exhibitions. 3. To develop entrepreneurial skills and mindset.								
CO1	Importance of different activities under different clubs.								
CO2	Formulate regular activities like workshops, competitions as per their interest and hobbies.								
CO3	Adapt to represent ADTU in various inter university, state and national level competitions.								
CO4	Discuss with invited experts in their respective fields.								
CO5	Develop an appreciation for diverse forms of artistic expression.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts.	**2**	Demonstrate improved proficiency in programming, software development, and the use of various technological tools and platforms. Apply theoretical knowledge to real-world problems through projects, internships, and industry collaborations.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students' engagement in different activities under different clubs.	2,3,4,5,6,7
2	Role play in regular activities like workshops, competitions as per their interest and hobbies.	2,3,4,5,6,7
3	Adapt and trained to represent ADTU in various inter university, state and national level competitions.	2,3,4,5,6,7,8
4	The students will be given a platform to earn from invited experts in their respective fields.	2,3,4,5,6,7,8
5	Develop an appreciation for diverse forms of artistic expression.	2,3,5,6,7,8

SEMESTER – III									
Course Title	**Personal Financial Planning**								
Course code	**22UUFL202R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To create awareness among students about the need for possessing financial literacy education. 2. To Identification of money as a working asset. 3. To Impart the ability to make better financial decisions								
CO1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.								
CO2	Design a diversified investment portfolio that addresses several different investment objectives.								
CO3	Differentiate between open- and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.								
CO4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** i. Meaning, need and importance of Financial Literacy; ii. Different components of Financial Literacy; iii. Prerequisites of financial literacy; iv. Savings – Meaning and Difference between savings and investment; v. Types of Financial Institutions and the services provided - Banking and Non-Banking; vi. Different investment avenues.	**7**	Describe, illustrate, and explain concepts of money, Importance of Financial Literacy their applications to financial planning.	**1,2**
II	**Financial Planning:** i. Meaning, need and importance for financial planning, ii. Economic needs, balancing between economic need and resources; iii. Three pillars of investments-risk, return, liquidity; iv. Budgeting and its importance in financial planning; v. Steps involved in Financial Planning Process; vi. Preparation of personal budgets, budget surplus and budget deficit, avenues for savings from surplus, sources	**6**	Describe, illustrate, and explain financial planning process, the life cycle of financial plans, and methods of goal achievement.	**1,2**

	for meeting deficit. vii. Informal Society funds and crowd funding			
III	**Banks & Post Office - As financial service provider:** i. Meaning and evolution of money, ii. Banks – meaning, types & functions; types of accounts; Formalities to open various accounts. iii. Different types of Post Office saving schemes: Recurring deposit, savings, term deposit; NSC; Kisan Vikas Patra; Monthly Income scheme (MIS) Account, iv. ublic Provident Funds (PPF), Senior citizen savings scheme (SCSS), Sukanya Samriddhi Accounts, v. Indian Postal Order; International Money transfer service; Forex Services; vi. Money remittance services; Jansuraksha Scheme.	**6**	Describe, illustrate, and explain Formulation of budget, record keeping system, and tax planning strategy based on current financial goals.	**1,2,3**
IV	**Insurance - As financial service provider:** i. Different types of Risks and their Management, Diversification of risk; ii. Meaning, need and importance of Insurance; Types of Insurance – Life Insurance, Health Insurance, General Insurance, Term Insurance, iii. Pension and retirement policies; iv. Post office life insurance schemes, Postal life insurance and rural postal life insurance.	**6**	Describe, illustrate, and explain and Creation of financial plan that covers Risk management, importance of Insurance.	**1,2,3,4**
V	**Transformations in Digital Money market:** i. Various functions & innovative services of Banks; Mobile Banking, NEFT, IMPS, RTGS, ii. Money transfer, Different types of cards- Debit & Credit, E-Banking, Unified payment interface(UPI), iii. Credit Scoring - CIBIL, Digital Banking, crypto	**5**	Explain the Digital money market , credit score, CIBIL score.	**1,2,3**

	currency and related transactions, **iv.** Fintech, Block chain; Understanding Digital Payments.			

TEXT BOOKS:

1. Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems and the Million Dollar Financial Advisor: Powerful Lessons and Proven Strategies from Top Producers by David J. Mullen Jr.
2. Personal Finance and Planning by Dr. Rajni
3. Peaceful Personal Finance: A short read on the basics of personal finance and planning Kindle Edition by Hema Singh.
4. Be your own financial advisor: Financial Planning, Investment Options, Risk Management, Tax Management, Succession Planning Kindle Edition y Sushil Bali.
5. The dumb things smart people do with their money: Thirteen ways to right your financial wrongs Kindle Edition y Jil Schlesinger.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.	**1,2,4,5,6,7,8**
2	Design a diversified investment portfolio that addresses several different investment objectives.	**2,3,4,5,6,7**
3	Differentiate between open- and closed-end mutual funds, exchange-traded funds, and direct or indirect real estate investments.	**4,5,6,8**
4	Create a financial plan that covers your income needs in retirement and helps protect you and your estate.	**1,2,3,4,5,6,7,8**
5	Develop a cash management strategy and a plan to facilitate the home or automobile buying process.	**1,2,3,5,6,7,8**

SEMESTER – III									
Course Title	**BASIC LIFE SAVING SKILLS(BLSS)**								
Course code	**22UULS202R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	The aim of the course is to provide the learners with basic knowledge and practical skills needed in an emergency fire situation, and to provide appropriate basic management and treatment for injuries								
CO1	Understand the specific skills of Basic lifesaving skill and knowledge that individuals should acquire and demonstrate after completing a BLS training course.								
CO2	Explain the soft skill attributes and abilities that enable students to interact effectively and harmoniously with others, both personally and professionally.								
CO3	Implement the knowledge and skills needed to effectively recognize, assess, and manage various types of traumatic injuries and emergencies.								
CO4	Understand the principles and purpose of the Triage system in healthcare settings. Describe the different levels of triage and their significance in prioritizing patient care.								
CO5	Identify common medical conditions and injuries that require immediate attention and those that can be managed at a later stage. Recognize the importance of accurate and timely patient assessment during triage.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basic Life Support (BLS)** Introduction of BLS Chain of survival ABCs Assessment CPR and Ventilation Technique AED Choking for adult and children	**5**	Basic Life Support (BLS) are the specific skills and knowledge that individuals should acquire and demonstrate after completing a BLS training course. These outcomes are essential for anyone who may encounter a medical emergency and need to provide immediate assistance before professional medical help arrives	1,2
II	**Soft skills** Introduction Communications Skills Situational Skills Team Work Other Soft Skills	**4**	Soft skills are a set of personal attributes and abilities that enable students to interact effectively and harmoniously with others, both personally	1,2

			and professionally. These skills are highly valued and can lead to better communication, collaboration, and overall success in various aspects of life	
III	**Trauma emergencies** Introduction Priorities of Initial approach in pre-hospital care Scene safety Primary assessment Bleeding control Helmet removal Care of amputated body part Extrication of victims and safe transfer Cervical spine stabilization Cervical collar application Splinting of broken Limbs	**10**	Focus on the knowledge and skills needed to effectively recognize, assess, and manage various types of traumatic injuries and emergencies. Essential for healthcare professionals, first responders, and anyone involved in emergency care.	1,2,3
IV	**Triage system** Introduction Flow chart approach of Triage Triage of Multiple Casualties in Pre-Hospital setting Triage of Single casual	**5**	Understand the principles and purpose of the Triage system in healthcare settings. Describe the different levels of triage (e.g., immediate, delayed, minimal, expectant) and their significance in prioritizing patient care. Identify common medical conditions and injuries that require immediate attention and those that can be managed at a later stage. Recognize the importance of accurate and timely patient assessment during triage	1,2,3,4

V	**Medical emergencies** Introduction Victim centred approach in medical emergency Management of: - a) seizures b) heart attack c) asthma diabetic emergencies emergency childbirth stroke recovery position	**6**	Identify common medical emergency conditions: Learners should be able to recognize and differentiate between common medical emergencies, including myocardial infarction (heart attack), stroke, diabetic emergencies, anaphylaxis, respiratory distress, seizures, and allergic reactions.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the specific skills of Basic lifesaving skill and knowledge that individuals should acquire and demonstrate after completing a BLS training course.	**5,6**
2	Explain the soft skill attributes and abilities that enable students to interact effectively and harmoniously with others, both personally and professionally.	**5,6**
3	Implement the knowledge and skills needed to effectively recognize, assess, and manage various types of traumatic injuries and emergencies.	**5,6**
4	Understand the principles and purpose of the Triage system in healthcare settings. Describe the different levels of triage and their significance in prioritizing patient care.	**5,6**
5	Identify common medical conditions and injuries that require immediate attention and those that can be managed at a later stage. Recognize the importance of accurate and timely patient assessment during triage.	**5,6**

MAPPING TABLE

Course code	Course Name	PO1*	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO211R	Database Management Systems		2.2	2				1.6	3
22BCAO212R	Operating Systems	2.67	2	1.67		2	2		2
22BCAO213R	Introduction To Linux	2	2	1.4	2.5	2			
22BCAO214R	Object Oriented Programming Using C++		2	1.8	1.25	1.5	1.8	1.5	2
22BCAO215R	Techno Professional Skills Ii	1	1.6					2	2.8
22UBPD212R	English Language for Excellence		1.96	1.72		1.83	1.9	1.7	2.45
22UBCC211	Co-Curricular Activity				2	1	2.6	2.4	2.4
22UBEC211	Extra-Curricular Activity		1	2	2	2	3	2	2
22UUFL213R	Personal Financial Planning	1	1.5	1.5		2	2	1.75	1
22UULS212R	Basic Life Saving Skills		1.33	1		1.4	2.25	1	1
22MOSY212R	Mooc I (Writing, Running and Fixing Code In C)	1	3	2					1
22BCAO216R	Generic Elective I (Introduction to Digital Marketing)		1	2	1	1	2	1	1

SEMESTER – IV									
Course Title	**Computer Networks**								
Course code	**22BCAO223R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Programming Skills**	**Co-requisite**	**LINUX**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives	1. Understand the fundamentals of data communications principles of media access, switching, routing and flow control. 2. Understand the basics of network protocol design and analysis. 3. Be familiar with the TCP/IP protocol suite and with application layer protocols. 4. Be able to write network-capable programs using the socket libraries. 5. Understand the structure of client-server systems and be able to build client-server programs.								
CO1	Demonstrate computer network basics, network architecture, TCP/IP and OSI reference models.								
CO2	Examine various techniques and modes of transmission. Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN.								
CO3	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme								
CO4	Discuss the elements and protocols of transport layer								
CO5	Analyse the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Introduction to networks, internet, protocols and standards, the OSI model, layers in OSI model, TCP/IP suite, Addressing, Analog and digital signals. **Physical Layer:** digital transmission, multiplexing, transmission media, circuit switched networks, Datagram networks, virtual circuit networks, switch and Telephone network.	**8**	Understand computer networks, Internet, TCP/IP protocol suite, OSI model and its seven layers, IP addressing, including IPv4, IPv6, analog and digital signals, digital transmission methods and techniques, circuit-switched network and their operation, datagram networks and virtual circuit networks.	**1,2**
II	**Data link layer:** Introduction, Block coding, cyclic codes, checksum, framing, flow and error control, Noiseless channels, noisy channels, HDLC, point to point protocols	**8**	Understand Data Link Layer, block coding and checksum techniques used for error detection and correction, Define noiseless and noisy channels in terms of error rates, HDLC, protocols like PPP	**1,2**
III	**Network Layer:** Logical addressing, internetworking, tunnelling, address mapping, ICMP, IGMP, forwarding, uni-cast routing protocols, multicast routing protocols.	**8**	Understand logical addressing, internetworking, tunnelling, ARP, ICMP, IGMP, packet forwarding, unicast routing protocols (e.g., RIP, OSPF, BGP), multicast routing	**1,2**

			protocols (e.g., PIM, DVMRP)	
IV	**Transport Layer:** Process to process delivery, UDP and TCP protocols, SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks.	**9**	Understand Transport Layer, UDP, TCP, SCTP, data traffic, congestion control mechanisms, QoS, how QoS principles are applied in switched networks.	**1,2**
V	**Application Layer:** Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multi-media, network security	**6**	Understand DNS, email communication (e.g., SMTP, IMAP, POP3), FTP, World Wide Web, HTTP, SNMP, multimedia content (e.g., audio, video), network security, authentication, encryption, and access control.	**1,2**

TEXT BOOKS:

1. Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH,2006.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav,2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Computer and Communication Networks, Nader F. Mir, Pearson Education
4. Computer Networking: A Top-Down Approach Featuring the Internet, James Kurose, K.W.Ross,3rd Edition, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate computer network basics, network architecture, TCP/IP and OSI reference models.	**1,2,3,8**
2	Examine various techniques and modes of transmission. Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN.	**1,2,3,8**
3	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme	**1,2,3,8**
4	Discuss the elements and protocols of transport layer	**1,2,3,8**
5	Analyse the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN	**1,2,3,8**

SEMESTER – IV									
Course Title	**Design & Analysis of Algorithms**								
Course code	**22BCAO221R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45L	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Data Structures**	**Co-requisite**	**C /C++ Programming**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives	1. Analyze the asymptotic performance of algorithms. 2. Demonstrate a familiarity with major algorithms and data structures. 3. Apply important algorithmic design paradigms and methods of analysis.								
CO1	Classify worst-case running time based on asymptotic analysis and justify the correctness of algorithm for a given problem.								
CO2	Explain the greedy paradigm, dynamic-programming paradigm and divide-and-conquer paradigm.								
CO3	Design a given model engineering problem using graph and write the corresponding algorithm to solve the problems.								
CO4	Identify NP completeness and different NP complete problems.								
CO5	Illustrate various advanced topics on algorithms								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** Characteristics of algorithms. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.	**4**	Understand algorithms, asymptotic analysis, use methods to measure the performance of algorithms, Use techniques such as the Substitution Method, Recursion Tree Method, and Master's Theorem	1,2
II	**Fundamental Algorithmic Strategies:** Brute-Force, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.	**12**	Understand brute-force algorithms, greedy algorithms, dynamic programming, branch and bound techniques, backtracking, brute-force, greedy, dynamic programming, branch and bound, backtracking, heuristics.	1,2
III	**Graph and Tree Algorithms:** Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree,	**8**	Understand DFS and BFS, shortest path, transitive closure, MST, topological sorting, network flow.	1,2

	Topological sorting, Network Flow Algorithm.			
IV	**Tractable and Intractable Problems:** Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques	**6**	Understand Church-Turing thesis, P, NP, NP-complete, NP-hard, Cook's theorem, SAT (Boolean Satisfiability), Traveling Salesman Problem (TSP), and Subset Sum, reduction techniques.	1,2
V	**Advanced Topics:** Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	**5**	Understand approximation algorithms, randomized algorithms, explore complexity classes beyond NP, focusing on PSPACE (polynomial space).	1,2

TEXT BOOKS:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson,
2. Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
3. Fundamentals of Algorithms – E. Horowitz et al.

REFERENCE BOOKS:

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Classify worst-case running time based on asymptotic analysis and justify the correctness of algorithm for a given problem.	1,2
2	Explain the greedy paradigm, dynamic-programming paradigm and divide-and-conquer paradigm.	1,2
3	Design a given model engineering problem using graph and write the corresponding algorithm to solve the problems.	1,2,3,8
4	Identify NP completeness and different NP complete problems.	1,2,3
5	Illustrate various advanced topics on algorithms	1,2,3

SEMESTER – IV									
Course Title	**Basics of python programming**								
Course code	**22BCAO222R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total Hours: 45L+30P	**3**	**0**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Data Structures**	**Co-requisite**	**NIL**						
Programme	**Bachelor of Computer Technology**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives	**1.** Understand the programming basics (operations, control structures, data types, etc.) **2.** Understand and begin to implement compound data like python lists, tuples etc. **3.** Read / Write to files and learn to use basic libraries in python for data analysis								
CO1	Develop proficiency in writing simple Python programs to solve basic computational problems.								
CO2	Explore control flow structures including conditionals (if statements), loops (for and while loops), and exceptions.								
CO3	Demonstrate the importance of modular programming through the creation and use of functions.								
CO4	Evaluate the essential data structures in Python, including lists, tuples, sets, and dictionaries.								
CO5	Examine key Python libraries and modules, such as NumPy for numerical computing and Pandas for data manipulation								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Python:** Unique features of Python, Python-2 and Python-3 differences, Install Python and Environment Setup, First Python Program, Python Identifiers, Keywords and Indentation, inserting comments in python, Command line arguments, Getting User Input, Data types, Operators, Precedence and associativity	**6**	Identify and explain the distinctive features of Python as a programming language, including its simplicity, readability, and versatility.	1,2,3
II	**Conditional execution and Iteration:** Boolean expressions, logical operators, conditional and alternative execution, chained and nested conditionals, the while statement, infinite loops and *break*, finishing iterations with *continue*, *for* loops	**6**	Understand Boolean expressions and their use in decision-making within programs, logical operators, conditional statements.	1,2
III	**Functions:** python built-in functions, defining and calling a function, parameters and arguents, fruitful functions and void functions, anonymous functions	**8**	Identify Python's standard library, functions, fruitful and anonymous functions.	1,2,3
IV	**Data Structures and strings in Python:** **Lists –** traversing a list, list operations, list slices, list methods	**12**	Learning about Data Structures (Lists, Dictionaries, tuples, strings), Basic Operations on Data Structures, Strings,	1,2

	Dictionaries – dictionary as a set of counters, looping and dictionaries, **Tuples –** tuple assignment, dictionaries and tuples, using tuples as keys in dictionaries **Strings –** string slices, looping and counting, the *in* operator, string comparison, string method		Advanced Data Structures, Performance and Efficiency, Applications and Use Cases.	
V	**Basic File and Exception Handling in python:** Reading and Writing to Files, Exception Handling **Introduction to basic libraries for data analysis:** Introduction to Matplotlib library, NumPy, Pandas	**8**	Understanding File Handling, Reading and Writing Files, File Navigation and Management, Exception Handling, Error Handling Strategies, File Handling in Context, Exception Handling Best Practices.	1,2
Practical				
Practical 1	Program to find area and circumference of a circle.	**1**	Creating a python program to find the area and circumference of a circle.	5
Practical 2	Program to convert temperature from degree centigrade to Fahrenheit	**1**	Creating a python program to convert degree to Fahrenheit.	5
Practical 3	Program to calculate Sum of 5 subject and find Percentage	**1**	Creating a python program to calculate the sum of 5 subjects and find the percentage.	5
Practical 4	Program to show swap of two numbers by using third variable	**1**	Creating a python program to swap two numbers using a third variable.	5
Practical 5	Program to show swap of two numbers by without using third variable	**1**	Creating a python program to swap two numbers without using the third variable.	5
Practical 6	Program to reverse a given number	**1**	Creating a python program to reverse a given number.	5
Practical 7	Program to find greatest among 3 Numbers	**1**	Creating a python program to find the greatest number from three inputs.	5
Practical 8	Program to find whether the given number is even or odd	**1**	Creating a python program to find the given number is odd or not.	5
Practical 9	Program to use switch statement	**1**	Creating a python program to make use of the switch case statement.	3, 5
Practical 10	Program to display first 10 natural number and their sum	**1**	Creating a python program for displaying the natural numbers and its sum.	5
Practical 11	Program to find Fibonacci series up to a range	**1**	Creating a python program to print the Fibonacci series.	5
Practical 12	Program to count Number of digits	**1**	Creating a python program to count the number of digits.	5
Practical 13	Program to find factorial of a number	**1**	Creating a python program to find the factorial of a given number.	5

Practical 14	Program to check whether the given number is palindrome or not	**1**	Creating a python program to check a palindrome number	5
Practical 15	Program to find whether the given number is prime or not	**1**	Creating a python program to check for a prime number	5
Practical 16	Program to show dynamic list implementation	**1**	Creating a python program for dynamic lists.	5
Practical 17	Program to find dynamic array implementation	**1**	Creating a python program for dynamic array	5
Practical 18	Program to display matrix	**1**	Creating a python program to display a matrix	5
Practical 19	Program to show the sum of 10 elements of array and show their average	**1**	Creating a python program to calculate the sum of 10 elements of an array and show their average.	5
Practical 20	Program to show the sum of 10 elements of list and show their average	**1**	Creating a python program to calculate the sum of 10 elements of a list and show their average.	5
Practical 21	Program to find the maximum and minimum number in an array	**1**	Creating a python program to find the maximum and minimum number in an array	5
Practical 22	Program to find the maximum and minimum number in a list	**2**	Creating a python program to find the maximum and minimum number in a list	5
Practical 23	Program to create a list and perform the following operation ● Insert a new value in 4th index ● Delete the value from the 2nd index ● Replace the existing value of 1st position ● Insert the value at the end of the list ● Sort the list in ascending order ● Print the reverse of the list	**2**	Creating a python program insert, delete, and replace the value in the list.	5
Practical 24	Program to implement queue using list	**2**	Creating a python program to implement a queue.	5
Practical 25	Program to implement stack using list	**2**	Creating a python program to implement a stack	5
Practical 26	Program to show the sum of two matrices	**2**	Creating a python program to display the addition of two matrices.	5
Practical 27	Program to calculate the square of the elements of a list by using list comprehension method and print the final list	**2**	Creating a python program to calculate the square of the element of a list.	5
Practical 28	Program to explain tuple conversion function	**2**	Creating a python program understand the tuple conversion function.	5
Practical 29	Program to perform the following operation ● Creation of a tuple ● Updation of a tuple	**2**	Creating a python program for a different operation on a tuple.	5

	● Deletion of a tuple ● Slicing of a tuple			

TEXT BOOKS:

1. Think Python, Allen B. Downy, O'Reilly
2. Python for Everybody: Exploring Data Using Python 3 Book by Charles Severance

REFERENCE BOOKS:

1. Python Data Science Handbook, Jakes Vander Plas O' Reilly
2. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop proficiency in writing simple Python programs to solve basic computational problems.	1,2,3,8
2	Explore control flow structures including conditionals (if statements), loops (for and while loops), and exceptions.	1,2,8
3	Demonstrate the importance of modular programming through the creation and use of functions.	1,2,8
4	Evaluate the essential data structures in Python, including lists, tuples, sets, and dictionaries.	1,2,8
5	Examine key Python libraries and modules, such as NumPy for numerical computing and Pandas for data manipulation	1,2,8

SEMESTER – IV										
Course Title	**Techno Professional Skills III**									
Course code	**22BCAO224R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 30P	**0**	**0**	**2**	**0**	**0**	**0**	**1**	
Pre-requisite		**Co-requisite**	**Nil**							
Programme	**Bachelor of Computer Application**									
Semester	**Fall/ IV semester of the second year of the program**									
Course Objectives	1. To have a detailed revision of Computer Science & Information Technology concepts learnt so far. 2. To become confident in Computer Science & Information Technology concepts to solve problems in real-life situations. 3. Teaching students how to manage projects effectively, including planning, execution, and monitoring, as well as understanding project lifecycles, resource management, and risk assessment.									
CO1	Apply Network Programming to make efficient use of various resources available on different machines in a network.									
CO2	Implementation of object-oriented based projects.									
CO3	Design and develop databases applications for companies / institutions									
CO4	Implement normalization algorithms using database design theory for different applications									
CO5	Analyse and implement transaction processing, concurrency control and database recovery protocols in databases.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Computer Application Fundamentals and Office automation and Web Technology	**4**	Understand hardware and software, Microsoft Office, Google Workspace, HTML.	1,2
II	C Programming and Data Structures in C	**6**	Understand Fundamentals of C Language, Data Types and Operators, Control Structures, Functions, Arrays and Strings, Pointers, Structures and Unions, File Handling.	1,2
III	Digital Electronics and Computer Organization and Architecture	**6**	Understanding of Digital Systems, Number Systems and Codes, Boolean Algebra and Logic Gates, Computer Organization, CPU Architecture and Operations, ISA.	1,2
IV	Operating Systems and Linux	**4**	Understanding OS -	1,2

			Process and Memory Management, Linux - Installation and Configuration.	
V	DBMS and OOP in C++	**6**	Understanding DBMS - Database Models, SQL, OOP - C++ Syntax and Structure, Classes and Objects,	1,2
Practical				
Practical 1	Write a program of matrix operation (+, -, *) using operator overloading whose class name is Matrix. Defining the rows and column size as 100.	**2**	Creating C++ program to perform different matrix operations (+ - / *)	5
Practical 2	Write a C++ program using Virtual function to display car or scooter from Vehicle class	**2**	Creating a C++ program using virtual functions to display scooter from vehicle class	5
Practical 3	Write a C++ program of multiplication of two metric using multiple inheritance. That is one matrix form class A and another matrix from class B	**2**	Creating a C++ program to perform matrix multiplications using multiple inheritance.	5
Practical 4	A supermarket chain has asked you to develop an automatic checkout system. All products are identifiable by means of a barcode and the product name. Groceries are either sold in packages or by weight. Packed goods have fixed prices. The price of groceries sold by weight is calculated by multiplying the weight by the current price per kilo. Develop the classes needed to represent the products first and organize them hierarchically. The Product class, which contains generic information on all products (barcode, name, etc.), can be used as a base class.The Product class contains two data members of type long used for storing barcodes and the product name. Define a constructor with parameters for both data members. Add default values for the parameters to provide a default constructor for the class. In addition to the access methods setCode() and getCode(), also define the methods scanner() and printer(). For	**2**	Creating a C++ program to find the solution to the given problem.	5

	test purposes, these methods will simply output product data on screen or read the data of a product from the keyboard. The next step involves developing special cases of the Product class. Define two classes derived from Product, PrepackedFood and FreshFood. In addition to the product data, the PrepackedFood class should contain the unit price and the FreshFood class should contain a weight and a price per kilo as data members. In both classes define a constructor with parameters providing default-values for all data members. Use both the base and member initializer. Define the access methods needed for the new data members. Also redefine the methods scanner() and printer() to take the new data members into consideration. Test the various classes in a main function that creates two objects each of the types Product, PrepackedFood and FreshFood. One object of each type is fully initialized in the object definition. Use the default constructor to create the other object. Test the get and set methods and the scanner() method and display the products on screen.			
Practical 5	Derive two classes, DepAcc and SavAcc, from the Account class, which was defined. Additionally define an overdraft limit and an interest rate for the DepAcc class. The SavAcc contains the members of the base class and an interest rate. For both classes, define constructors to provide default values for all parameters, add access methods, and add a display() method for screen output. Test the new classes by initializing objects of the DepAcc and SavAcc types in the object declarations and outputting them. Then modify both a savings and a deposit account interactively and display the new	**2**	Creating a C++ program to find the solution to the given problem using class.	5

<table>
<tr><td></td><td>values.</td><td></td><td></td><td></td></tr>
<tr><td>Practical 6</td><td>The classes Car and PassCar are to modify to allow objects to be created and destroyed. In addition, the class Truck is to be added to the class hierarchy.
Change the classes Car and PassCar to make the constructor issue the following message: "Creating an object of type ...."
Define a destructor for the Car and PassCar classes. The destructor should issue the following message: "Destroying an object of type ...."
Then define the class Truck, which is derived from Car, using the data members shown opposite, a constructor, a destructor, and the additional methods shown opposite.
Implement the constructor for the Truck class—the constructor should again issue a suitable message. Use the base initializer to initialize the data members of Car. Define a destructor for Truck—the destructor should again issue a suitable message for trucks.
To test your class, create and display a Truck type object in your main function. If required by the user, enable your program to create and display objects of the types PassCar and Car.</td><td>2</td><td>Creating a C++ program to find the solution to the given problem using class and object.</td><td>5</td></tr>
<tr><td>Practical 7</td><td>Write a SQL Query to display Second highest Salary from Employee table (Emp_ID, Emp_name, Department, Salary)? (Nested Query)
Or
Write a SQL Query to display Employee name who is taking second highest salary?
<table><tr><td>Emp_Id</td><td>Emp_name</td><td>Dept</td><td>Salary</td></tr><tr><td>1</td><td>Ram</td><td>IT</td><td>20000</td></tr><tr><td>2</td><td>Tom</td><td>Civil</td><td>30000</td></tr></table></td><td>2</td><td>Create a program for creating tables and find the solution to the query for finding the second highest salary.</td><td>5</td></tr>
</table>

	3	Anita	HR	40000		
	4	Sobha	Mechanical	30000		
	5	Sandya	Electrical	50000		
Practical 8	Write a query to display all the dept names along with the number of employees working in that?				**2**	Creating a table and find the query to display all the department names along with the number of employees.	5
	Emp_Id	Emp_name	Dept	Salary			
	1	Ram	IT	20000			
	2	Tom	Civil	30000			
	3	Anita	HR	40000			
	4	Sobha	HR	30000			
	5	Sandya	IT	50000			
Practical 9	Write a query to display all the dept names where numbers of employees are less than 2. Or Write a query to display all the names from the dept where numbers of employees are less than 2.				**2**	Creating a table and display the department name where numbers of employees are less than 2	5
	Emp_Id	Emp_name	Dept	Salary			
	1	Ram	IT	20000			
	2	Tom	Civil	30000			
	3	Anita	HR	40000			
	4	Sobha	HR	3000			

<table>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td></td><td>0</td></tr>
<tr><td>5</td><td>Sandya</td><td>IT</td><td>50000</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td>Practical 10</td><td>Write a query to display highest salary department wise and name of employee who is taking highest salary.
<table>
<tr><td>Emp_Id</td><td>Emp_name</td><td>Dept</td><td>Salary</td></tr>
<tr><td>1</td><td>Ram</td><td>IT</td><td>20000</td></tr>
<tr><td>2</td><td>Tom</td><td>Civil</td><td>30000</td></tr>
<tr><td>3</td><td>Anita</td><td>HR</td><td>40000</td></tr>
<tr><td>4</td><td>Sobha</td><td>HR</td><td>30000</td></tr>
<tr><td>5</td><td>Sandya</td><td>IT</td><td>50000</td></tr>
</table>
</td><td>2</td><td>Creating a table and display the highest salary department wise, and highest salary among employee.</td><td>5</td></tr>
<tr><td>Practical 11</td><td>Find the name of the employee who are working on a project.

Employee
<table>
<tr><td>Emp_Id</td><td>Emp_name</td><td>Address</td></tr>
<tr><td>1</td><td>Ram</td><td>Assam</td></tr>
<tr><td>2</td><td>Tom</td><td>Delhi</td></tr>
<tr><td>3</td><td>Anita</td><td>Kolkata</td></tr>
<tr><td>4</td><td>Anuska</td><td>Manipur</td></tr>
<tr><td>5</td><td>Romita</td><td>Nagaland</td></tr>
<tr><td>6</td><td>Sarmila</td><td>Tripura</td></tr>
<tr><td>7</td><td>Ramchandra</td><td>Assam</td></tr>
</table>
Project
<table>
<tr><td>Pro_Id</td><td>Pro_name</td><td>Location</td><td>Emp_Id</td></tr>
<tr><td>P1</td><td>Data Analyst</td><td>Bangalore</td><td>1</td></tr>
<tr><td>P2</td><td>AI</td><td>Hyderabad</td><td>5</td></tr>
<tr><td>P3</td><td>Web</td><td>Chennai</td><td>3</td></tr>
</table>
</td><td>2</td><td>Creating a table and finding the name of the employees who are working on a project.</td><td>5</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td></td><td>Development</td><td></td><td></td></tr>
<tr><td>P4</td><td>Big Data</td><td>Mumbai</td><td>4</td></tr>
<tr><td>P5</td><td>Android</td><td>Delhi</td><td>1</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td>Practical 12</td><td>Find the detail of Employee who is working on at least one Project.

Employee
<table>
<tr><td>Emp_Id</td><td>Emp_name</td><td>Address</td></tr>
<tr><td>1</td><td>Ram</td><td>Assam</td></tr>
<tr><td>2</td><td>Tom</td><td>Delhi</td></tr>
<tr><td>3</td><td>Anita</td><td>Kolkata</td></tr>
<tr><td>4</td><td>Anuska</td><td>Manipur</td></tr>
<tr><td>5</td><td>Romita</td><td>Nagaland</td></tr>
<tr><td>6</td><td>Sarmila</td><td>Tripura</td></tr>
<tr><td>7</td><td>Ramchandra</td><td>Assam</td></tr>
</table>
Project
<table>
<tr><td>Pro_Id</td><td>Pro_name</td><td>Location</td><td>Emp_Id</td></tr>
<tr><td>P1</td><td>Data Analyst</td><td>Bangalore</td><td>1</td></tr>
<tr><td>P2</td><td>AI</td><td>Hyderabad</td><td>5</td></tr>
<tr><td>P3</td><td>Web Development</td><td>Chennai</td><td>3</td></tr>
<tr><td>P4</td><td>Big Data</td><td>Mumbai</td><td>4</td></tr>
<tr><td>P5</td><td>Android</td><td>Delhi</td><td>2</td></tr>
</table>
</td><td>2</td><td>Creating a table and finding the detail of an employee who is working on at least one project.</td><td>5</td></tr>
<tr><td>Practical 13</td><td>Find all the employees who work in a department.

Employee
<table>
<tr><td>Emp_Id</td><td>Emp_name</td><td>Address</td></tr>
<tr><td>1</td><td>Ram</td><td>Assam</td></tr>
<tr><td>2</td><td>Tom</td><td>Delhi</td></tr>
</table>
</td><td>2</td><td>Creating a table and finding the employees who work in the department.</td><td>5</td></tr>
</table>

	3	Anita	Kolkata		
	4	Anuska	Manipur		
	5	Romita	Nagaland		
	6	Sarmila	Tripura		
	7	Ramchandra	Assam		

Department

Dept_Id	Dept_name	Location	Emp_Id
D1	Data Analyst	Bangalore	1
D2	AI	Hyderabad	5
D3	Web Development	Chennai	3
D4	Big Data	Mumbai	4
D5	Android	Delhi	2

Practical 14	Select Student_Id who is enrolled in at least two courses from Study table.(Self Join)			**2**	Creating a table and displaying the student id who is enrolled in at least two courses.	

Study

Student_Id	Course_Id	Time_Since
S1	C1	2015
S2	C2	2018
S1	C2	2018
S3	C3	2016

Practical 15	Find the employee name, Address, Department name and Location details who work in a department using Left join.				Creating a table and finding the employee details from the table using left join.	5

Employee

Emp_Id	Emp_name	Address
1	Ram	Assam
2	Tom	Delhi
3	Anita	Kolkata

	4	Anuska	Manipur	
	5	Romita	Nagaland	
	6	Sarmila	Tripura	
	7	Ramchandra	Assam	

Department

Dept_Id	Dept_name	Location	Emp_Id
D1	Data Analyst	Bangalore	1
D2	AI	Hyderabad	5
D3	Web Development	Chennai	3
D4	Big Data	Mumbai	4
D5	Android	Delhi	2

Practical 16	Find the employee's name, Address, Department name and Location details who work in a department using Right join.	**2**	Creating a table and finding the name, address, department name, and location using right join	5

Employee

Emp_Id	Emp_name	Address
1	Ram	Assam
2	Tom	Delhi
3	Anita	Kolkata
4	Anuska	Manipur
5	Romita	Nagaland
6	Sarmila	Tripura
7	Ramchandra	Assam

Department

Dept_Id	Dept_name	Location	Emp_Id
D1	Data Analyst	Bangalore	1
D2	AI	Hyderabad	5
D3	Web Development	Chennai	3
D4	Big Data	Mumbai	4
D5	Android	Delhi	2

TEXT BOOKS:

REFERENCE BOOKS:

1. Programming in ANSI C", E. Balaguruswamy, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
4. Archana Kumar, Computer Basics with Office Automation, Willey.
5. Horowitz and Sahni, Fundamentals of Data Structures in C, University Press.
6. Stallings, Computer Organization & Architecture, Pearson.
7. M. Morris Mano and Michael D. Ciletti, Digital Design- With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, Pearson.
8. Godbole and Khate, Web Technologies, McGraw Hill Education.
9. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, McGraw Hill.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply Network Programming to make efficient use of various resources available on different machines in a network.	**1,2,3**
2	Implementation of object-oriented based projects.	**1,2,3,4**
3	Design and develop databases applications for companies / institutions	**1,2,3**

4	Implement normalization algorithms using database design theory for different applications	**1,2,3**
5	Analyse and implement transaction processing, concurrency control and database recovery protocols in databases.	**1,2,3**

SEMESTER – IV									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 4 hrs		**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To develop the social and soft skills 2. To promote a holistic development of the learners 3. To Provide opportunities to apply theoretical knowledge in real-world scenarios.								
CO1	Connect and adapt cultural diversity among communities.								
CO2	Develop team for working toward a shared vision								
CO3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals								
CO4	Build effectively communicate, delegate responsibilities and motivate team members.								
CO5	Improve strong teamwork and collaboration skills by engaging in group activities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages activities that are aimed to develop the social and soft skills of students and promote a holistic development of the learners. Keeping in mind the 360-degree learning methodology, the students are engaged in different activities other than their regular classes. Experts are invited to conduct workshops that benefit the students. Technical quizzes are conducted to enhance the knowledge of the students. Technical seminars help them to develop their public speaking abilities.	**4**	Demonstrate improved proficiency in programming, software development, and the use of various technological tools and platforms. Apply theoretical knowledge to real-world problems through projects, internships, and industry collaborations.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
CO1	Connect and adapt cultural diversity among communities.	**4,5,6,7,8**
CO2	Developed team for working toward a shared vision	**4,5,6,7,8**
CO3	Demonstrate and apply interdisciplinary connections and Cultivate spirit of creative thought and curiosity to achieve goals	**4,5,6,7,8**
CO4	Build effectively communicate, delegate responsibilities and motivate team members.	**6,7,8**
CO5	Improve strong teamwork and collaboration skills by engaging in group activities.	**6,7,8**

SEMESTER – IV									
Course Title	**Extra-Curricular**								
Course code	**23UBEC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 4	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Applications**								
Semester	**Fall/ I semester of the second year of the program**								
Course Objectives	1. To develop problem-solving abilities through coding challenges and hackathons. 2. To participate in app development contests and exhibitions. 3. To develop entrepreneurial skills and mindset.								
CO1	Importance of different activities under different clubs.								
CO2	Formulate regular activities like workshops, competitions as per their interest and hobbies.								
CO3	Adapt to represent ADTU in various inter university, state and national level competitions.								
CO4	Discuss with invited experts in their respective fields.								
CO5	Develop an appreciation for diverse forms of artistic expression.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts.	**2**	Demonstrate improved proficiency in programming, software development, and the use of various technological tools and platforms. Apply theoretical knowledge to real-world problems through projects, internships, and industry collaborations.	1,2,3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students' engagement in different activities under different clubs.	**2,3,4,5,6,7**
2	Role play in regular activities like workshops, competitions as per their interest and hobbies.	**2,3,4,5,6,7**
3	Adapt and trained to represent ADTU in various inter university, state and national level competitions.	**2,3,4,5,6,7,8**
4	The students will be given a platform to earn from invited experts in their respective fields.	**2,3,4,5,6,7,8**
5	Develop an appreciation for diverse forms of artistic expression.	**2,3,5,6,7,8**

<table>
<tr><td colspan="9">SEMESTER – IV</td></tr>
<tr><td>Course Title</td><td colspan="8">ENGLISH FOR EMPLOYABILITY (Communicative English, Soft Skills & Logical Reasoning)</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UBPD222R</td><td>Total credits: 2</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>Total hours: 60P</td><td>0</td><td>0</td><td>4</td><td>0</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Pre-requisite</td><td>English Language for Excellence</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="8">All the Under Graduate Programmes</td></tr>
<tr><td>Semester</td><td colspan="8">Winter/II Semester of Second Year of the Programme</td></tr>
<tr><td>Course Objectives</td><td colspan="8">1. To familiarize students with Public Speaking and helping them overcome stage fear.
2. To enhance the writing skills in different areas including CV and cover letter writing.
3. To enable students, know about the email etiquettes and draft professional emails.
4. To boost the productivity of students by understanding how to regulate disagreements effectively.
5. To prepare students for upcoming interviews by enhancing interview skills.
6. To make them prepare for various public and private sector exams & placement drives.
7. To enhance the analytical skill and problem-solving skill of the students.</td></tr>
<tr><td>CO1</td><td colspan="8">Develop skills in script preparation and understand nonverbal communication pivotal to effective public speaking.</td></tr>
<tr><td>CO2</td><td colspan="8">Improve student’s ability in drafting clear, concise, and effective emails.</td></tr>
<tr><td>CO3</td><td colspan="8">Master the creation, submission, and understanding of screening processes for resumes.</td></tr>
<tr><td>CO4</td><td colspan="8">Build conflict management skills within themselves.</td></tr>
<tr><td>CO5</td><td colspan="8">Plan efficiently for discussions in different platforms by enhancing their thought process and problem-solving skills</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>KL</td></tr>
<tr><td>I</td><td colspan="3">Public Speaking:
1.Preparation of Scripts and understanding Nonverbal cues of Public Speaking
2.Understanding and Overcoming Fear of Public Speaking
3.Practice strategies of Public Speaking
Pipe and cistern
i. Introduction of pipes and cistern
ii. Solving different types of questions</td><td>10</td><td colspan="3">Understand and overcome the fear of public speaking, and practice strategies to improve their delivery and confidence.</td><td>1,2</td></tr>
</table>

II	**Practical session on Resume and Cover letter:** i. Preparation, submission & screening of Resume. ii. Practical session on cover letter screening session Mixture allegation and Clock i. Introduction of basics ii. Solving questions on mixture	**10**	Students will master the creation, submission, and understanding of screening processes for resumes.	2,3
III	**Email Etiquettes** I. Different Parts of Email and Usage ii. Drafting emails effectively Statement and Course of action i. Revision of syllogism ii. Statement and conclusion Iii. Course of action based on statement	**15**	Identify, address, and resolve conflicts effectively, enhancing their ability to maintain positive and productive relationships in both personal and professional settings.	1,2,3
IV	**Interview Skills (Mock sessions)** I. Preparing Commonly Asked Interview Questions ii. Mock Interview sessions Sitting arrangement (puzzle) i. Linear arrangement puzzle ii. Circular arrangement puzzle iii. Matrix	**15**	Familiarity with Common Interview Questions, Practice in Answering Interview Questions, Feedback and Improvement, Building Confidence, Understanding Sitting Arrangement Puzzles, Enhancing Logical Reasoning Skills, Teamwork and Collaboration, Preparedness for Assessment Tests	2,3
V	**Conflict Management** i. Definition ii. Type of Conflict Management iii. Effects of Conflict Management Profit loss and discount i. Introduction to basics ii. Introduction to discount iii. Probems related on the topic	**10**	Understand what conflict management entails, including the identification, resolution, and mitigation of conflicts in various contexts, concepts related to profit and loss, including revenue, costs, profit margin, concept of discounting, including types of discounts and their significance in pricing strategies.	1,2,3,4

TEXT BOOKS:

1. Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.
2. McDowell, Gayle Laakmann. 2008.Cracking the Coding Interview (Indian Edition)
3. Professionalism Skills for Workplace Success, Lydia E. Anderson, Sandra B. Bolt, Publisher: Pearson Education
4. The Art of Public Speaking, Dale Carnegie, Publisher:Diamond Pocket Books Pvt Ltd
5. English for Academic CVs, Resumes, and Online Profiles, Adrian Wallwork, Publisher:Springer International Publishing
6. Employment & Volunteering: Job Interview Basics, Lisa Renaud, Publisher:Classroom Complete Press

REFERENCE BOOKS:

1. Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction, Harper Perennial
2. Taylor J. and Wright, J., IELTS Advantage Reading Skills: A step-by-step guide to a high IELTS reading score, Delta Publishing by Klett
3. Murphy, Raymond, (2012) English Grammar in Use Book with Answers: A Self-Study and Practice Book for Intermediate Learners of English, Cambridge University Press
4. Real-resumes for Teachers, Anne McKinney, Publisher: Prep Pub.
5. Public Speaking for Success, Dale Carnegie, Publisher: Penguin Publishing Group
6. Job Interview Skills, Paige Labert, Publisher: Di Dio Calderone Giuseppina
7. Dressology: The Science of Power Dressing, Nandita Pandey, Publisher: Pan Macmillan

OTHER LEARNING RESOURCES:

1. https://learning.shine.com/talenteconomy/career-help/top-group-discussion-skills/https://www.coursera.org/articles/conflict-management

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop skills in script preparation and understand nonverbal communication pivotal to effective public speaking.	**1,3 & 4**
2	Improve student's ability in drafting clear, concise, and effective emails.	**1,2**
3	Master the creation, submission, and understanding of screening processes for resumes.	**7.9,10**
4	Build conflict management skills within themselves.	**5,7**
5	Plan efficiently for discussions in different platforms by enhancing their thought process and problem-solving skills	**5,8**

SEMESTER – IV									
Course Title	**MOOCS III (Intermediate PostgreSQL)**								
Course code	**22MOSY222R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	0	0	0	0	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**BCA**								
Semester	**Winter/II Semester of Second Year of the Programme**								

Course Objectives	1. To understand advanced SQL techniques beyond basic CRUD operations in PostgreSQL. 2. To learn and apply aggregation methods in SQL queries. 3. To master the use of transactions in PostgreSQL for data integrity and concurrency control. 4. To gain proficiency in reading and parsing CSV files and inserting the data into a PostgreSQL database. 5. To explore and understand PostgreSQL's handling and indexing of text data. 6. To develop skills in altering table schemas and creating stored procedures. 7. To construct and execute advanced SQL queries for sorting, grouping, and managing data. 8. To utilize regular expressions and other techniques for working with text data in PostgreSQL.
CO1	Advanced SQL Proficiency: Develop advanced proficiency in SQL techniques beyond basic CRUD operations, including aggregation, transactions, and data manipulation.
CO2	Effective Data Handling: Master the skills to efficiently handle data, including reading and parsing CSV files, inserting data into databases, and managing text data through PostgreSQL.
CO3	Database Management Skills: Gain practical experience in altering table schemas, creating stored procedures, and utilizing indexing for optimizing database performance.
CO4	Complex Query Construction: Construct and execute advanced SQL queries for sorting, grouping, and analyzing data, enabling effective data retrieval and manipulation.
CO5	Text Data Manipulation: Apply techniques such as regular expressions to manipulate text data within databases, enhancing data processing capabilities and query flexibility.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	SQL Techniques	**7**	Understanding SQL Fundamentals, Database Design and Schema Definition, Data Retrieval and Manipulation, Data Modification and Transactions, DDL and DML, Performance Optimization and Indexing,	2

			Data Analysis and Reporting, Security and Access Control.	
II	Using SQL Techniques	**4**	Understanding SQL Fundamentals, Data Retrieval, Data Manipulation, Joins and Subqueries, Data Definition, DCL, Transaction Management, Performance Optimization, Data Analysis and Reporting, Advanced SQL Techniques, Integration with Programming Languages, Database Administration.	1,2,3
III	Text in PostgreSQL	**2**	Understanding Text Data Types, Basic Text Manipulation, Text Functions and Operators, Pattern Matching and Regular Expressions, Text Searching and Full-Text Search, Text Indexing, Case Conversion and Formatting, Text Aggregation and Analysis, Handling Multilingual Text, Practical Applications.	3,5
IV	Regular Expressions	**3**	Understanding Regular Expression Syntax, Pattern Matching, Text Searching, Text Extraction and Substitution, Advanced Regex Features, Regex in Programming Languages, Regex for Validation, Performance Optimization, Debugging and Testing, Practical Applications.	4,5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Advanced SQL Proficiency: Develop advanced proficiency in SQL techniques beyond basic CRUD operations, including aggregation, transactions, and data manipulation.	**2,3,7,8**
2	Effective Data Handling: Master the skills to efficiently handle data, including reading and parsing CSV files, inserting data into databases, and managing text data through PostgreSQL.	**2,3,7,8**
3	Database Management Skills: Gain practical experience in altering table schemas, creating stored procedures, and utilizing indexing for optimizing database performance.	**2,3,7,8**
4	Complex Query Construction: Construct and execute advanced SQL queries for sorting, grouping, and analyzing data, enabling effective data retrieval and manipulation.	**1,2,3,7,8**
5	Text Data Manipulation: Apply techniques such as regular expressions to manipulate text data within databases, enhancing data processing capabilities and query flexibility.	**2,3,8**

SEMESTER – IV									
Course Title	**Generic Elective II (Strategy of Content Marketing)**								
Course code	**22BCAO225R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	0	0	0	0	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**BCA**								
Semester	**Winter/II Semester of Second Year of the Programme**								
Course Objectives	1. To understand the fundamental strategies used in content marketing for acquiring and retaining customers. 2. To develop, organize, and implement effective content marketing strategies. 3. To analyze and measure the effectiveness of content marketing efforts. 4. To learn the principles of writing compelling and strategic copy.								
CO1	Explain core content marketing strategies and their role in customer acquisition and retention.								
CO2	Develop a comprehensive content marketing strategy tailored to specific business goals.								
CO3	Organize and implement content marketing plans effectively.								
CO4	Analyze content marketing performance using appropriate metrics and tools.								
CO5	Develop a distribution plan for content across various channels								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	The Content Marketing Ecosystem	**3**	Understanding Content Marketing Fundamentals, Components of the Content Marketing Ecosystem, Audience Research and Persona Development, Content Strategy Development, Content Creation and Storytelling, Content Curation, Content Distribution and Promotion, SEO and Content Optimization, Content Measurement and Analytics, Content Marketing Technology and Tools, Trends and Best Practices.	2
II	The Strategic Context (The 7A Framework)	**3**	Understanding the Content Marketing Ecosystem, 7A Framework, Integration of the 7A Framework.	1,3
III	Mapping the Journey: Crafting a Content Marketing Strategy	**6**	Understanding the Importance of a Content Marketing Strategy, Conducting Audience	3,4

			Research, Setting Clear Objectives and Goals, Content Audit and Gap Analysis, developing a Content Plan, Creating Engaging and Valuable Content, Content Distribution and Promotion, Utilizing Content Management Tools and Platforms, Measuring and Analyzing Performance, Optimizing and Refining the Strategy, Developing a Content Calendar.	
IV	The Strategic Types of Content	**6**	Advanced Technical Proficiency, Professional Communication, Project Management, Problem-Solving and Critical Thinking, Team Collaboration, Industry Awareness, Ethical and Professional Responsibility, Career Preparation.	2,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain core content marketing strategies and their role in customer acquisition and retention.	1,2,3,5,6,7,8
2	Develop a comprehensive content marketing strategy tailored to specific business goals.	1,2,3,5,6,7,8
3	Organize and implement content marketing plans effectively.	1,2,3,5,6,7,8
4	Analyze content marketing performance using appropriate metrics **and** tools.	1,2,3,5,6,7,8
5	Develop a distribution plan for content across various channels	1,2,3,4

SEMESTER – IV									
Course Title	**BASIC ACCLIMATIZING SKILLS (BAS)**								
Course code	**22UULS201R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	0	0	2	0	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**All the Under Graduate Programmes**								
Semester	**Fall/I or Winter/II Semester of Second Year of the Programme**								
Course Objectives	1. To impart knowledge of the fundamentals of Hospitality industry and its applications. 2. Students will be able to familiarize with the cooking equipment & Utensils. 3. Students will be able to handle different modes of reservations.								
CO1	Students will have basic knowledge of cooking methods.								
CO2	Students will gain the knowledge of organizing & Cleaning of Rooms.								
CO3	Students will be able to gain the travel management concept.								
CO4	Students will be able to acquire the knowledge of basic households' amenities for day- to-day use.								
CO5	Understand the importance of time management and organization in acclimatizing to new academic demands.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Accommodation Management:** Telephone handling technique, Organizing of Rooms, Cleaning agents, cleaning equipment and uses, Bed making Process.	**7**	Describe, illustrate, and explain cell organization and functions, microscopy, and structural differences.	1,2
II	**Fundamentals of Cooking**: Definition of cookery –Aim & Objectives of cooking, Use of basic cooking equipment, Personal Hygiene and Safety, Use of Fire & Fuels	**10**	Describe, illustrate, and explain membrane structure, function; cell organization, and the proteins involved in transportation.	1,2
III	**Methods of Cooking:** Different Cuts. Use of Herbs and Spices. Basic Food and Beverage Preparation. Regional food Habits	**10**	Describe, illustrate, and explain chromosomal structure and types.	1,2
IV	**Forms & Format's**: C –form Reservation form Registration form Passport Application form Legal Rent Agreement	**8**	Describe, illustrate, and explain the mechanism of cell-to-cell communication	1,2
Practical	. Staining and microscopic observation of various stages of Mitosis of given sample(s). . Staining and microscopic	**30**	Describe, illustrate and explain and apply staining techniques and carry out microscopic	1,2,3,4

	observation of various stages in Meiosis of given sample(s).		examination.	

TEXT BOOKS:

1. Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt ltd-New Delhi.
2. Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restauranteur, Guides.
3. Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.
4. Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013.

REFERENCE BOOKS:

1. Cooper GM. The Cell: A Molecular Approach. 2nd edition. Sunderland (MA): Sinauer Associates; 2000.
2. Ambrose and Dorothy. Cell Biology. 2nd Edition. MEasty, ELBS Publications; 1970.
3. Sharp, Lester W. Fundamentals of Cytology. 1st edition. Mc Graw Hill Company; 1943.

OTHER LEARNING RESOURCES:

1. https://www.ncbi.nlm.nih.gov/books/NBK9839/?term=cell%20Biolpgy

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Able to explain the fundamentals and advances of cytology including structure and functions of cell and cell organelles.	1,3 & 4
2	Able to explain the cell cycle and cell division.	1,2
3	Learn and develop skills for operating microscope, preparing slides by various staining techniques	7.9,10
4	Apply knowledge of cellular processes to explain how cells operate and interact within living organisms.	5,7
5	Demonstrate a comprehensive understanding of cell structure and function.	5,8

MAPPING TABLE

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO221R	DESIGN AND ANALYSIS OF ALGORITHM	2	2.66	2.33					1.66
22BCAO222R	BASICS OF PYTHON PROGRAMMING	1.6	1	1					1.6
22BCAO223R	COMPUTER NETWORKS	2.6	2	2					1
22BCAO224R	TECHNO PROFESSIONAL SKILLS III	1.8	2	2.2	1				
22UBPD222R	(ENGLISH FOR EMPLOYABILITY			2					
22UBCC221	CO-CURRICULAR				2	1	2.6	2.4	2.4
22UBEC221	EXTRA-CURRICULAR		1.2	2.2	1.75	2.2	2.6	1.6	2.33
22BCAO311R	BASIC ACCLIMATIZING SKILLS	2.5	2.5	2	1	1.66		2.66	1
22MOSY222R	MOOC III (INTERMEDIATE POSTGRESQL)	1	2	2.8				1	1
22BCAO225R	GENERIC ELECTIVE II (THE STRATEGY OF CONTENT MARKETING)	1	1.5	2		1.75	2.5	1.5	1

SEMESTER – V									
Course Title	**PROGRAMMING IN JAVA**								
Course code	**22BCAO311R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40L+30P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. To enable students to understand the basic object-oriented programming concepts and apply them in problem solving. 2. To illustrate among students the inheritance concepts for reusing the program. 3. To enable students to develop GUI-based applications using AWT, Swing and Event handling.								
CO1	Explain the object-oriented programming concepts and implement in java.								
CO2	Demonstrate the building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.								
CO3	Apply the exception handling methods on programming								
CO4	Develop interactive as well as GUI-based java applications in project-based learning.								
CO5	Outline the concept of package, interface, multi-threading and File handling in java.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Java Overview:** Java Introduction, Platform Independence, JVM & JDK, Data types, Operators, If, else statement, Switch condition, while, do-while, for loop, break and continue statement; **Array and String:** Single Array & Multidimensional Array, Library Classes-String, String Buffer & Wrapper Class, Command line arguments and Various String Operations.	**8**	Describe and demonstrate Java's basic concepts like platform independence, data structures, control structures, and standard library utilization. Understand arrays and strings.	1,2
II	**Classes, Objects and Methods:** Class and Object, Object reference, Constructor: Constructor Overloading, Method: Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Import statement, Static import, Access control, Nested class, Inner class, Anonymous inner class.	**8**	Understand the structure and usage of classes, objects, and methods, and apply skills to implement constructors, method overloading, recursion, and manage access within Java programs.	2, 3

III	**Inheritance and Interfaces in Java:** Overview of Inheritance, inheritance in constructor, Inheriting Data members and Methods, Multilevel Inheritance – method overriding Handle multilevel constructors super keyword, Stop Inheritance, final keyword. Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Abstract class, Comparison between Abstract Class and interface, inside of System.out.println – statements.	**8**	Comprehend the principles of inheritance including multilevel inheritance, method overriding, and constructor behaviours, and apply these concepts along with interface implementation, abstract classes, and dynamic method dispatch in Java programming.	2, 3
IV	**Exception Handling in Java:** Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class. **JAVA File Handling:** Overview of Different Stream (Byte Stream, Character stream), Readers and Writers class, File Class, File Input Stream, File Output Stream, Input Stream Reader and Output Stream Writer class, File reader and writer class, File Writer, Buffered Reader class.	**8**	Apply techniques to manage exceptions using try, catch, throw, throws, and finally, and create custom exceptions; analyze and implement file operations using various stream classes, including file streams, buffered readers, and writers to handle input and output in Java.	3, 4
V	**Applet, AWT and Swing:** Applet: Applet Fundamental, Applet Architecture, Applet Skeleton, Requesting Repainting, Event Handling: various event handling mechanisms, various classes related to event sources and event listeners, AWT: window fundamentals, creating frames, Adding removing various controls, Layout managers, Introduction to Swing.	**8**	Apply the fundamentals of Java applets, including architecture and event handling mechanisms; analyze and implement graphical user interfaces using AWT and Swing, focusing on window fundamentals, frames, control management, and layout arrangements.	3, 4, 5
Practical				
Practical	**Content**	**Contact**	**Learning Outcome**	**BL**

		Hour		
Practical 1	Program to print all even numbers between 1 and 50 using for loop.	**2**	Demonstrate the understanding of for loops and conditional statements	2
Practical 2	Program to calculate and print factorial of a number ‘n’ using for loop	**2**	Apply the knowledge of for loops and mathematical concepts	3
Practical 3	rogram to check two arrays are equal or not.	**2**	Analyze and compare two arrays to determine if they are equal by writing a program that iterates through the arrays and checks for element-wise equality	4
Practical 4	Program to add two matrices.	**2**	Apply the understanding of matrix operations	3
Practical 5	Program to display marks, percentage, grade based on attendance.	**2**	Explain how attendance data impacts marks, percentage, and grades	2
Practical 6	Program to check if a number is odd or even.	**2**	Determine and explain whether a number is odd or even by writing a program that uses conditional statements	2
Practical 7	Program to check if a number is prime or not.	**2**	Determine and explain whether a number is prime by writing a program that tests the number's divisibility by integers other than 1 and itself	2
Practical 8	Program to use switch case to print seasons.	**2**	Apply the knowledge of switch case statements by writing a program that prints the appropriate season based on a given input	3
Practical 9	Program to print Volume of box using Constructor overloading.	**2**	Analyze and differentiate between various constructor implementations by writing a program that uses constructor overloading	4
Practical 10	Program to show function overloading.	**2**	Apply the understanding of function overloading	3
Practical 11	Program to show return by object.	**2**	Apply object-oriented programming concepts by writing a program that returns an object from a function to demonstrate encapsulation and data handling	3

Practical 12	Program to show pass by value.	**2**	Understand and explain the concept of pass by value by writing a program that shows how passing arguments by value affects the function's behaviour	2
Practical 13	Program to show pass by reference.	**2**	Understand and explain the concept of pass by reference by writing a program that shows how passing arguments by reference affects the function's behavior	2
Practical 14	Program to find Factorial using recursive function.	**2**	Apply the understanding of recursion by writing a program that calculates the factorial of a number using a recursive function	3
Practical 15	Program to find Month- season using switch case.	**2**	Apply the knowledge of switch case statements by writing a program that determines and prints the season based on the input month	3
Practical 16	Program to print data of employee.	**2**	Demonstrate their understanding of data structures and object-oriented programming	2
Practical 17	Program to print student data.	**2**	Apply object-oriented programming principles	3
Practical 18	Write a Java program to create a new Box class in Java.	**2**	Synthesize the knowledge of object-oriented programming by designing and implementing a new class in Java	6

TEXT BOOKS:

1. Herbert Schildt and Dale Skrien, “Java Fundamentals – A comprehensive Introduction”, McGraw Hill.
2. Herbert Schildt, “Java the complete reference”, McGraw Hill, Osborne.
3. T. Budd, “Understanding Object- Oriented Programming with Java”, Pearson Education.

REFERENCE BOOKS:

1. P.J.Dietel and H.M.Dietel , “Java How to program”, Prentice Hall.
2. P.Radha Krishna , “Object Oriented programming through Java”, CRC Press.
3. S.Malhotra and S. Choudhary, “Programming in Java”, Oxford University Press.

OTHER LEARNING RESOURCES:

1. http://java.sun.com
2. http://www.oracle.com/technetwork/java/index.html

3. http://java.sun.com/javase
4. http://www.oracle.com/technetwork/java/javase/overview/index.html
5. http://download.oracle.com/javase/7/docs/api/index.html

E-Text Books:

1. http://docs.oracle.com/javase/tutorial/
2. https://iiti.ac.in/people/~tanimad/JavaTheCompleteReference.pdf
3. https://www.codejava.net/books/4-best-free-java-e-books-for-beginners

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the object-oriented programming concepts and implement in java.	1, 2, 5, 8
2	Demonstrate the building blocks of OOPs language, inheritance, package and interfaces, and analyse real-world problems in terms of these.	2, 3, 4, 5, 7, 8
3	Apply the exception handling methods on programming	7
4	Develop interactive as well as GUI-based java applications in project-based learning.	2, 3, 4, 5, 7, 8
5	Outline the concept of package, interface, multi-threading and File handling in java.	1, 2, 3

SEMESTER – V									
Course Title	**CLOUD COMPUTING**								
Course code	**22BCAO312R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40L	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. To elucidate both theoretical and practical aspects of cloud computing. 2. To equip students with the skills to design, implement, and manage cloud computing solutions effectively in both personal and professional settings. 3. To foster proficiency in evaluating cloud-based systems and optimizing them for enhanced performance and security.								
CO1	Understand cloud computing's fundamental concepts, including its history, architecture, and key advantages and disadvantages.								
CO2	Acquire knowledge of different cloud service and deployment models, assessing their impact on security and privacy.								
CO3	Comprehend virtualization techniques and their practical applications within cloud infrastructures.								
CO4	Explore the relationship between IoT and cloud computing, including emerging technologies like fog computing.								
CO5	Master the essentials of cloud security, focusing on risk management and protective measures for cloud-based systems.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Cloud Computing - An Introduction:** Introduction to Cloud Computing, History of Cloud Computing, Cloud Architecture, Cloud Storage, Why Cloud Computing Matters, Advantages of Cloud Computing, Disadvantages of Cloud Computing, Cloud Services.	**8**	Understand and describe the foundational aspects of cloud computing, including its history, architecture, storage solutions, and the overall significance, as well as the advantages and disadvantages of using cloud services.	1,2
II	**Cloud Deployment Models and Cloud Architecture:** Cloud reference model, Platform as service, Software as a service, Infrastructure as service, Cloud deployment models, public clouds, Private clouds, Community cloud, Hybrid clouds, security, trust and privacy	**8**	Understand and differentiate various cloud deployment models and architectures, including public, private, community, and hybrid clouds, along with cloud service models like Platform as a Service (PaaS), Software as a Service (SaaS), and Infrastructure as a Service (IaaS). Evaluate their implications for security, trust, and privacy.	2, 4
III	**Cloud Virtualization Technology:** Overview of Virtualization techniques, Types of	**8**	Understand and explain various virtualization techniques and types,	2, 3

	Virtualizations, Implementation Levels of Virtualization Structures, Virtualization benefits, Server virtualization, Hypervisor management software, Virtual infrastructure requirements		assess the benefits and levels of virtualization structures, and apply knowledge of server virtualization and hypervisor management to meet specific virtual infrastructure requirements.	
IV	**IoT and the Cloud Computing** Introduction to IoT, Difference between Cloud Computing and IoT, Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Living on the Edge, An Abstract Edge Architecture Model, Connecting devices at the edge and to the cloud	**8**	Understand the fundamentals of IoT and its distinction from cloud computing, analyze the integration and role of cloud computing within IoT ecosystems, and apply concepts of fog computing and edge architectures to enhance connectivity and functionality between devices and the cloud.	2, 3, 4
V	**Cloud security:** Introduction to Security, Cloud Security challenges and Risks, Software-as-a-Service Security, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control	**8**	Understand cloud security fundamentals and challenges; design and apply security measures for data, applications, and identity management; and evaluate the efficacy of these security solutions in cloud environments.	3, 4, 5

TEXT BOOKS:

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008

REFERENCE BOOKS:

1. K.Chandra Sekaran, "Essentials of Cloud Computing", 1st Edition, 2015, CRC Press, Taylor & Francis Group.
2. A.Srinivasan and J.Suresh, "Cloud Computing, A practical approach for learning and implementation", Pearson, 2014.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand cloud computing's fundamental concepts, including its history, architecture, and key advantages and	**3, 4**

	disadvantages.	
2	Acquire knowledge of different cloud service and deployment models, assessing their impact on security and privacy.	**2, 3**
3	Comprehend virtualization techniques and their practical applications within cloud infrastructures.	**3**
4	Explore the relationship between IoT and cloud computing, including emerging technologies like fog computing.	**3, 4**
5	Master the essentials of cloud security, focusing on risk management and protective measures for cloud-based systems.	**2, 5, 7**

SEMESTER – V									
Course Title	**PROJECT-I**								
Course code	**22BCAO313R**	**Total credits: 6**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:60P	**0**	**0**	**4**	**12**	**6**	**0**	**6**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. To develop the knowledge, skills and attitudes of a professional Computer Application professional. 2. To become confident in designing Software solutions to complex software problems utilising a systems approach. 3. Develop a deep understanding of computer applications to enhance professional knowledge, skills, and attitudes necessary for the field.								
CO1	Demonstrate a sound technical knowledge of their selected project topic.								
CO2	Undertake problem identification, formulation and solution.								
CO3	Design Software solutions to complex problems utilising a systems approach.								
CO4	Communicate with the community at large in written an oral form.								
CO5	Demonstrate the knowledge, skills and attitudes of a Computer Application or IT professional.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	This course will be conducted largely as an individual or small group project under the direct supervision of a member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student(s) and supervisor. Students will be required to: 1. Perform a literature search to review current knowledge and developments in the chosen technical area; 2. Undertake detailed technical work in the chosen area using one or more of: 3. theoretical studies 4. computer simulations 5. hardware construction; 6. Produce progress reports or maintain a professional journal to establish work completed, and to schedule additional work within the time frame specified for the project;	**90**	Analyze current knowledge through a comprehensive literature review in a chosen technical field, apply advanced methods like theoretical studies, computer simulations, and hardware construction. Synthesize findings into progress reports and professional journals, evaluate and present these findings in seminars, and demonstrate practical outcomes through poster presentations and operational demonstrations.	3, 4, 5

	7. Deliver a seminar on the general area of work being undertaken and specific contributions to that field; 8. Prepare a formal report describing the work undertaken and results obtained so far; and Present the work in a forum involving poster presentations and demonstrations of operational hardware and software.			

OTHER LEARNING RESOURCES:

As given by Project supervisor.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will be able to demonstrate a sound technical knowledge of their selected project topic.	**1, 2, 4**
2	Students will be able to undertake problem identification, formulation, and solution.	**1, 3**
3	Students will be able to design Software solutions to complex problems utilising a systems approach.	**2, 3, 5, 7**
4	Students will be able to communicate with the community at large in written an oral form.	**2, 3, 5, 6, 7**
5	Demonstrate the knowledge, skills and attitudes of a Computer Application or IT professional.	**1, 2, 3, 7**

SEMESTER – V									
Course Title	**TECHNO PROFESSIONAL SKILLS IV**								
Course code	**22BCAO314R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1. To thoroughly revise and consolidate foundational concepts of Computer Science & Information Technology learned previously. 2. To build confidence in applying Computer Science & Information Technology concepts to address real-world challenges. 3. To cultivate practical skills in analyzing, designing, and implementing software solutions grounded in theoretical and technical principles.								
CO1	Understand fundamental and advanced web technologies to address real-world problems.								
CO2	Gain deep knowledge of advanced Python programming techniques.								
CO3	Explore and apply essential concepts of operating systems.								
CO4	Develop a comprehensive understanding of computer network systems.								
CO5	Cultivate skills in critical analysis and evaluation of software and hardware systems to improve technological solutions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Web Technology Advanced:** SPA with React and Express.js for Book Management, Real-time Chat Application with Node.js and Socket.IO, E-commerce Platform Development with React and Node.js, PWA Development with React.	**8**	Design and implement complex web applications	6
II	**Python advanced:** Data Pipeline with Apache Airflow for API Data Extraction and PostgreSQL, Machine Learning Model Deployment with Flask, Asynchronous Web Scraper with Python's asyncio and aiohttp, Stock Market Data Analysis with Pandas and Visualization using Matplotlib.	**8**	Develop and deploy sophisticated Python-based solutions	6
III	**Operating Systems:** Producer-Consumer Problem with POSIX Threads and Synchronization, Simulation of Virtual Memory Management System,	**8**	Evaluate and optimize operating system components by engaging in hands-on projects	5

	Development of a Simple File System using C, Implementation of a Simple Unix-like Shell in C.			
IV	**Computer Networks:** Configuring VLANs and Inter-VLAN Routing with Cisco Switches and Routers, Implementation and Verification of OSPF Routing Protocol in a Multi-Router Network, Setting Up Site-to-Site VPN between Remote Locations Using Cisco Routers, Implementing QoS on Cisco Router for VoIP Traffic 6Prioritization.	**8**	Analyze network configurations and protocols	4
V	**System Architecture and Performance Evaluation:** Performance Analysis and Optimization of CPU using Benchmarking Tools, Evaluation of Memory Hierarchy Performance (Cache, RAM, Disk), Performance Impact of Multithreading and Parallel Processing on Multi-core Systems, Performance Evaluation of Network Communication in Distributed Systems.	**8**	Analyze and optimize system architecture components by utilizing performance evaluation techniques.	4
Practical				
Practical	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
Practical 1	Develop a single-page application (SPA) using React for the frontend and Express.js for the backend. The application should allow users to perform CRUD operations on a collection of books.	**2**	Create a full-stack application by developing a Single Page Application (SPA) using React for the frontend and Express.js for the backend	6
Practical 2	Create a real-time chat application using Node.js and Socket.IO.	**2**	Develop a real-time chat application by utilizing Node.js and Socket.IO to enable instantaneous communication between users	6
Practical 3	Build an e-commerce platform with a React frontend and a	**2**	Construct a comprehensive e-	6

	Node.js backend.		commerce platform by integrating a React frontend with a Node.js backend	
Practical 4	Develop a Progressive Web App (PWA) using React.	**2**	Design and develop a Progressive Web App (PWA) using React, implementing features such as offline access, push notifications, and a responsive user interface	6
Practical 5	Create a data pipeline to extract data from an API, process it, and load it into a PostgreSQL database using Apache Airflow.	**2**	Evaluate and optimize a data pipeline by using Apache Airflow to extract data from an API, process it, and load it into a PostgreSQL database	5
Practical 6	Develop and deploy a machine learning model using Flask.	**2**	Evaluate and refine the deployment of a machine learning model by using Flask, ensuring the model's functionality, scalability, and accessibility	5
Practical 7	Implement an asynchronous web scraper using Python’s asyncio and aiohttp.	**2**	Create an efficient and scalable asynchronous web scraper using Python’s asyncio and aiohttp, enabling concurrent data extraction from multiple web sources	6
Practical 8	Analyze stock market data using Pandas and visualize the results with Matplotlib.	**2**	Analyze stock market data by utilizing Pandas for data manipulation and Matplotlib for visualizing the results, gaining insights into market trends and patterns	4
Practical 9	Implement a producer-consumer problem using POSIX threads and synchronization primitives.	**2**	Analyze and implement a solution to the producer-consumer problem using POSIX threads and synchronization primitives, ensuring proper coordination and resource sharing between	4

			threads.	
Practical 10	Create a simulation of a virtual memory management system.	**2**	Create a simulation of a virtual memory management system, demonstrating their understanding of memory allocation, paging, and address translation	6
Practical 11	Develop a simple file system using C.	**2**	Analyze and implement a simple file system using C, demonstrating their understanding of file organization, storage management, and basic file operations	4
Practical 12	Implement a simple Unix-like shell in C.	**2**	Analyze and implement a simple Unix-like shell in C, demonstrating their understanding of command parsing, process control, and basic shell functionalities	4
Practical 13	Configure multiple VLANs on a Cisco switch and ensure proper inter-VLAN routing using a Cisco router.	**2**	Evaluate the configuration of multiple VLANs on a Cisco switch and ensure proper inter-VLAN routing using a Cisco router	5
Practical 14	Implement and verify the OSPF routing protocol in a multi-router network.	**2**	Implement and verify the OSPF routing protocol in a multi-router network, ensuring efficient and accurate routing	3
Practical 15	Set up a site-to-site VPN between two remote locations using Cisco routers.	**2**	Create a secure site-to-site VPN between two remote locations using Cisco routers, facilitating protected and reliable communication	6
Practical 16	Implement QoS on a Cisco router to prioritize VoIP traffic over regular data traffic.	**2**	Analyze and implement QoS on a Cisco router to prioritize VoIP traffic over regular data traffic, improving call quality and network performance.	4
Practical 17	Analyze the performance of a CPU	**2**	Analyze CPU	4

	using benchmarking tools and optimize its performance by adjusting system parameters and configurations.		performance using benchmarking tools and optimize its performance by adjusting system parameters and configurations	
Practical 18	Evaluate the performance of different levels of the memory hierarchy (cache, RAM, and disk) and their impact on overall system performance.	**2**	Evaluate the performance of different levels of the memory hierarchy (cache, RAM, and disk) and understand their impact on overall system performance.	5
Practical 19	Assess the performance impact of multithreading and parallel processing on a multi-core system.	**2**	Analyze the performance impact of multithreading and parallel processing on a multi-core system, identifying how these techniques affect computational efficiency	4
Practical 20	Evaluate the performance of network communication in a distributed system and identify bottlenecks.	**2**	Evaluate the performance of network communication in a distributed system, identifying bottlenecks and proposing solutions to enhance data transfer rates and overall network efficiency.	5

TEXT BOOKS:

1. "Learning React: Modern Patterns for Developing React Apps", Alex Banks and Eve Porcello.
2. "Fluent Python: Clear, Concise, and Effective Programming", Luciano Ramalho.
3. "Operating Systems: Three Easy Pieces", Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau.
4. "CCNA 200-301 Official Cert Guide Library", Wendell Odom.
5. "Cisco Networking All-in-One for Dummies", Edward Tetz.
6. "Computer Architecture: A Quantitative Approach", John L. Hennessy and David A. Patterson

REFERENCE BOOKS:

1. "Node.js Design Patterns", Mario Casciaro and Luciano Mammino
2. "Data Science from Scratch: First Principles with Python", Joel Grus
3. "UNIX Systems Programming: Communication, Concurrency, and Threads", Kay A. Robbins and Steven Robbins.

4. “Routing TCP/IP, Volume 1”, Jeff Doyle and Jennifer DeHaven Carroll.
5. “Computer Systems: A Programmer's Perspective”, Randal E. Bryant and David R. O'Hallaron

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand fundamental and advanced web technologies to address real-world problems.	**2, 3, 4, 6, 8**
2	Gain deep knowledge of advanced Python programming techniques.	**2, 3, 8**
3	Explore and apply essential concepts of operating systems.	**1, 2, 3, 4, 7, 8**
4	Develop a comprehensive understanding of computer network systems.	**1, 2, 3, 4, 6, 7, 8**
5	Cultivate skills in critical analysis and evaluation of software and hardware systems to improve technological solutions.	**2, 3, 4, 5, 7**

SEMESTER – V									
Course Title	**INTERNSHIP**								
Course code	**22BCAO315R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40	**0**	**0**	**0**	**0**	**0**	**8**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. Apply academic knowledge and develop industry-specific skills in a professional setting. 2. Gain insight into career pathways and enhance problem-solving, communication, and teamwork skills. 3. Build a professional network and understand workplace dynamics.								
CO1	Demonstrate the application of theoretical knowledge in a practical environment.								
CO2	Identify and develop key professional skills relevant to the field of study.								
CO3	Reflect on personal and professional growth throughout the internship.								
CO4	Produce professional documents, such as a resume, cover letter, and portfolio.								
CO5	Present the internship experience and learning outcomes effectively.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Orientation and Preparation:** Introduction to the internship, setting goals, understanding workplace expectations, and professional behaviour.	**8**	Demonstrate the application of theoretical knowledge in a practical environment.	1, 2
II	**Skills Development:** Developing industry-specific skills, working on assigned projects, and regular feedback sessions.	**8**	Identify and develop key professional skills relevant to the field of study.	2, 3
III	**Professional Growth:** Understanding workplace dynamics, building a professional network, and learning from mentors and colleagues.	**8**	Reflect on their personal and professional growth throughout the internship.	2, 3
IV	**Professional Documentation**: Creating and refining professional documents such as resumes, cover letters, and portfolios.	**8**	Produce professional documents, such as a resume, cover letter, and portfolio.	3, 4
V	**Presentation and Reflection:** Presenting the internship experience, discussing learning outcomes, and reflecting on personal growth and future career plans.	**8**	Present their internship experience and learning outcomes effectively.	3, 4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the application of theoretical knowledge in a practical environment.	**1, 2**
2	Identify and develop key professional skills relevant to their field of study.	**2, 3, 7**
3	Reflect on their personal and professional growth throughout the internship.	**8**
4	Produce professional documents, such as a resume, cover letter, and portfolio.	**6**
5	Present their internship experience and learning outcomes effectively.	**6**

SEMESTER – V									
Course Title	**PE I: FUNDAMENTALS OF AI /ML**								
Course code	**22BCAO316R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45 L	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. Learn the basic principles of machine learning and how they can be applied to different scenarios. 2. Understand the differences between supervised and unsupervised learning algorithms. 3. Understand the fundamental concepts and terminology of Artificial Intelligence (AI)								
CO1	Explain machine learning concepts, applications, challenges, and basic data descriptions								
CO2	Apply and evaluate clustering techniques using various methods.								
CO3	Differentiate prediction and classification, apply algorithms, and evaluate performance.								
CO4	Implement and compare various search strategies and algorithms.								
CO5	Use logic and probabilistic models for knowledge representation and reasoning.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Machine Learning:** What is machine learning, applications of machine learning, issues and challenges faced in machine learning, types of data attributes – nominal, binary, ordinal, numeric, discrete and continuous, basic statistical descriptions of data – measures of central tendency and dispersion, major tasks in data pre-processing	**8**	Define machine learning, list its applications, identify common issues, distinguish between types of data attributes, describe basic statistical data measures, and outline key data pre-processing tasks.	**1, 2, 4**
II	**Unsupervised Learning - Data Clustering:** what is cluster analysis, need for cluster analysis, data matrix, dissimilarity matrix, proximity and dissimilarity measures for different data attribute types, partitioning based clustering methods, density-based clustering methods and hierarchical clustering methods, measuring cluster quality	**8**	Define cluster analysis, explain its necessity, describe data and dissimilarity matrices, discuss proximity and dissimilarity measures, compare partitioning, density-based, and hierarchical clustering methods, and evaluate cluster quality.	**1, 2, 3, 4**

III	**Supervised Learning – Prediction:** What is prediction, application areas of prediction, Simple linear regression, Multiple linear regression, Predictor Error measures **Classification**: What is classification, differences between classification and prediction, applications of classification, Some classification algorithms, Confusion matrix and metrics for evaluating classifier performance	**8**	Define prediction and classification, identify their applications, explain the differences between them, describe linear regression models and prediction error measures, list classification algorithms, and evaluate classifier performance using confusion matrices and metrics.	**1, 2, 3, 4**
IV	**Introduction to Search:** Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha – Beta pruning.	**8**	Understand various search strategies, including uninformed and informed methods, explore local search algorithms and adversarial search techniques, and apply alpha-beta pruning in game search scenarios.	**2, 3, 4**
V	**Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.	**8**	Master propositional and first-order logic, implement inference mechanisms like forward and backward chaining and resolution, understand probabilistic reasoning including Hidden Markov Models and Bayesian Networks, and apply concepts of utility theory.	**3, 4, 5**

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, India
2. Russell, S., &Norvig, P. Artificial intelligence: a modern approach. Third Edition. Pearson new international edition. 2014

REFERENCE BOOKS:

1. Han, Manilla and Smyth, Principles of Data Mining, PHI, India
2. Tan, Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education Inc. Rich and K. Knight, Artificial Intelligence, Tata McGrawHill.
3. N. J. Nilsson, Principles of Artificial Intelligence, Narosa

4. D. W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain machine learning concepts, applications, challenges, and basic data descriptions	**1, 2, 3**
2	Apply and evaluate clustering techniques using various methods.	**2, 3, 4**
3	Differentiate prediction and classification, apply algorithms, and evaluate performance.	**2, 3, 6**
4	Implement and compare various search strategies and algorithms.	**2, 3, 7**
5	Use logic and probabilistic models for knowledge representation and reasoning.	**3, 4, 5**

SEMESTER – V									
Course Title	**PE I: BUSINESS INTELLIGENCE**								
Course code	**22BCAO318R**	**TOTAL CREDITS: 3 TOTAL HOURS: 40**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. To learn how managers utilise business analytics to create, address, and assist management decision-making for company challenges. 2. To become accustomed to the procedures required to create, present, and analyse business data. 3. Get knowledge on how to use Excel and its add-ons to solve business challenges								
CO1	Understand the basic concepts of Business Analytics, including the roles of Business Intelligence and the value proposition of integrating business with technology to enhance decision-making.								
CO2	Demonstrate the ability to organize and source data, address data quality issues, and classify data effectively to prepare for advanced visualization techniques.								
CO3	Create and interpret a variety of data visualizations (such as bar charts, pie charts, scatter plots, heat maps) and utilize these visualizations in dashboards and storyboards to convey meaningful analytics insights.								
CO4	Apply predictive analytics techniques such as linear and multi-linear regression and time series forecasting, alongside utilizing prescriptive analytics methods								
CO5	Synthesize knowledge gained from industry experts on emerging trends in business analytics and intelligence through practical demonstrations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Overview of Business Analytics**: Introduction to Analytics, The Challenge of Decision Making, What Is Business Intelligence, The Business Intelligence Value Proposition, The Combination of Business and Technology	**8**	Define and understand the fundamentals of business analytics, the decision-making challenges, the concept and value of business intelligence, and the synergistic relationship between business and technology.	1,2
II	**Introduction to Data Visualization:** Visualization/ Data Issues, Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data, Data Classification.	**8**	Master the principles of data visualization, including data organization, the significance of data quality, strategies for handling missing data, and data classification	2, 3

			techniques.	
III	**Descriptive Analytics**: Data Visualization and Analytics-Charts (Bars-Pie-Line-Scatter-Map-Bubble-Box & Whisker-Tree map - Heat Map-Circle and Area) -Worksheet, Dashboard and Story Board creation	**8**	Create and interpret diverse charts and visualizations such as bar, pie, line, scatter, map, bubble, box & whisker, tree map, heat map, and area charts, and develop comprehensive worksheets, dashboards, and storyboards.	3, 6
IV	**Predictive Analytics**: Linear Regression, Multi-linear Regression and Time Series Forecasting. **Prescriptive Analytics**: Linear optimization, Integer optimization, Non-linear programming, Optimization of Network models and Monte Carlo Simulation	**8**	Apply linear and multi-linear regression models and time series forecasting for predictive analytics, and utilize optimization techniques	3, 4
V	**Applications:** Practical demonstration using R or Python or SPSS by industry experts on Emerging trends in business analytics and intelligence	**8**	Demonstrate proficiency in using software tools like R, Python, or SPSS to implement advanced analytics techniques	3, 5, 6

TEXT BOOKS:

1. Sharda R, Delen D, Turban E, Aronson J, Liang T. P, (2014), Business Intelligence and Analytics: Systems for Decision Support, 10th edition, Pearson Education.
2. Powell S. G, Barker K. R, (2014), Management Science: The Art of Modeling With Spreadsheets, (W/Cd), 4th edition, John Wiley & Sons.

REFERENCE BOOKS:

1. Linoff G. S, Berry M. J, (2011), Data mining techniques: for marketing, sales, and customer relationship management, 3rd edition, John Wiley & Sons.
2. Frank B, Green B, Harris T, Van De Vanter K, (2010), Business Intelligence Strategy: A Practical Guide for Achieving BI Excellence, MC Press.
3. Hair, J. F, Black W. C, Babin B. J, Anderson R. E, Tatham R. L, (2009), Multivariate data analysis, 7th edition, Pearson education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic concepts of Business Analytics, including the roles of Business Intelligence and the value proposition of integrating business with technology to enhance decision-making.	**2, 3, 4**
2	Demonstrate the ability to organize and source data, address data quality issues, and classify data effectively to prepare for advanced visualization techniques.	**2, 3**
3	Create and interpret a variety of data visualizations (such as bar charts, pie charts, scatter plots, heat maps) and utilize these visualizations in dashboards and storyboards to convey meaningful analytics insights.	**2, 3, 6**
4	Apply predictive analytics techniques such as linear and multi-linear regression and time series forecasting, alongside utilizing prescriptive analytics methods	**2, 3, 7**
5	Synthesize knowledge gained from industry experts on emerging trends in business analytics and intelligence through practical demonstrations.	**2, 3, 7, 8**

SEMESTER – V									
Course Title	**PE II: DATA ANALYTICS USING PYTHON**								
Course code	**22BCAO317R**	**TOTAL CREDITS: 3 TOTAL HOURS: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. Equip students with essential skills in algebra and statistical analysis fundamental to data science. 2. Teach students to effectively manipulate data using Python libraries like NumPy and Pandas and create comprehensive visualizations. 3. Enable students to implement unsupervised learning methods and engage with the latest data science advancements through practical applications and case studies.								
CO1	Understand and apply concepts of functions, exponentials, logarithms, polynomials, alternate coordinate systems, and statistical distributions								
CO2	Demonstrate proficiency in using NumPy for various operations and broadcasting, and manipulate data frames in Pandas, including loading data in different formats								
CO3	Create and interpret various types of data visualizations such as histograms, box plots, bar plots, pie charts, and line charts								
CO4	Implement and evaluate unsupervised learning techniques in Python, including K-Means clustering, hierarchical clustering, and Principal Component Analysis (PCA)								
CO5	Analyze the latest improvements and applications in data science through case studies and exploratory data analysis (EDA) in interdisciplinary research areas.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** Intermediate Algebra& Linear Algebra: Functions, Exponentials and Logarithm's, Polynomial's, Alternate Coordinate systems, Binomial Distribution, Poisson distribution and Normal distribution its properties, Assumption of ANOVA, Measures of Central Tendency in Data.	**8**	Demonstrate understanding and application of intermediate algebra and linear algebra concepts	1,2
II	**Introduction about NumPy:** Different NumPy Operations, Broadcasting with NumPy, Introduction about Pandas, Reading or Loading data into Data frame, Pandas Data Frame Manipulations, Data Loading /Reading in different formats (CSV, Excel, Json, HTML)	**8**	Master the use of NumPy for performing array operations, broadcasting techniques, and Pandas for data manipulation, including reading, loading, and transforming data within data frames across various formats	2, 3

III	**Introduction to data Visualizations:** Principles Behind Data Visualizations, Histograms Visualize, Box Plots-Visualize, the Distribution of Continuous Numerical Variables (Bar Plots Pie Chart Line Chart). Data Visualization using R- Line Plots and Regression.	**8**	Develop the ability to create and interpret various data visualizations, including histograms, box plots, bar plots, pie charts, line charts, and utilize R for generating line plots and conducting regression analysis to effectively communicate data insights.	3, 4
IV	**Unsupervised Learning in Python:** K- Means Theory/ Implementation, Quantifying K-Means Clustering Performance, Hierarchical Clustering Theory, Principal Component Analysis (PCA) theory / Implementation. Selection criteria for number of clusters choosing.	**8**	Apply unsupervised learning techniques in Python, including K-Means clustering and hierarchical clustering, evaluate their performance, implement Principal Component Analysis (PCA), and determine the appropriate number of clusters based on selection criteria.	3, 4
V	The improvements and most recent developments in the course's topics as well as their most recent applications in the field Data Science. Case Study and EDA in the interdisciplinary research areas of Data Science.	**8**	Analyze recent advancements and applications in data science, applying knowledge through case studies and exploratory data analysis (EDA) in various interdisciplinary research areas to understand current trends and innovations.	4, 5

TEXT BOOKS:

1. Think Python, Allen B. Downy, O'reilly
2. Python for Everybody: Exploring Data Using Python 3 Book by Charles Severance

REFERENCE BOOKS:

1. Python Data Science Handbook, Jakes Vander Plas O' Reilly
2. Eric Matthes, Python Crash Course, A Hands – on Project Based Introduction to Programming, 2nd Edition, No Starch Press, 2019

OTHER LEARNING RESOURCES:

1. https://www.w3schools.com/python/python_intro.asp

2. https://www.tutorialspoint.com/python/index.htm

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand and apply concepts of functions, exponentials, logarithms, polynomials, alternate coordinate systems, and statistical distributions	**1, 2, 3**
2	Demonstrate proficiency in using NumPy for various operations and broadcasting, and manipulate data frames in Pandas, including loading data in different formats	**3, 6, 7**
3	Create and interpret various types of data visualizations such as histograms, box plots, bar plots, pie charts, and line charts	**3, 6, 8**
4	Implement and evaluate unsupervised learning techniques in Python, including K-Means clustering, hierarchical clustering, and Principal Component Analysis (PCA)	**2, 3, 7**
5	Analyze the latest improvements and applications in data science through case studies and exploratory data analysis (EDA) in interdisciplinary research areas.	**3, 7, 8**

SEMESTER – V									
Course Title	**PE II: KNOWLEDGE ENGINEERING**								
Course code	**22BCAO319R**	**TOTAL CREDITS: 3 TOTAL HOURS: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. Understand the basics of Knowledge Engineering. 2. Discuss the knowledge representation and reasoning methods. 3. Apply reasoning and uncertainty for intelligent systems								
CO1	Understand the basics of Knowledge Engineering								
CO2	Interpret the knowledge representation and reasoning methods.								
CO3	Apply reasoning and uncertainty for intelligent systems								
CO4	Design and develop ontologies								
CO5	Understand learning and rule learning								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Knowledge Engineering:** Introduction Data, Information and Knowledge Skills of Knowledge Engineer Knowledge based systems Types of Knowledge based systems Expert Systems Neural Networks Case Based Reasoning Genetic Algorithms Intelligent Systems Data Mining	**8**	Gain a foundational understanding of data, information, and knowledge distinctions; acquire skills essential for a knowledge engineer	1,2
II	**Knowledge Representation and Reasoning:** Knowledge Acquisition Knowledge Representation and Reasoning Using Knowledge Logic, Rules and Representation Developing Rule based Systems Semantic Networks Frames	**8**	Master the processes of knowledge acquisition and representation, develop skills in reasoning with knowledge using logic and rules, and effectively create rule-based systems, while understanding the applications of semantic networks and frames in artificial intelligence.	2, 3
III	**Reasoning under Uncertainty:** Introduction Abductive reasoning Probabilistic reasoning Enumerative Probabilities	**8**	Understand and apply various methods of reasoning under uncertainty; develop	3, 4

	Subjective Bayesian view Belief Functions Baconian Probability Fuzzy Probability Uncertainty methods Evidence-based reasoning Intelligent Agent Mixed Initiative Reasoning Knowledge Engineering.		competence in integrating these approaches within intelligent agents and mixed-initiative reasoning environments for effective knowledge engineering.	
IV	**Ontologies Design and Development:** Concepts and Instances Generalization Hierarchies Object Features Defining Features Representation Transitivity Inheritance Concepts as Feature Values Ontology Matching Design and Development Methodologies Steps in Ontology Development	**8**	Acquire skills to design and develop ontologies, understanding the structural elements such as concepts, instances, generalization hierarchies, and object features, and apply methodologies for ontology matching and development	3, 4
V	**Learning and Rule Learning:** Machine Learning Concepts Generalization and Specialization Rules Types of Generalization and Specialization Formal definition of Generalization. Modelling, Learning and Problem Solving	**8**	Master the foundational concepts of machine learning, focusing on generalization and specialization principles; understand formal definitions and different types of generalization, and apply these concepts in modelling, learning, and problem-solving contexts to develop effective rule-based learning systems	3, 4, 5

TEXT BOOKS:

1. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018
2. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016
3. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
4. John F. Sowa: Knowledge Representation Logical, Philosophical, and Computational Foundations, Brooks Cole, Thomson Learning, 2000

REFERENCE BOOKS:

1. King, Knowledge Management and Organizational Learning, Springer, 2009.
2. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition, 2001

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basics of Knowledge Engineering	**1, 3**
2	Interpret the knowledge representation and reasoning methods.	**2, 3, 5**
3	Apply reasoning and uncertainty for intelligent systems	**2, 3, 7**
4	Design and develop ontologies	**2, 3, 7**
5	Understand learning and rule learning	**1, 3, 6**

SEMESTER – V									
Course Title	**MOOCS IV (MEAN Stack Developer: MongoDB, ExpressJS, AngularJS & NodeJS)**								
Course code	**22MOSY311R**	**Total credits: 6**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 90	**0**	**0**	**4**	**12**	**6**	**0**	**6**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ V semester of the third year of the program**								
Course Objectives	1. To develop proficiency in MongoDB for efficient NoSQL data management. 2. To harness the power of ExpressJS to streamline server-side JavaScript development. 3. To master AngularJS for dynamic and responsive front-end application design. 4. To utilize NodeJS for creating high-performance server environments. 5. To achieve seamless integration across the MEAN stack, ensuring a cohesive and efficient development workflow.								
CO1	Understand the fundamentals of NoSQL databases.								
CO2	Gain in-depth knowledge of Express.js framework for building web applications.								
CO3	Build dynamic and interactive web applications using AngularJS.								
CO4	Grasp the concepts of event-driven programming and asynchronous I/O in Node.js.								
CO5	Learn to integrate MongoDB, Express.js, AngularJS, and Node.js components to build a complete MEAN stack application.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**MongoDB: The Complete Guide to NoSQL Database Development:** This comprehensive course ensures to develop a foundational understanding of MongoDB, covering its principles, architecture, and essential operations. Gain hands-on skills installing MongoDB, executing CRUD operations, and navigating its architecture. Progressing to advanced concepts, delve into schema design, indexing, and performance optimization, incorporating advanced querying techniques using Mongoose. The course further extends to integrating MongoDB with Mongoose, emphasizing document creation, RESTful API design, and validation practices. Finally, explore MongoDB's advanced	**9**	Understanding the basics of MEAN Stack. Applying the knowledge of MongoDB.	1, 3

	functionalities, mastering data distribution, fault tolerance, and performance strategies. Will possess a robust skill set for proficient MongoDB development and management by the course's conclusion.			
II	**ExpressJS Essentials: Building Modern Web APIs:** This comprehensive module provides a deep dive into Express.js, a robust web application framework for Node.js. Participants will master fundamental concepts, architecture, and the step-by-step process of setting up Express.js projects. Explore HTTP methods, route definition, and parameter extraction, gaining practical skills in setting up requests with Thunder Client and Postman tools. Delve into middleware's pivotal role, crafting custom functions and distinguishing built-in from custom middleware. Navigate error handling with proficiency in addressing synchronous errors and transmitting appropriate responses. The course extends to integrating MongoDB with Express.js, covering CRUD operations. Concluding with user authentication, participants acquire skills in generating and managing JWTs for secure authentication practices.	**6**	Understanding the working of APIs and ExpressJS. Applying different APIs and integrating MongoDB with ExpressJS.	1, 3, 5
III	**Angular Fundamentals: Building Responsive Web Apps with Ease:** This comprehensive module takes through AngularJS, delving into foundational principles, including architecture, data binding, and essential features. Deepen the understanding of AngularJS architecture, empowering to initiate critical application	**5**	Understanding the basics of responsive web apps with AngularJS. Creating responsive Web Apps with AngularJS.	1, 3, 5

	development. Exploring advanced concepts, interpret adept implementation of routing, navigation, and form controls, showcasing proficiency in data binding. The module guarantees a thorough comprehension of Angular services, user authentication, and the execution of role-based access control. Delving into advanced Angular concepts, construct modular components, implement effective state management, and ensure code reliability through testing and debugging practices. Additionally, the course emphasizes seamless Bootstrap integration into AngularJS and practical application in creating a MEAN stack project, showcasing expertise in web development and design.			
IV	**NodeJS Unleashed: Mastering Backend Development:** Embark on a comprehensive Node.js development journey with this module. Starting with the fundamentals, it will establish a solid foundation by mastering Node.js installation and utilizing Visual Studio Code. Later, lets delve into advanced topics, such as asynchronous programming, error handling, CRUD operations, and OS module usage for system information retrieval. The module progresses to web development essentials, covering HTTP request handling, JSON manipulation, and Express.js configuration. Authentication, authorization, and email communication with Node mailer are explored for secure applications. The module culminates in advanced Node.js features, including WebSocket	**6**	Understanding the backend development. Creating a backend with NodeJS.	1, 3, 5

	communication, real-time chat application construction using Socket.io, and scalability/performance optimization for responsive applications. It will emerge adept in foundational and advanced Node.js concepts.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the fundamentals of NoSQL databases.	**1, 2, 3, 5, 6, and 8**
2	Gain in-depth knowledge of Express.js framework for building web applications.	**2, 3, 5, 6, 7, and 8**
3	Build dynamic and interactive web applications using AngularJS.	**2, 3, 5, 6, 7, and 8**
4	Grasp the concepts of event-driven programming and asynchronous I/O in Node.js.	**1, 2, 3, 5, 6, 7, and 8**
5	Learn to integrate MongoDB, Express.js, AngularJS, and Node.js components to build a complete MEAN stack application.	**2, 3, 5, 6, 7, and 8**

MAPPING TABLE

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO311R	PROGRAMMING IN JAVA	2.5	2.5	2	1	1.67		2.67	1
22BCAO312R	CLOUD COMPUTING	1	2.2	3	2.2	1.4	1	1.6	2
22BCAO313R	PROJECT-I	1.33	2.2	2.67	1	2	2	2.33	2
22BCAO314R	TECHNO PROFESSIONAL SKILLS IV	1.5	3	2.8	1.75	2	2	2.33	2
22BCAO315R	INTERNSHIP	1.33	2	2	1	1	2.33	1.5	1.5
22BCAO316R	PE I (Fundamentals of AI /ML)	1.5	2.6	2.4	1.5	2	2	1.67	1.67
22BCAO317R	PE II (Data Analytics using Python)	1	3	2.8	1	1.2	3	3	2
22BCAO318R	Business	1	2.6	1.6	2	1.25	1	2	1.5

	Intelligence								
22BCAO319R	Knowledge Engineering	2	3	3	1	1.2	2	2	1.5
22MOSY311R	MEAN Stack Developer: MongoDB, ExpressJS, AngularJS & NodeJS	1	2	3		2	1	1	1

SEMESTER – VI									
Course Title	**COMPUTER VISION**								
Course code	**22BCAO321R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30L	**2**	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	Basic Programming Skills, Mathematics	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1. Introduce the fundamentals of computer vision and its applications. 2. Equip students with the skills to acquire, pre-process, and analyse image and video data. 3. Explore various techniques for image feature extraction, segmentation, and object recognition. 4. Understand the principles of motion analysis and tracking. 5. Gain practical experience through programming assignments and projects.								
CO1	Explain the essential concepts of computer vision, including its applications, challenges, and limitations, drawing comparisons with human vision.								
CO2	Classify the different image feature extraction techniques (edge detection, corner/blob detection, texture analysis, shape descriptors) to extract relevant information from images.								
CO3	Develop various image segmentation algorithms (thresholding, region-based, edge-based, morphological) to partition images into meaningful regions for further analysis.								
CO4	Justify supervised and unsupervised learning methods (k-NN, SVM, neural networks, K-means, PCA) for object recognition and classification tasks in images.								
CO5	Examine the diverse applications of computer vision in various domains like image retrieval, medical imaging, robotics, and security systems, highlighting its potential impact.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Computer Vision:** Definition, history, and applications of computer vision, the human visual system vs. computer vision Images in the Spatial Domain: Pixels and Windows	**6**	Describe and explain Computer vision and Spatial Domain of Images	**1, 2**
II	Image Formation: 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections, Photometric image formation, The digital camera, Sampling and aliasing, Compression.	**8**	Describe, Illustrate and Analyse the Image Formation and their different form	**1,2,4**
III	Image processing: Point operators, Linear filtering, Fourier	**8**	Explain and Applying Image processing like	**2, 3**

	transforms, Pyramids and wavelets, Parametric transformations, Mesh-based warping, Application: Feature-based morphing		Fourier transforms, Parametric transform etc	
IV	Feature detection and matching: Points and patches, Performance-driven animation, Edge detection, Edge linking, Vanishing points Image **Segmentation, Snakes** Image classification, Application: Visual similarity search	**8**	Describe and Applying Feature detection and matching in different images	**2, 3**
V	Applications of Computer Vision: Image and video retrieval: searching for specific images or videos in a database, medical imaging: diagnosis and analysis of medical images, Surveillance and security: object tracking and anomaly detection	**6**	Describe and Applying Various Computer Vision techniques like Searching, Medical images diagnosis, etc	**2, 3**
Practical 1	Image Loading and Display: Learn how to read and display images using OpenCV.	**4**	Illustrate and implement different imaging techniques and carry out practical experiments in the lab.	**1,2,3,4**
Practical 2	Image Grayscale Conversion: Understand the process of converting colour images to grayscale.	**4**	Understanding and implementing Image Grayscale Conversion in colour images.	**3,4,5,6**
Practical 3	Image Thresholding: Explore thresholding techniques for image binarization.	**4**	Understanding and implementing threshold technique for image binarization.	**3,4,5,6**
Practical 4	Image Smoothing and Blurring: Implement various filters for smoothing and blurring images.	**4**	Understanding and implementing Image Smoothing and Blurring using various filters.	**3,4,5,6**
Practical 5	Edge Detection: Detects edges in images using Canny edge detection and other methods.	**4**	Understanding and implementing Image edge detection using Canny and other methods.	**3,4,5,6**
Practical 6	Image Morphological Operations: Apply morphological operations like erosion and dilation for image processing.	**4**	Understanding and implementing Image Morphological Operations and dilation	**3,4,5,6**

			process.	
Practical 7	Image Geometric Transformations: Perform scaling, rotation, and other geometric transformations on images.	**4**	Understanding and implementing different transformations in images.	**3,4,5,6**
Practical 8	Contour Detection and Object Recognition: Find contours in images and use them for object recognition.	**4**	Understanding and implementing Contour Detection and Object Recognition.	**3,4,5,6**
Practical 9	Histogram Analysis and Equalization: Analyze image histograms and perform histogram equalization for image enhancement.	**4**	Understanding and implementing histogram equalization for image enhancement	**3,4,5,6**
Practical 10	Template Matching: Find occurrences of a template image within a larger image.	**4**	Understanding and implementing a template image within a larger image.	**3,4,5,6**
Practical 11	Feature Detection and Keypoints: Detect keypoints like corners and Harris corners in images.	**4**	Understanding and implementing Feature Detection and Keypoints.	**3,4,5,6**
Practical 12	Feature Matching and Homography: Match features between images and estimate homography for image registration.	**4**	Understanding and implementing Feature Matching and Homography.	**3,4,5,6**
Practical 13	Image Pixel Manipulation and Display with OpenCV.	**4**	Understanding and implementing Pixel Manipulation and Display.	**3,4,5,6**
Practical 14	Python program to draw various shapes.	**4**	Understanding and implementing various shape.	**3,4,5,6**
Practical 15	Python program to draw a simple bullseye with the cv2.circle function	**4**	Understanding and implementing bullseye with the cv2.circle function	**3,4,5,6**
Practical 16	Program to perform various transformations in an image.	**4**	Understanding and implementing transformations in an image.	**3,4,5,6**
Practical 17	Python program that finds and draws contours of objects in an image.	**4**	Understanding and implementing Contour Detection and Object.	**3,4,5,6**
Practical 18	Detecting Blue Objects.	**4**	Understand the implementation of the Blue Objects detection.	**3,4,5,6**

Practical 19	Program for detecting faces.	**4**	Understand and implement of face detection	**3,4,5,6**
Practical 20	Program for Face and Smile Detection.	**4**	Understand and implement face and smile detection using different technique	**3,4,5,6**
Practical 21	Image segmentation based on color	**4**	Understand and implement color based image segmentation using different algorithm	**3,4,5,6**
Practical 22	Image Color Conversion: Convert the color space of the image (e.g., RGB to grayscale, HSV, LAB, etc.) and analyze the channels separately.	**4**	Understand and implementation different color space image dataset	**3,4,5,6**

TEXT BOOKS:

1. Szeliski, Richard. Computer Vision: Algorithms and Applications. Springer Nature, 2022.
2. Davies, E. Roy. Computer and Machine Vision: Theory, Algorithms, Practicalities. Academic Press, 2012.
3. Gonzalez, Rafael C. Digital Image Processing. Pearson Education India, 2009.

REFERENCE BOOKS:

1. Forsyth, David A., and Jean Ponce. Computer Vision: A Modern Approach. Prentice Hall Professional Technical Reference, 2002.
2. Brownlee, Jason. Data Preparation for Machine Learning: Data Cleaning, Feature Selection, And Data Transforms In Python. Machine Learning Mastery, 2020.

ADDITIONAL RESOURCES:

- OpenCV Tutorials and Documentation: https://opencv.org/
- Python libraries for computer vision: Scikit-image, TensorFlow, PyTorch
- https://nptel.ac.in/courses/117105079
- https://nptel.ac.in/courses/106105216/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the essential concepts of computer vision, including its applications, challenges, and limitations, drawing comparisons with human vision.	**1, 2, 7 and 8**
2	Classify the different image feature extraction techniques (edge detection, corner/blob detection, texture analysis,	**1, 2, 7 and 8**

	shape descriptors) to extract relevant information from images.	
3	Develop various image segmentation algorithms (thresholding, region-based, edge-based, morphological) to partition images into meaningful regions for further analysis.	**1, 2, 7 and 8**
4	Justify supervised and unsupervised learning methods (k-NN, SVM, neural networks, K-means, PCA) for object recognition and classification tasks in images.	**1, 2, 7 and 8**
5	Examine the diverse applications of computer vision in various domains like image retrieval, medical imaging, robotics, and security systems, highlighting its potential impact.	**1, 2, 7 and 8**

SEMESTER – VI									
Course Title	**Applied AI/ML**								
Course code	**22BCAO323R**	**Total credits: 3** **Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Basics of AI**	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1.To introduce the applications of Artificial Intelligence (AI) in various domains. 2.To learn how to apply AI to solve practical problems. 3.To understand the real-world application								
CO1	Outline the basic concepts of machine learning and Artificial intelligence.								
CO2	Analyse various AI and ML techniques in expert systems and other machine learning models.								
CO3	Illustration and application of supervised learning in different domains.								
CO4	Application of un-supervised learning in expert systems.								
CO5	Implementation of advanced concepts of AI and ML in emerging field like Medical and Agricultural sciences.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**AI in healthcare:** Role of AI in enhancing clinical decision-making process, classifying and segmenting 2D and 3D medical images to augment diagnosis, build predictive models using different Algorithms: Supervised and unsupervised, Naïve Bayes, Decision Tree, Logistic Regression, SVM, KNN etc. Medical data: imaging such as X-ray, CT, MRI, Mammography, Pathology. Build different AI models for different clinical scenarios that involve 2D/3D images.	**10**	Explain AI in healthcare. Understanding and Applying different ML in Healthcare datasets**.**	**1, 2, 3**
II	AI in Agriculture: Introduction of Smart farming, Definition of Smart and Precision farming, AI in Smart/Precision farming, Predictive Analytics in farming, Autonomous Farming using IoT and ML. Example: Yield Prediction, Disease Detection, Weed Detection, Crop Quality, Species Recognition, Animal Welfare, Livestock Production, Water	**10**	Describing AI is useful in Agriculture. Understand different Analysis in Agriculture and Applying in real world scenario	**1, 2, 3**

	Management, Soil Management			
III	AI for Language Processing Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is Difficult. Parts of Speech. Components of NLP: Natural Language Understanding (NLU), Natural Language Generation (NLG). Difficulties in NLU, NLP Terminology, Steps in NLP. Implementation Aspects of Syntactic Analysis: Context-Free Grammar, Top-Down Parser.	**8**	Understanding NLP and Applying in day-to-day life. Analysis with different real-world examples.	**2, 3, 4**
IV	AI for Image Processing Digital Image Formation: point spread functions -sampling and quantization. Spatial Transforms: convolution concept - low and high pass filtering. Image corrections: Atmospheric Correction, Image enhancement and filtering, Image classification (Unsupervised, Supervised) and Accuracy assessment. Remote Sensing Concepts: spatial and radiometric characteristics – spectral and temporal characteristics. Data reception, Data processing & Data generation: Ground station, Data generation, Data processing & correction. Radiometric and Geometric corrections: Radiometric corrections Random noise correction, Atmospheric correction, Geometric errors and corrections.	**10**	Explain different images Processing techniques. Understanding with examples and applying with different images.	**1, 2, 3**

TEXT BOOKS:

1. Handbook of Artificial Intelligence in Healthcare Vol 2: Practicalities and Prospects CP Lim Vol 2, Springer
2. Artificial Intelligence in Agriculture Rajesh Singh, Anita Gehlot, Mahesh Kumar Prajapat, Bhupendra Singh 1st Edition
3. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Daniel Jurafsky and James H.Marti Prentice Hall Series in Artificial Intelligence, 2020
4. Digital Image Processing R. C. Gonzalez and R. E. Woods Pearson, India, third

edition, 2017.

5. Remote sensing and Image interpretation Lillesand and Keifer John Wiley and Sons, 2000

REFERENCE BOOKS:

1. Natural Language Processing: A Quick Introduction to NLP with Python and NLTK Samuel Burns 2019
2. Introductory digital image processing - A Remote Sensing perspective John R. Jenson Prentice Hall, 1986

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Outline the basic concepts of machine learning and Artificial intelligence.	**1, 2, 3 and 8**
2	Analyse various AI and ML techniques in expert systems and other machine learning models.	**1, 2 and 3**
3	Illustration and application of supervised learning in different domains.	**1, 2, 3 and 8**
4	Application of un-supervised learning in expert systems.	**1, 2, 3 and 8**
5	Implementation of advanced concepts of AI and ML in emerging field like Medical and Agricultural sciences.	**1, 2, 3 and 8**

SEMESTER – VI									
Course Title	**Recommender System**								
Course code	**22BCAO326R**	**Total credits: 3** **Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Fundamental of AI/ML**	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1. To understand the foundations of the recommender system. 2. To learn about content-based and collaborative filtering 3. To learn the significance of machine learning and data mining algorithms for Recommender systems								
CO1	Understand the basic concepts of recommender systems								
CO2	Gain proficiency in Content-Based Recommendation Systems								
CO3	Learn about Collaborative Filtering Techniques								
CO4	Understand security concerns in recommender systems and gain the ability to design attack-resistant recommender systems								
CO5	Learn about evaluating paradigms of recommender systems								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction** Introduction and basic taxonomy of recommender systems, Traditional and non-personalized Recommender Systems, Overview of data mining methods for recommender systems, similarity measures, Dimensionality reduction Singular Value Decomposition (SVD)	**9**	Explain and understand the different data mining methods. Applying SVD in different datasets.	**1, 2, 3**
II	**Content-Based Recommendation Systems** High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.	**9**	Understanding different Content Based Architecture and Apply different retrieval and Classification algorithms.	**2, 3**
III	**Collaborative Filtering** A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection.	**9**	Understanding Collaborative Filtering and Applying in different ways.	**2, 3**

IV	**Attack-Resistant Recommender Systems** Types of Attacks, Detecting attacks on recommender systems Individual attack and Group Attack Strategies for robust recommender design, Robust recommendation algorithms.	**9**	Understanding different attract Resistant system and applying different recommendation Algorithms.	**2, 3**
V	**Evaluating Recommender Systems** Evaluating Paradigms, Online and Offline Evaluation Goals of evaluation design, Design Issues, Accuracy metrics, Limitations of Evaluation measures	**9**	Understanding and Applying Evaluation Recommender Systems and Analyses it with different metrics.	**2, 3, 4**

TEXT BOOKS:

1. Recommender Systems: The Textbook Charu C. Aggarwal Springer, 2016.
2. Recommended Systems: An Introduction Dietmar Jannach, Markus Zanker, Alexander Fleering and Gerhard Friedrich Cambridge University Press (2011), 1st ed.

REFERENCE BOOKS:

1. Recommender Systems Handbook Francesco Ricci, Lior Roach, Bracha Shapira 1st ed, Springer (2011)
2. Mining of massive datasets Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman Cambridge University Press, 2020

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic concepts of recommender systems	**1,2,3,7, and 8**
2	Gain proficiency in Content-Based Recommendation Systems	**1,2,3,7, and 8**
3	Learn about Collaborative Filtering Techniques	**1,2,3,7, and 8**
4	Understand security concerns in recommender systems and gain the ability to design attack-resistant recommender systems	**1,2,3,7, and 8**
5	Learn about evaluating paradigms of recommender systems	**1,2,3,7, and 8**

SEMESTER – VI									
Course Title	**Exploratory Data Analysis**								
Course code	**22BCAO324R**	**Total credits: 3** **Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Probability and Statistics**	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1.To gain insights and understanding from a dataset through visual and quantitative methods. 2.To identify patterns, relationships, and anomalies in the data, this can inform further analysis or decision-making. 3.To extract meaningful information from data and communicate it effectively to stakeholders.								
CO1	Demonstrate the importance of exploratory data analysis in data analysis and decision-making.								
CO2	Develop skills in data visualization using various tools and techniques.								
CO3	Learn how to effectively communicate insights and findings from data analysis.								
CO4	Apply EDA techniques to real-world data analysis problems.								
CO5	Enhance critical thinking skills to identify patterns, trends, and outliers in data.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Exploratory Data Analysis** EDA Introduction, what is EDA? EDA vs Classical & Bayesian, EDA vs Summary, EDA Goals, The Role of Graphics, An EDA/Graphics Example, General Problem Categories.	**6**	Explain EDA and understand and Apply EDA in different datasets with Examples.	**1, 2, 3**
II	**Underlying Assumptions** Importance, Techniques for Testing Assumptions, Interpretation of 4-Plot, Consequences.	**6**	Understand and Applying Different Testing Assumptions and Analysis with Graph.	**2, 3, 4**
III	**EDA Techniques** Introduction, Analysis Questions, Graphical Techniques: Alphabetical, Graphical Techniques: By Problem Category, Quantitative Techniques, Probability Distributions.	**8**	Understanding and applying different datasets and analyses with Graph Quantitatively.	**2, 3, 4**
IV	**EDA Case Studies** Case Studies Introduction, Case Studies: Normal random numbers, Uniform random numbers,	**10**	Understanding different case study and applying with suitable example. Analyze with graphs	**2, 3, 4**

	Random Walk, Josephson Junction Cryo thermometry, Beam Deflections, Filter Transmittance, Standard Resistor, Heat Flow Meter 1, Airplane Glass Failure Time, Ceramic Strength.			
V	**Data Visualization** Design principles for charts and graphs, ggplot2 and Tableau tools for creating data visualizations, the process creating visualizations and selecting the appropriate visual display, designing effective digital presentations, Visualization as exploration, visualizing categorical data, Visualizing time series data, Visualizing multiple variables, Visualizing geospatial data, Dashboard design, Web-based visualizations, Interactive visualizations and motion.	**6**	Understanding the different charts, graphs and their interpretations. And Analyses with different datasets.	**2, 3, 4**

TEXT BOOKS:

1. Exploratory Data Analysis John Tukey Pearson;1st edition

REFERENCE BOOKS:

1. Engineering Statistics Handbook http://www.itl.nist.gov/div898/handbook/nist.gov
2. Hands-On Exploratory Data Analysis with Python: Perform EDA techniques to understand, summarize and investigate your data PaperbackSuresh Kumar Mukhiya, Usman Ahmed Packet Publishing Limited

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate the importance of exploratory data analysis in data analysis and decision-making.	**1, 2 and 3**
2	Develop skills in data visualization using various tools and techniques.	**1, 2, 3, 5 and 8**
3	Learn how to effectively communicate insights and findings from data analysis.	**1, 2, and 3**
4	Apply EDA techniques to real-world data analysis problems.	**1, 2, 3, 5 and 7**
5	Enhance critical thinking skills to identify patterns, trends, and outliers in data.	**1, 2, 3, 5, 7 and 8**

Course Title	Pattern Recognition								
Course code	22BCAO327R	Total credits: 3	L	T	P	S	R	O/F	C
		Total hours: 45L	3	0	0	0	0	0	3
Pre-requisite	Fundamentals of probability, linear algebra and Digital Image Processing	Co-requisite	NIL						
Programme	Bachelor of Computer Application (BCA)								
Semester	Fall/ II semester of the third year of the program								
Course Objectives	1.Pattern recognition which has several important applications on classical computer engineering problems like word/sentence-based searches, etc. 2.The emphasis of the course is on algorithms for pattern recognition 3.The representation of patterns and classes and the proximity measures are an important aspect of pattern recognition								
CO1	Summarize the various techniques involved in pattern recognition.								
CO2	Categorize the various pattern recognition techniques into supervised and unsupervised								
CO3	Understand feature selection and extraction techniques.								
CO4	Illustrate the artificial neural network-based pattern recognition								
CO5	Discuss the applications of pattern recognition in various real-world applications								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction and Mathematical Preliminaries**: Pattern Recognition: Definition, Applications and Examples, Clustering Vs Classification, Supervised Vs Unsupervised, Basic of Linear Algebra, Vector Spaces, Basics of Probability, Basics of Estimation Theory, Decision Boundaries, Decision Regions, Metric Spaces	9	Explain Pattern Recognition, Understanding different Clustering Techniques and their theory. Applying in real world scenario.	1, 2, 4
II	**Classification:** Bayes Decision Rules, Error Probability, Examples, Normal Distribution, Linear Discriminant Function, Non-Linear Decision Boundaries, Mahalanobis Distance, K-NN Classifier, Single and Multi-Layer Perceptron, Training Set, Test Set, Standardization and Normatization	9	Explaining different Classification techniques and understanding their interpretation by applying in different datasets.	1, 2, 4
III	**Clustering:** Basics, Similarity/Dissimilarity Measures, Clustering Criteria, Different distance functions and similarity measures, within cluster distance criterion, K-means algorithm, Single linkage and complete linkage algorithms, MST, K-	9	Explaining different Clustering techniques and understanding their interpretation by applying in different datasets.	1, 2, 4

	medoids, DBSCAN, Data sets: Visualization, Unique Clustering			
IV	**Feature Selection and Extraction**: Problem statement and Uses, Branch and Bound Algorithm, Sequential Forward / Backward Selection Algorithms, (l,r) algorithm, Probabilistic separability based criterion functions, interclass distance based criterion functions, Feature Extraction, PCA + Kernel PCA	**8**	Explaining different Feature Selection and Extraction technique and understanding their role in enhancing models.	**1, 2, 3, 4**
V	**Recent Advances in Pattern Recognition**: Structural PR, SVMs, FCM, Soft-Computing and Neuro-Fuzzy Techniques, Real-Life Examples	**8**	Understanding Recent Advance Pattern Recognition Technique with Real life Examples	**1, 2, 3, 4**

TEXT BOOKS:

1. J.I. Tou & R.C. Gonzalez, Pattern Recognition Principles, Addition-Wesley.
2. MR. Schalkoff, Pattern Recognition - Statistical, Structural and Neural Approaches, John Wiley, 1992.

REFERENCE BOOKS:

1. P.A. Devijer & J. Kittler, Pattern Recognition - A Statistical Approach, Prentice-Hall.
2. Christopher. M. Bishop, 'Pattern recognition and machine learning, Springer, 2006.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Summarize the various techniques involved in pattern recognition.	**1,2,3,7, and 8**
2	Categorize the various pattern recognition techniques into supervised and unsupervised	**1,2,3,7, and 8**
3	Understand feature selection and extraction techniques.	**1,2,3,7, and 8**
4	Illustrate the artificial neural network-based pattern recognition	**1,2,3,7, and 8**
5	Discuss the applications of pattern recognition in various real-world applications	**1,2,3,5,7, and 8**

SEMESTER – VI									
Course Title	**Applied Analytics in NLP**								
Course code	**22BCAO325R**	**Total credits: 3** **Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**NIL**	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1. To familiarize the concepts and techniques of Natural Language Processing for analysing words based on Morphology and CORPUS. 2. To introduce the fundamentals of language processing from the algorithmic point of view. 3. To apply the Statistical learning methods and cutting-edge research models from deep learning.								
CO1	Realize the principles and Processes of Human Languages such as English and other Indian Languages using computers.								
CO2	Describe the concepts of morphology, syntax, semantics, discourse, and pragmatics of natural language.								
CO3	Perform POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language.								
CO4	Demonstrate advanced algorithms and techniques for text-based processing with respect to morphology.								
CO5	Develop Statistical Methods for Real World Applications and explore deep learning-based NLP								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction to Natural Language Processing, Ambiguities in language, Regular expression, Words, Morphology, Morphology parsing, Word tokenization, Lemmatization & stemming, Edit distance. Morphological analysis and generation using Finite State Automata and Finite State transducer.	**8**	Describing NLP and understanding the different NLP Processing techniques. Applying with examples.	**1, 2, 3**
II	Introduction, English word classes, Rule-based part of speech tagging, Transformation based part of speech tagging, Evaluation and error analysis, Issues Tag indeterminacy and tokenization. Applications of Tagging	**8**	Understanding different word rules, tags etc. Applying and analyzing different evaluation techniques.	**2, 3, 4**
III	Parsing Basic concepts: Statistical Parsing basics: Probabilistic Context Free Grammar; Probabilistic CKY Parsing of PCFGs. Problems with PCFGs. Real life example and related case study.	**8**	Applying and analysing different Grammar or Parsing Techniques with real world examples.	**3, 4**
IV	Lexical Semantics, Cosine for measuring	**8**	Applying and Analysis	**3, 4**

	similarity, TF-IDF N-Gram Models, Language Model Adaptation, Types of Language Models, and Language-Specific Modelling Problems. Lexicalized models using derivational histories and dependency-based models. Real-life example and related case study.		Lexical Semantics different modelling techniques form case study.	
V	Introduction and Application to WordNet. Recent trends in NLP. Question Answering Systems, Social Network analysis.	**8**	Applying different applications and analyses by using different datasets.	**3, 4**

TEXT BOOKS:

1. Jurafsky Daniel and Martin James H. "Speech and Language Processing" ,3rd Edition, Pearson publications, 2018.
2. Christopher D. Manning and Hinrich Schutze, "Foundations of Natural Language Processing", 6th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003.

REFERENCE BOOKS:

1. Jurafsky Daniel and Martin J. H., "Speech and language processing Natural Language Processing, Computational Linguistics,2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Jalaj Thanaki, Python Natural Language Processing: Explore NLP with Machine Learning and deep Learning Techniques, Packt, 2017.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Realize the principles and Processes of Human Languages such as English and other Indian Languages using computers.	**1,2,3,7 and 8**
2	Describe the concepts of morphology, syntax, semantics, discourse, and pragmatics of natural language.	**1,2,3,7 and 8**
3	Perform POS tagging for a given natural language and select a suitable language modelling technique based on the structure of the language.	**1,2,3,7 and 8**
4	Demonstrate advanced algorithms and techniques for text-based processing with respect to morphology.	**1,2,3,7 and 8**
5	Develop Statistical Methods for Real World Applications and explore deep learning-based NLP	**1,2,3,7 and 8**

SEMESTER – VI									
Course Title	**Deep Learning**								
Course code	**22BCAO328R**	**Total credits: 3 Total hours: 45L**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Machine Learning**	**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1.Introduce major deep learning algorithms. 2.Differentiate between Traditional ML and Deep Learning 3.The problem settings, and their applications to solve real-world problems								
CO1	Understand the basics of artificial neural networks and deep learning.								
CO2	Mathematical intuition of Deep learning networks, and their application.								
CO3	Different Deep Learning Tools in academic research.								
CO4	Identify the deep learning algorithms and tools for real-world applications which are more appropriate for various types of learning tasks in various domains.								
CO5	Analyze deep learning algorithms to solve real-world problems.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction: Various paradigms of learning problems, Perspectives, and Issues in deep learning framework, review of fundamental learning techniques. Feed-forward neural network: Artificial Neural Network, activation function, multi-layer neural network.	10	Explain and understand the fundamentals of Deep learning techniques. Applying with example.	**1, 2, 4**
II	Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization. Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	10	Explain Neural Networks and understand the architecture and their applications.	**1, 2, 3**
III	Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts,	8	Understanding and Analysing the Feedforward and Dropout in CNN	**2, 4**

	Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.			
IV	Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Autoencoders.	10	Understanding and Application of Probabilistic Neural Network with example.	**2, 3**
V	Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing. Deep Learning Tools: Caffe, Theano, Torch.	8	Understanding Deep Learning in Computer Vision, NLP etc. Write the code in different Application Tools.	**2, 3**

TEXT BOOKS:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.

REFERENCE BOOKS:

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basics of artificial neural networks and deep learning.	**1,2,3, and 8**
2	Mathematical intuition of Deep learning networks, and their application.	**1,2,3, and 8**
3	Different Deep Learning Tools in academic research.	**1,3, and 8**
4	Identify the deep learning algorithms and tools for real-world applications which are more appropriate for various types of learning tasks in various domains.	**1,2,3,7, and 8**
5	Analyze deep learning algorithms to solve real-world problems.	**1,2,3,7, and 8**

SEMESTER – VI									
Course Title	**Project II**								
Course code	**22BCAO322R**	**Total credits:**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pre-requisite		**Co-requisite**	NIL						
Programme	**Bachelor of Computer Application (BCA)**								
Semester	**Fall/ II semester of the third year of the program**								
Course Objectives	1.To develop the practical skill 2.To enhance Critical Thinking and Problem-Solving Abilities 3.To Improve Communication and Collaboration Skills								
CO1	Demonstrate a sound technical knowledge of the selected project topic.								
CO2	Illustrate problem identification, formulation, and solution.								
CO3	Plan solutions to complex problems utilizing a systems approach.								
CO4	Design the prototype of the solution and analyze the prototype using testing methods.								
CO5	Improve ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Project Introduction and Planning** Overview of project goals and objectives. Importance of project planning and management. Project Proposal Development: Identifying a project topic or problem Conducting preliminary research Writing a project proposal Setting timelines and milestones Resource allocation (materials, tools, etc.) Risk assessment and management strategies	**6**	Describe, illustrate and explain technical knowledge of the selected project topic.	**2,3**
II	Literature Review and Research Methodology Identifying and reviewing relevant literature Summarizing and synthesizing existing research Highlighting gaps and formulating research questions Choosing appropriate research methods (qualitative, quantitative, or mixed methods) Designing research instruments (surveys, interviews, experiments, etc.) Ethical considerations in research	**8**	Describe, illustrate and explain problem identification, formulation, and solution.	**2,3,4**
III	Data Collection and Analysis Gathering primary data (surveys,	**8**	Describe, illustrate and explain data	**2,3,4**

	experiments, interviews, observations) Ensuring data accuracy and reliability Storing and organizing data Using statistical tools and software for data analysis Interpreting data and drawing conclusions Visualizing data (charts, graphs, tables)		collection and analysis	
IV	Project Implementation and Monitoring Project Execution: Implementing the project plan Monitoring progress and making adjustments as needed Documentation and Record Keeping: Keeping detailed records of project activities and outcomes Troubleshooting and problem-solving during implementation Interim Reporting: Preparing and presenting progress reports Receiving and incorporating feedback	**8**	Describe, illustrate and explain project implementation and execution	**6**
V	Project Presentation and Evaluation Final Reporting: Writing the final project report (structure, content, formatting) Ensuring clarity, coherence, and completeness Project Presentation: Preparing visual aids (slides, posters, etc.) Practicing presentation skills (public speaking, answering questions) Evaluation and Reflection: Assessing project outcomes against objectives Reflecting on the project process and personal learning Identifying areas for future improvement and potential follow-up projects	**6**	Describe, illustrate and explain testing and documentation	**2,3,5**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate a sound technical knowledge of selected project topics.	**1, 2 and 4**
2	Illustrate problem identification, formulation and solution.	**1, and 2**
3	Plan solutions to complex problems utilizing a systems approach.	**1, 2, 3, 5 and 7**
4	Design the prototype of the solution and analyze the prototype using testing methods.	**1, 2, 3, 5, 6, 7, and 8**

5	Improve ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society.	**1, 2, 3, 6 and 8**

MAPPING TABLE:

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
22BCAO321R	COMPUTER VISION	**1**	**1.4**					**1.2**	**2**
22BCAO322R	PROJECT I	**1.4**	**2**	**2.33**	**1**	**2**	**2.5**	**2**	**2.5**
22BCAO323R	PE III (Applied AI/ML)	**3**	**3**	**1.8**					**1.25**
22BCAO324R	PE IV (Exploratory Data Analysis)	**2**	**2.6**	**2.4**		**2**		**1**	**1.5**
22BCAO325R	PE V (Applied Analytics in NLP)	**1.6**	**1.6**	**2.6**				**0.6**	**1.2**
22BCAO326R	Recommender System	**1.2**	**2**	**2.4**				**0.8**	**1**
22BCAO327R	Pattern Recognition	**1.4**	**2**	**2.6**	**2**	**1**		**1.2**	**1.2**
22BCAO328R	Deep Learning	**1.8**	**1.75**	**2.2**				**1**	**1**

Assam down town University

Curriculum and Syllabus

Bachelor of Technology
in
Mechanical Engineering

OUTCOME BASED EDUCATION FRAMEWORK
CHOICE BASED CREDIT SYSTEM
Version: 2.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, Dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators.

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

Programme Overview (not more than 100 words)

As part of our industry-focused curricula, we, at Assam down town University, with an open collaborative learning ambience offer our students a platform to launch their careers in the right sector. Evolved as one of the best mechanical engineering colleges, we intend to train the skilled workforce to match industry expectations.

I. Specific Features of the Curriculum (To be derived from PSOs. **Not more than 100 words**)

The curriculum provides skill enhancement and value-added courses along with the core papers.

II. Eligibility Criteria: (To be aligned with the admission office)

Minimum 45% in 10+2 with Mathematics, Physics & Chemistry. 5% relaxation for SC/ST, EWS, and Especially abled candidates.

III. Program Educational Objectives (PEOs):

PEO-1: AdtU Mechanical engineering graduates will demonstrate proficiency in core mechanical engineering principles, methodologies, gain knowledge to think, analyze, and solve practical problems in the Mechanical Engineering domain with a holistic approach toward the greater implications of their solutions to society while adhering to ethical standards and professional responsibilities.

PEO-2: AdtU Mechanical Engineering graduates will develop the ability to critically evaluate complex engineering challenges, develop technical and management skills to take on substantial responsibility for engineering projects and research initiatives by inculcating ethical and human values among the students for the betterment of society.

PEO-3: AdtU Mechanical Engineering graduates will exhibit leadership qualities, including effective teamwork, project management, multidisciplinary approach and co-relate engineering challenges to a larger social and human background, in which their engineering assistance will be employed.

IV. Program Specific Outcomes (PSOs):

PSO1: Research and Reasoning: Enables the graduates to manage all kinds of

Mechanical engineering projects requiring analysis, design, cost estimation and execution and also they will be able to comprehend the implications of the project outcomes and roles and responsibilities as Mechanical engineers in global, economic, and societal contexts.

PSO2: Techno-Professional Efficiency: Develop proficiency in modern and emerging subjects of Mechanical Engineering and use them as stepping stones for building their future careers in academics, cooperate, and developmental sectors.

PSO3: Global Competency: Understanding the concepts of Mechanical engineering the graduates will be endowed with soft skills to give them an edge in qualifying for National and International level competitive examinations to excel in their careers through the experiential learning process.

V. Program Outcome: (8-12)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VI. Total Credits to be Earned: 178

VII. Career Prospects:

Graduates with B. Tech in Mechanical Engineering have excellent career prospects in research & development, industry, academics and sustainable development. The prospective sectors viz. automobile, oil, aviation, manufacturing, processing industries, Govt. sectors, teaching, IT industries, Entrepreneurship development, etc. welcome graduate in B. Tech mechanical Engineering.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

1. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination)*	30
2.	In-Sem Exam – II (ISE-II) (Written Examination)*	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in the any of the component without any valid reason he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absent.

2. The report of evaluation of an activity towards the in-semester (sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

2. SEMESTER END EXAMINATION:

Time table for end semester examination is published at least 25 days prior to the start of Examination.

1. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

2. Admit Card:

Admit card for the examination may be downloaded through ERP where the system will generate a Unique ID Cards through online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

3. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.

3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyze	Classify, outline, categorize, analyze, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on basis of **all 6 knowledge levels.**

The format of the question paper across all the program follow a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl. No.	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

4. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

5. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

6. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the center may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the

exam with new answer sheet or may expel the student from appearing the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribe expulsion form. The student may not be allowed to write that examination.

7. Instruction to the Students:

(i) The students shall not bring to the Examination Hall, any electronic gadget used as a means of communication or record except electronic calculator, if required.

(ii) The students shall not receive any book or printed or hand written or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

8. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down

by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

3. Credit Point:

It is the product of grade point and number of credits for a course, thus, CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades 'O' to 'P' shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in TaBLe 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using

Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrollment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrollment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the i^{th} completed Course and C_i is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

4. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a University appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or viva voce and wish to appear again may apply to be evaluated can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. Student- centric / Constructivist Approach:

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centric classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programme the student has to undergo project-based learning at least 4 months' duration. This approach will help the student to think critically, evaluate, analyze, make decisions, collaborate, and more.

b. Inquiry-Based Learning: The teacher/ students are supposed to list at least five questions in each contact hour and student solve these question or search for answer which becomes the home work for the students "question-driven" learning

approach. The teacher may look for the correctness of the solution or the best possible answer and discuss in the successive class. This will help in the preparation for various competitive examination and develop a habit for search for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watch video or lecture prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are more passive to an approach where students are active participants. As a result, this approach is also a student-centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

The teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework

Breakdown of Credits (for 2022-23 Syllabus)

Sl. No	Category	Total number of Credits
1	University Core(UC)	17
2	University Elective (UE)	16
3	Program Core(PC)	57
4	Program Elective (PE)	52
5	Faculty Elective (FE)	36
Total number of credit		**178**

Breakdown of Credits according to NEP 2020
Credits (for 2023-24 Syllabus)

Sl. No	Category	Total number of Credits
1	University Core(UC)	5
2	University Elective (UE)	7.5
3	Program Core(PC)	65
4	Program Elective (PE)	68
5	Skill Enhancement Course(SEC)	18.5
6	Value Added Course (VAC)	25
7	Multidisciplinary Course(MDC)	1
Total		**190**

Breakdown by categories of courses

Sl. no	Category	Credits	%
1	Engineering	117	65.73
2	Science	23	12.92
3	Value added course	20	11.23
4	Humanities	18	10.11
Total		**178**	**100**

PCI, INC, AICTE regulated programs shall have to follow the regulating body

SEMESTER WISE COURSE DISTRIBUTION

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester I	1	22BTME111R	Engineering Mathematics I	FE	3	1	0	0	0	0	4	40	60	0	100
	2	22BTME112R	Introduction to Basic Mathematics, Logic and Coding	FE	2	1	2	0	0	0	4	40	60	100	200
	3	22BTME113R	Engineering physics	FE	2	1	2	0	0	0	4	40	60	100	200
	4	22BTME114R	Basic Electrical Engineering	PE	2	1	2	0	0	0	4	40	60	100	200
	5	22BTME115R	Workshop/Manufacturing Practices	PC	1	0	4	0	0	0	3	40	60	100	200
	6	22UBPD114R	Introductory English for Engineers	UE	0	0	4	0	0	0	2			100	100
	7	22UBEC111	Extra-curricular	UC	0	0	0	4	0	0	1			100	100
	Total				10	4	14	4	0	0	22	200	300	600	1100

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester II	1	22BTME121R	Engineering Mathematics II	FE	3	1	0	0	0	0	4	40	60	0	100
	2	22BTME122R	Engineering Chemistry	FE	2	1	2	0	0	0	4	40	60	100	200
	3	22BTME123R	Programming for Problem Solving	FE	3	0	2	0	0	0	4	40	60	100	200
	4	22BTME124R	Engineering Graphics and Design	PC	1	0	4	0	0	0	3	40	60	100	200
	5	22BTME125R	Fundamentals of C Programming	PC	0	0	2	0	0	0	1	0	0	100	100
	6	22UBPD124R	Effective English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100

7	MOSY121R/122R/123R	MOOCSI	FE	0	0	0	0	0	0	2			100	100
8	22UBCC121	Co-curricular II	UC	0	0	0	4	0	0	1	0	0	100	100
9	22UBEC121	Extra-curricular II	UC	0	0	0	4	0	0	1	0	0	100	100
10	22BTME126R	Techno-Professional Skills I	PC	0	0	2	0	0	0	1	0	0	100	100
11	22UUHV102R	Human Values (UHV)+ Professional Ethics	UC	1	0	2	0	0	0	2	40	60	100	200
12	22UUDL103R	Computational Systems and Digital World	UC	0	0	2	0	0	0	1	0	0	100	100
Total				10	2	18	8	0	0	25	200	300	1000	1500

	S. No.	**Course Code**	**Course Title**	**Course Category**	**Engagement**							**Maximum Marks for**			
					L	**T**	**P**	**S**	**R**	**O**	**C**	**IA***	**SEE***	**PE***	**Total**
Semester III	1	22BTME211R	Biology for Engineers	FE	2	1	0	0	0	0	3	40	60	0	100
	2	22BTME213R	Basic Electronic Engineering	PE	2	1	0	0	0	0	3	40	60	0	100
	3	22BTME214R	Engineering Mechanics	PC	2	1	0	0	0	0	3	40	60	0	100
	4	22BTME215R	Thermodynamics	PC	2	1	0	0	0	0	3	40	60	100	200
	5	22BTME212R	PDE and Transform Mathematics	FE	2	1	0	0	0	0	3	40	60	0	100
	6	22UBPD214R	English for Employability for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	7	22UBCC211	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	8	22UBEC211	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	MOSY211R/212R/213R	MOOCSII	FE	0	0	0	0	0	0	2			100	100

	10	22BTME216R	Techno-Professional Skills II	PC	0	0	2	0	0	0	1	0	0	100	100
	11	22UUHV102R	Universal Human Values (UHV) + Professional Ethics	UC	1	0	2	0	0	0	2	40	60	0	100
	Total				11	2	8	8	0	0	24	240	360	600	1200

	S. N.	**Course Code**	**Course Title**	**Course Category**	**Engagement**							**Maximum Marks for**			
					L	**T**	**P**	**S**	**R**	**O**	**C**	**IA***	**SEE***	**PE***	**Total**
Semester IV	1	22BTME221R	Applied Thermodynamics	PC	3	0	0	0	0	0	3	40	60	100	200
	2	22BTME222R	Fluid Mechanics and Fluid Machines	PC	3	0	2	0	0	0	4	40	60	0	100
	3	22BTME223R	Strength of Materials	PC	3	0	0	0	0	0	3	40	60	0	100
	4	22BTME224R	Materials Engineering	PC	3	0	0	0	0	0	3	40	60	100	200
	5	22BTME225R	Instrumentation and Control	PE	3	0	2	0	0	0	3	40	60	100	200
	6	22BTME227R	Environmental Science	UC	2	0	0	0	0	0	2	40	60	0	100
	7	22UBPD224R	English Language Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	8	22UBCC221	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22UBEC221	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22BTME226R	Techno-Professional Skills III	PC	0	0	2	0	0	0	1	0	0	100	100
	11	MOSY221R/222R/223R	MOOCSIII	FE	0	0	0	0	0	0	1	0	0	100	100

12	22UUFL202R	Personal Financial Planning	UC	0	0	2	0	0	0	1	0	0	100	100
13	22UULS202R	Basic Life Saving Skills	UC	0	0	0	0	0	0	0	0	0	100	100
14	22UULS201R	Basic Acclimatizing Skills (BAS)	UC	0	0	0	0	0	0	0	0	0	100	100
Total				17	0	12	8	0	0	25	240	360	1100	1700

	S. No.	**Course Code**	**Course Title**	**Course Category**	**Engagement**							**Maximum Marks for**			
					L	**T**	**P**	**S**	**R**	**O**	**C**	**IA***	**SEE***	**PE***	**Total**
Semester V	1	22BTME311R	Heat Transfer	PC	3	0	2	0	0	0	4	40	60	100	200
	2	22BTME312R	Solid Mechanics	PC	3	0	0	0	0	0	3	40	60	0	100
	3	22BTME313R	Manufacturing Process	PC	3	0	0	0	0	0	3	40	60	0	100
	4	22BTME314R	Kinetics and Theory of Machines	PC	3	0	0	0	0	0	3	40	60	100	200
	5	22BTME316R	Project-I	PE	0	0	6	0	0	0	3	0	0	100	100
	6	22BTME317E	Generic Elective I	UE	2	0	0	0	0	0	2	40	60	0	100
	7	MOSY311R/312R /313R	MOOCSIV	FE	0	0	0	0	0	0	1	0	0	100	100
	8	22UBPD314R	Competent English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	9	22UBCC311	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22UBEC311	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	11	22BTME315R	Techno-Professional Skills IV	PC	0	0	2	0	0	0	1	0	0	100	100
	Total				14	0	14	8	0	0	24	200	300	800	1200

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester VI	1	22BTME321R	Manufacturing Technology	PC	3	0	0	0	0	0	3	40	60	100	200
	2	22BTME322R	Design of Machine Elements	PC	2	1	2	0	0	0	4	40	60	0	100
	3	22BTME325E	Professional Elective I	PE	3	0	0	0	0	0	3	40	60	0	100
	4	22BTME326E	Professional Elective II	PE	3	0	0	0	0	0	3	40	60	0	100
	5	22BTME327E	Generic Elective II	UE	2	0	0	0	0	0	2	40	60	0	100
	6	22UBPD324R	Corporate Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	7	22UBCC321	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	8	22UBEC321	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22BTME323R	Techno-Professional Skills V	PC	0	0	2	0	0	0	1	0	0	100	100
	10	MOSY321R/322R/323R	MOOCSV	FE	0	0	0	0	0	0	1	0	0	100	100
	11	22BTME324R	Project II	PE	0	0	6	0	0	0	3	0	0	100	100
	Total				13	1	14	8	0	0	24	200	300	700	1200

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester VII	1	22BTME411R	Automation in Manufacturing	PC	3	0	0	0	0	0	3	40	60	100	200
	2	22BTME416E	Professional Elective III	PE	3	0	0	0	3	3	3	40	60	0	100
	3	22BTME417E	Professional Elective IV	PE	3	0	0	0	3	3	3	40	60	0	100
	4	22BTME412R	Manufacturing Lab	PC	0	0	6	0	0	0	3	0	0	0	100
	5	22BTME413R	Project III	PE	0	0	12	0	6	6	6	0	0	100	100
	6	22BTME415R	Industrial Mock Viva	PC	0	0	0	0	0	0	0	0	0	100	100
	7	22BTME414R	Techno-Professional Skills VI	PC	0	0	2	0	1	1	1	0	0	100	100
	8	22UBCC411	Co-curricular	UC	0	0	0	4	1	1	1	0	0	100	100
	Total				9	0	20	4	14	14	20	120	180	500	900

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester VIII	1.	22BTME422E	Professional Elective V	PE	3	0	0	0	0	0	3	40	60	0	100
	2	22BTME423E	Professional Elective VI	PE	3	0	0	0	0	0	3	40	60	0	100
	3	22BTME424E	Professional Elective VII	PE	3	0	0	0	0	0	3	40	60	100	100
	4	22BTME425E	Professional Elective VIII	PE	0	0	0	0	0	0	3	40	60	100	100
		22BTME421R	Project IV	PE	0	0	12	0	0	0	6	0	0	100	100
	Total				9	0	12	0	0	0	18	160	240	300	500

***IA: Internal Assessment, SEE: Semester End Examination,**
PE: Practical Examination

SEMESTER I									
Course Title	**Engineering Mathematics I**								
Course code	**22BTME111R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 48T	**3**	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To make understand to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma function must be introduced. 2. To provide the application of differential and integral calculus. 3. To make understand the convergence and divergence of sequence and series.								
CO1	Apply differential and integral calculus to notions of curvature and improper integrals								
CO2	Understand the concept of calculus and linear algebra.								
CO3	Understand the concept of convergence and divergence of sequence and series.								
CO4	Understand the application of differential and integral calculus.								
CO5	Understand the concepts of matrices to solve systems of linear equations and application problems requiring them.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Integral Calculus and its applications** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**10**	Enabling solving skills of definite and improper integrals	1,2,3
II	**Application of Differential Calculus:** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and Minima.	**10**	Understand Rolle's theorem, Mean value theorems and maxima, minima of a function	3,4
III	**Sequences and series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.	**10**	Introduction to Power series, Taylor's series, Fourier series, Parseval's theorem	3,4

IV	**Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	**8**	Introduction to Differentiation, Limits, Continuity, Gradient, Curl and Divergence	4
V	**Matrices:** Inverse and rank of a matrix, ranknullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley Hamilton Theorem, and Orthogonal transformation.	**10**	Understanding matrices and their types.	4

TEXT BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2008.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

OTHER LEARNING RESOURCES:

1. https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply differential and integral calculus to notions of curvature and improper integrals	1,2
2	Understand the concept of calculus and linear algebra.	1,2,3
3	Understand the concept of convergence and divergence of sequence and series.	1,3
4	Understand the application of differential and integral calculus.	1,3
5	Understand the concepts of matrices to solve systems of linear equations and application problems requiring them.	1,3&4

SEMESTER – I									
Course Title	**Introduction to basic mathematics, logic and coding**								
Course code	**22BTME112R**	**Total credits: 4** **Total hours: 36T+12P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To understand and be able to use the language, symbols and notation of mathematics 2. To develop the ability to create a programmable model for a given problem 3. To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations								
CO1	Understand the concepts of mathematics, logic, reasoning and coding.								
CO2	Applications of the concepts in other disciplines such as engineering, computer science, physics, etc.								
CO3	Learn to solve and devise solutions to a range of elementary real-world problems in mathematics and programming.								
CO4	Explore and apply key concepts in logical thinking to business problems								
CO5	Enables students to critically analyze information in order to evaluate evidence and construct reasoned arguments								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Basics of Set Theory and Functions:** **Sets:** Basic definitions, cardinality of a set, principle of exclusion and inclusion, combination of sets: union, intersection, difference, complement etc., De Morgan laws, Venn Diagram Cartesian **Products and Relations:** Basic Definitions, binary relations – composition and inverse, binary relation on a set: properties – reflexive, irreflexive, symmetric, antisymmetric, transitive, equivalence relations, partial order relations **Functions:** Basic definition, domain and co-domain, image and range, identity function, one-to-one and onto functions, bijections, characteristic function, composition of functions, inverse of a function, operations on sets: unary operators – idempotence, binary operators – associativity, commutativity **Number systems:** Natural numbers, whole numbers, integers, rational numbers, real numbers, operations on numbers:	**10**	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. They will become confident in using mathematics, logic, reasoning and coding to analyze and	1,2,3

	addition, subtraction, multiplication and division		solve problems in real-life situations	
II	**Introduction to Mathematical Logic and Induction:** **Mathematical Logic:** Truth values of mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables **Propositional Logic:** Constants, variables, assignment of variables in a formula, tautology, contradiction and satisfiability, truth table of a formula, equivalence of formulas, proving formulas and equivalences by truth table method **Mathematical Induction:** Principle of mathematical induction – induction basis and induction step, examples	**8**	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. They will become confident in using mathematics, logic, and reasoning and coding to analyze and solve problems in real-life situations.	2,3
III	**Introduction to Logic and Reasoning:** Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order, Puzzle, Blood Relations , Analogy, Cube and Dice, Coding Decoding	**10**	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. Explore and apply key concepts in logical thinking to business	3

			problems.	
IV	**Introduction to Coding: C** **Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. **Control Statements:** Decision Making using if statement, Types of if ...else Block, Switch case block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement	**10**	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. Solve and devise solutions to a range of elementary real-world problems in mathematics and programming	1,3
V	**Introduction to Arrays, Strings and Functions** **Arrays:** One Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.	**10**	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. Solve and devise solutions to a range of	1,3

			elementary real-world problems in mathematics and programming .	

TEXT BOOKS:

1. Schaum's Outline of Programming with C by Byron Gottfried, Third Edition
2. Programming in ANSI C by E. Balaguruswamy, Eight Edition
3. Discrete Mathematics by Lipschutz, Lipsonand and Patil, Revised Third Edition
4. A Textbook on Discrete Mathematics by Sastry and Nayak

REFERENCE BOOKS:

1. A Modern Approach to Verbal & Non Verbal Reasoning by R S Agarwal, Revised Edition
2. Analytical and Logical Reasoning by Sijwali B S, Revised Edition
3. The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie, Second Edition
4. 2000 Solved Problems in Discrete Mathematics by Lipschutz and Lipson

OTHER LEARNING RESOURCES:

1. **https://www.javatpoint.com/discrete-mathematics-tutorial**
2. **https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logical-reasoning**
3. **https://www.javatpoint.com/c-programming-language-tutorial**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the concepts of mathematics, logic, reasoning and coding.	1,8
2	Applications of the concepts in other disciplines such as engineering, computer science, physics, etc.	3,7
3	Learn to solve and devise solutions to a range of elementary real-world problems in mathematics and programming.	6,9,10

4	Explore and apply key concepts in logical thinking to business problems	5,9
5	Enable students to critically analyze information in order to evaluate evidence and construct reasoned arguments	7,1,12

SEMESTER – I									
Course Title	**Engineering Physics**								
Course code	**22BTME113R**	**Total credits: 4** **Total hours: 36T+12P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To understand the theories of physics. 2. To apply the concepts in practical problems. 3. To understand the physics of any process.								
CO1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.								
CO2	Illustrate conservative and non-conservative forces, angular momentum and energy equations								
CO3	Explain basics of non-inertial frames and acceleration and its application in engineering field								
CO4	Comprehend on oscillations and its application in the field of engineering kinematics								
CO5	Understand the three dimensional rigid body motion and determine the moment of inertia.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**
I	**Unit I: Electrostatics in Vacuum** Coulomb's law, electric field intensity, Gauss's law and its applications, electric potential and potential energy, conductors in electrostatic equilibrium, capacitors and capacitance calculations.		**10**		It will provide an understanding to electrostatics and its applications.				1, 2
II	**Unit II: Magnetostatics** Biot-Savart law, Ampère's law and applications, magnetic vector potential, magnetic properties of materials (diamagnetism, paramagnetism, ferromagnetism)		**10**		It will help the students to acquire knowledge of magnetostatics.				1, 2, 3, 4
III	**Unit III: Faraday's Law** Electromagnetic induction, Faraday's law (integral and differential forms), magnetic flux, induced electromotive force (emf), practical applications.		**10**		Introduction to Faraday's law				1, 2, 3, 4, 5
IV	**Unit IV: Displacement Current and Maxwell's Equations** Displacement current, magnetic field due to time-dependent electric field,		**10**		Introduction to displacement current and Maxwell				2, 3, 4

	Maxwell's equations in integral and differential forms, boundary conditions for electromagnetic fields.		equations	
V	**Unit V: Electromagnetic Waves** Wave equation for electromagnetic fields, propagation of electromagnetic waves in free space and in materials, energy and momentum of electromagnetic waves, reflection and refraction, polarization, electromagnetic wave applications	**8**	Understanding of Electromagnetic waves and its properties	2, 3, 4, 5

TEXT BOOKS:

1. Introduction to Electrodynamics. David Griffiths. Prentice Hall, Upper Saddle River, New Jersey, 07458
2. Basic Laws of Electromagnetism. IE IRODOV

REFERENCE BOOKS:

1. Principles of physics. Halliday Resnick

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S0951832022005142

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.	1,2
2	Illustrate conservative and non-conservative forces, angular momentum and energy equations	3,5
3	Explain basics of non-inertial frames and acceleration and its application in engineering field	6,9,10
4	Comprehend on oscillations and its application in the field of engineering kinematics	5,9
5	Understand the three dimensional rigid body motion and determine the moment of inertia.	4,1,11

SEMESTER – I									
Course Title	**Basic Electrical Engineering**								
Course code	**22BTME114R**	**Total credits: 4** **Total hours: 36T+12P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	Explain operative principle of transformer with background of magnetic circuits. Classify and compare different types of Electrical machines. To understand and analyze basic electrical and magnetic circuits.								
CO1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems								
CO2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.								
CO3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.								
CO4	Explain the working principles of common electrical instruments and their characteristics.								
CO5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and elementary calculations for energy consumption								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	**DC Circuit** Electrical circuit elements (R, L, C), voltage and current source, Kirchoff's current and voltage law, analysis of simple circuit, Thevenin, Norton and Superposition theorem		**5**	Understanding and analysing basic electrical and magnetic circuits.					1, 2
II	**AC Circuit:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single phase ac circuits consisting of R,L,C.RL,RC,RLC combination(series and parallel), voltage and current relationship in star and delta connection		**7**	Studying the working principle of electrical machines and power converters.					2, 3, 4
III	**Transformer:** Magnetic materials, ideal and practical transformer, equivalent circuit, losses in transformer, regulation and efficiency, auto transformer, three phase transformer connection		**6**	Introduction to the components of low voltage electrical installations					1, 2, 3, 4

IV	**Electrical Machines:** Generation of rotating magnetic fields, construction and working of three phase induction motor, torque-slip characteristics, losses and efficiency, Single phase induction motor, working of synchronous generator	**6**	To understand the rotating magnetic fields, single phase and three phase induction motor and working of synchronous generator.	1, 2
V	**Power converter and electrical installation:** DC-DC buck and boost converter, single phase and three phase voltage source inverter, Fuse, MCB, ELCB, MCCB, Earthing, wires and cables, types of batteries	**6**	Introduction to power converter and electrical installations.	2, 3, 4, 5

TEXT BOOKS:

1. D. P. Kothari and I. J.Nagrath, Basic Electrical Engineering , Tata McGraw Hill,2010

REFERENCE BOOKS:

1. D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010

OTHER LEARNING RESOURCES:

1. https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems	1,2
2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.	3,10
3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.	6,9,12
4	Explain the working principles of common electrical instruments and their characteristics.	5,9
5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and elementary calculations for energy consumption	4,1,7

SEMESTER – I									
Course Title	**Workshop/Manufacturing Practices**								
Course code	**22BTME115R**	**Total credits: 12 Total hours: 12T+24P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Learning this course will lead you to understand basic concepts of workshop and manufacturing. 2. Apply fundamental knowledge of workshop and manufacturing in day-to-day life. 3. Recognize components using different materials.								
CO1	Infer about various manufacturing methods like casting, forming, machining etc.								
CO2	Apply fitting operation and power tools in manufacturing works								
CO3	Demonstrate to Carpentry & fitting operations and its application in industries								
CO4	Enhance skills in machining operations like material cutting and preparation of mould etc.								
CO5	Critique the different types of welding, metal casting and its field of application.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Manufacturing Methods:** Casting, Forming, Machining, Joining, Advanced manufacturing methods	**8**	Introduction to various manufacturing methods like casting, Forming, machining etc.	1,2,3
II	**CNC machining, Additive Manufacturing:** Overview of CNC machining process, overview of additive manufacturing	**8**	Application of computer coding in automation of Machines.	3,4
III	**Carpentry & Fitting operations:** Carpentry tools, carpentry operations, fitting tools, fitting operations	**6**	Introduction to Carpentry & fitting operations and its application in industries.	3,4
IV	**Machining operations:** Turning, milling, turning processes, milling processes.	**8**	Introduction to various manufacturing methods like casting, forming, machining, etc.	4
V	**Welding:** Arc welding & gas welding, brazing	**8**	Introduction to safety precautions in welding.	4

TEXT BOOKS:

1. Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy Media promoters and publishers private limited, Mumbai.

REFERENCE BOOKS:

1. Manufacturing Technology – I Gowri P. Hariharan and A. Suresh Babu Pearson Education, 2008
2. Processes and Materials of Manufacture Roy A. Lindberg 4th edition, Prentice
3. Hall India, 1998

OTHER LEARNING RESOURCES:

1. https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Infer about various manufacturing methods like casting, forming, machining etc	1,3,5
2	Apply fitting operation and power tools in manufacturing works	2,4
3	Demonstrate to Carpentry & fitting operations and its application in industries	6,8
4	Enhance skills in machining operations like material cutting and preparation of mould etc.	7,10,12
5	Critique the different types of welding, metal casting and its field of application.	8,9

SEMESTER – I									
Course Title	**Introductory English for Engineers**								
Course code	**22UBPD114R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To Enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be able to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.								
CO2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.								
CO3	Understand the process and purpose of listening differentiate between listening and hearing, identify factors affecting listening, and implement strategies to improve their listening skills.								
CO4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.								
CO5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Module 1 – Grammar Parts of Speech Articles Auxiliary Verbs Affirmative and Negative Sentences	**6**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and	1, 2

			meaningful sentences.	
II	Module 2- Grammar Determiners Sentence Construction Types of Sentences (Assertive, Imperative, etc.) Degree of Comparison Comprehension Exercises	**7**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and exclamatory). The concept of the degree of comparison (positive, comparative, and superlative) will be explored. The module will also include comprehension exercises designed to enhance students' ability to understand and interpret written texts effectively	2, 3, 4
III	Module 3 - Listening Skills What is listening? The Process of Listening Factors that adversely affect Listening Difference between Listening and Hearing, Purpose and Importance of Effective Listening How to Improve Listening Process.	**6**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	Module 4 - Speaking Skills Introducing yourself Self-discovery Basics of Phonetics, Pronunciation Extempore speech Video Recording for Self reflection	**5**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	Module 5- Communication Skills Introduction to Communication,	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of	2, 3, 4, 5

	Importance of Communication Skills, Purpose of Communication, Types of Communication, Formal and informal communication Importance of Communication, Barriers to Communication, How to improve/ tips to improve Communication skills. Responding to different questions in various situations (formal/informal)		communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	

TEXT BOOKS:

1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.
2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & Company Ltd.: New Delhi.

REFERENCE BOOKS:

1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India
2. Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Blett

OTHER LEARNING RESOURCES:

1. https://youtu.be/bEB8-SWMYhI
2. https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.	1,2
2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.	3,5
3	Understand the process and purpose of listening differentiate between listening and hearing; identify factors affecting listening, and implement strategies to	6,9,10

	improve their listening skills.	
4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.	5,9
5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.	1, 4,11

SEMESTER – I									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop soft and social skills 2. To promote a holistic development of the learners 3. To enhance the learning experience in different stages etc.								
CO1	Participants will develop personal skills, such as leadership, communication, time management, and teamwork, contributing to their overall character development and self-confidence.								
CO2	Engagement in Community service and outreach activities will cultivate a sense of social responsibility , empathy, and civic awareness, encouraging students to actively contribute to society								
CO3	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	Different types of activities outside regular curriculum		**10**	1. AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest. These activities are aimed to develop the social and soft skills and promote a holistic development of the learners. 2. Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc. 3. The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies.					1,2, 3,4, 5

			4. The student members of the club are trained represent AdtU in various inter University student and national level competitions. 5. Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Participants will develop personal skills, such as leadership, communication, time management, and teamwork, contributing to their overall character development and self-confidence.	1,3
2	Engagement in Community service and outreach activities will cultivate a sense of social responsibility, empathy, and civic awareness, encouraging students to actively contribute to society	3,4,7
3	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	6,8
4	The students will be given a platform to earn from invited experts in their respective fields.	4,6
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	7,11

MAPPING TABLE

Course code	**Course Name**	**PO1**	**PO2**	**PO3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**P O 11**	**PO12**
22BTME111R	Engineering Mathematics I	3	3	2	2	1				1			1
22BTME112R	Introduction to Basic Mathematics, Logic and Coding	3	3	2	2	1				1			1

22BTME113R	Engineering Physics	3	2	3	2	2				1			1
22BTME114R	Basic Electrical Engineering	3	2	2	2	2	1			2			1
22BTME115R	Workshop/Manufacturing Practices	3	2	2	2	2	1			2	2		1
22UBPD114R	Introductory English for Engineers						2			2	3	2	2
22UBEC111	Extracurricular activities							1		2	1		1

SEMESTER – II									
Course Title	**Engineering Mathematics**								
Course code	**22BTME121R**	**Total credits: 4 Total hours: 40**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Describe the concept of first order differential equation and apply them in understanding complex problems. 2. Apply the concept of ordinary differential equations of higher orders. 3. Develop students' skills in basic probability and statistics, including the analysis of probability distributions, measures of central tendency, and statistical parameters, and to apply these concepts to real-world data and hypothesis testing.								
CO1	Understand to solve differential Equations and their applications in engineering problems.								
CO2	Understand the basic principles of set theorem and apply them in solving different complex problems.								
CO3	Apply the concepts of proposition logic.								
CO4	Analyze the concept of basic probability and its application								
CO5	Understand the concept of basic and applied statistics.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**BL**
I	**First order ordinary differential equations:** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	**7**	First-order ordinary differential equations include understanding and solving exact, linear, and Bernoulli equations, as well as Euler's equations for rigid body dynamics. Students will also learn to handle equations not of the first degree, including those solvable for pp, yy, or xx, and Clairaut's type equations. These outcomes focus on enhancing analytical and problem-solving skills in differential equations.						1

II	**Ordinary differential equations of higher orders:** Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.	**9**	Method of variation of parameters. Students will also understand and solve the Cauchy-Euler equation, which is a specific type of second-order linear differential equation useful in various applications.	3
III	**Complex variable-Differentiation:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions(exponential, trigonometric, logarithm) and their properties.	**8**	Gaining proficiency in solving second-order linear differential equations with variable coefficients using techniques like the variation of parameters. Additionally, students will learn to solve the Cauchy-Euler equation, a particular type of second-order differential equation, and comprehend its applications and solution methods. This expertise prepares students to tackle complex differential equations found in various scientific and engineering contexts	6
IV	**Basic probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution.	**8**	Understanding the foundational concepts of probability spaces and the ability to calculate conditional probability and determine the independence of events. Students will also learn about discrete random variables and how to analyze distributions involving independent random variables. Additionally, they will gain proficiency in working with the multinomial distribution and applying the Poisson approximation to the binomial	4

			distribution, equipping them with essential tools for solving a variety of probabilistic problems.	
V	**Basic and applied Statistics:** **Basic:** Measures of central tendency: Moments, skewness and Kurtosis-Probability distributions: Binomial, Poisson and Normal-evaluation of statistical parameters for these three distributions, Correlation and regression. **Applied:** Test of significance: Large sample test for single proportion. Difference of proportions, single mean, difference of means and difference of standard deviations.	**7**	Understanding and calculating measures of central tendency such as mean, median, and mode. Students will also learn to compute moments, and analyze skewness and kurtosis to describe data distribution shapes. Additionally, they will gain proficiency in working with key probability distributions (Binomial, Poisson, and Normal), including evaluating their statistical parameters. Furthermore, students will develop skills in correlation and regression analysis to examine relationships between variables.	3

TEXT BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

REFERENCE BOOKS:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2. S. L. Ross, Differential Equations, 3rd Ed. Wiley India, 1984.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand to solve differential Equations and their applications in engineering problems.	1,2
2	Understand the basic principles of set theorem and apply them in solving different complex problems.	3,4,8
3	Apply the concepts of proposition logic.	6,8,10

4	Analyze the concept of basic probability and its application	4,6
5	Understand the concept of basic and applied statistics.	7,11,12

SEMESTER – II										
Course Title	**Engineering Chemistry**									
Course code	**22BTME122R**	**Total credits: 4** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop a deep understanding of atomic and molecular structures, including the application of quantum mechanics to solve complex problems. 2. To apply theoretical concepts to real-world scenarios, such as predicting molecular properties and understanding spectroscopic techniques. 3. To foster critical thinking and analytical skills necessary for interpreting complex chemical phenomena.									
CO1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.									
CO2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.									
CO3	Analyze molecular orbitals of diatomic molecules and multi-center orbitals using quantum mechanical equations and visualize these orbitals through plots.									
CO4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.									
CO5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Atomic and molecular structure Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multi-	**6**	Demonstrate proficiency in solving quantum mechanical problems related to atomic and molecular structures.	1

	center orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures			
II	Spectroscopic techniques and applications Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.	**6**	Analyze spectroscopic data to deduce molecular structures and dynamics.	2
III	Use of free energy in chemical equilibria Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.	**6**	Evaluate the impact of intermolecular forces on the physical and chemical properties of substances.	3
IV	Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces. Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.	**6**	Apply thermodynamic principles to chemical equilibria and electrochemical systems.	4
V	**Stereochemistry** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity,	**6**	Interpret periodic trends and their implications on chemical behaviour and reactivity.	6

	absolute configurations and conformational analysis. Isomerism in transitional metal compounds **Organic reactions and synthesis of a drug molecule** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule			

TEXT BOOKS:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

REFERENCE BOOKS:

1. O. V. Roussak and H. D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
2. S. S. Dara, A Text book of Engineering Chemistry, S. Chand & Co Ltd., New Delhi, 20thEdition, 2013.

OTHER LEARNING RESOURCES:

1. Home :: NPTEL

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply the Schrödinger equation to predict the particle in box solutions and analyze their implications for conjugated molecules and nanoparticles.	1,3
2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.	3,4,7
3	Analyze molecular orbitals of diatomic molecules and multi-center orbitals using quantum mechanical equations and visualize these orbitals through plots.	6,8,12
4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.	4,6
5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties	7,11,12

SEMESTER – II									
Course Title	**Programming for Problem Solving**								
Course code	**22BTME 123 R**	**Total credits: 4** **Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To formulate simple algorithms for arithmetic and logical problems. 2. To test and execute the programs and correct syntax and logical errors. 3. To implement the programming in real life practical applications								
CO1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.								
CO2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.								
CO3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.								
CO4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.								
CO5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)	**8**	Demonstrate proficiency in constructing and interpreting flowcharts and pseudocode for algorithm design.	1,2, 3
II	Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.	**12**	Apply knowledge of variables, data types, and arithmetic expressions with appropriate precedence in programming tasks.	3,4
III	Arrays (1-D, 2-D), Character arrays and Strings	**8**	Implement conditional branching and iterative structures to control program flow and optimize algorithm efficiency.	3,4
IV	Basic Algorithms: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity Function and Recursion: Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.	**4**	Develop proficiency in manipulating arrays, character arrays, and strings to manage and process data effectively.	4

V	Structure and Pointers: Pointers, Structures (including self referential structures e.g., linked list, notional introduction) File handling	**4**	Analyze and evaluate algorithm efficiency through the application of basic searching and sorting techniques, understanding time complexity implications.	4

TEXT BOOKS:

1. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

REFERENCE BOOKS:

1**.** Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.	1,3
2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.	3,4,8
3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.	6,8,12
4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.	4,6
5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.	7,11,12

SEMESTER – II									
Course Title	**Engineering Graphics and Design**								
Course code	**22BTME 124 R**	**Total credits: 4** **Total hours: 10T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Develop the ability to communicate with others through the language of technical drawing and sketching. 2. Enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient. 3. Enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient.								
CO1	To understand principles of engineering graphics and usage of drawing instruments								
CO2	To discuss orthographic projections.								
CO3	To classify different dimensioning methods and scales.								
CO4	To understand sectional views for different geometrical solids, CAD drawing.								
CO5	To give examples of isometric views by using isometric scales annotations and layering.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, numbering	**2**	Understand principles of engineering graphics and usage of drawing instruments	2,4
II	Plain, Diagonal and Vernier Scales. Conic sections - Rectangular Hyperbola; Cycloid, Epicycloid, Hypocycloid and Involute; Projection of regular solids	**2**	Discuss orthographic projections	2,4, 5
III	Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes	**2**	Classify different dimensioning methods and scales.	2,4, 5
IV	Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone	**2**	Understand sectional views for different geometrical solids, CAD drawing.	2,4, 5
V	Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa	**2**	Give examples of isometric views by using isometric scales, annotations and layering.	2,4, 5
Practical	1. Lettering, scaling, dimensioning	**30**	Learn the different methods of	1,2,

	2. Hyperbola cycloid, hypocycloid and involute, projection of regular solids 3. Projection of points, lines, planes 4. Solid Surface drawing of Prism, cylinder, pyramid, cone- auxiliary views 5. Isometric views and drawing of different objects		drawing and apply it in practical application.	3,4

TEXT BOOKS:

1. Venugopal K and Prabhu Raja V, "Engineering Graphics", New AGE International Publishers, 2015.
2. N. D. Bhatt, Engineering Drawing, Charotar publishing House, 2012.

REFERENCE BOOKS:

1. Natarajan, K. V., A Text book of Engineering Graphics, Dhanalakshmi Publishers, 2012.

OTHER LEARNING RESOURCES:

1. Home :: NPTEL

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	To understand principles of engineering graphics and usage of drawing instruments	1,3
2	To discuss orthographic projections.	1
3	To classify different dimensioning methods and scales.	1,3
4	To understand sectional views for different geometrical solids, CAD drawing.	1,3
5	To give examples of isometric views by using isometric scales, annotations and layering	1,3&4

SEMESTER – II									
Course Title	Techno-professional Skills (Fundamentals of C Programming)								
Course code	22BTME125R	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 20 P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Derive problem specifications from problem statements 2. Develop algorithms using modular design principles to meet stated specifications. 3. Justify, understand and modify code written by others								
CO1	Compute algorithmic solutions to problems								
CO2	Design and code a medium application								
CO3	Justify, understand and modify code written by others								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**INTRODUCTION TO 'C' LANGUAGE** Design Style, coding style, functions and operators	**6**	Compute algorithmic solutions to problems.	1,2
II	**FUNCTIONS AND ARRAYS** Functions definition and declaration function types, Actual and formal arguments, Recursion array notation and Declaration, Processing with arrays, Array and Function.	**8**	Design and code a medium application	3,4
III	**POINTERS, STRUCTURES AND UNIONS** Pointer Declaration, Pointer Arithmetic, Pointer and Functions, Structure- Union-Bitfields-Typedef –Enumerations	**6**	Justify, understand and modify code written by others	3,4

TEXT BOOKS:

1. Herbert Schildt, Java The Complete Reference, Seventh Edition: The Complete Reference, Seventh Edition

REFERENCE BOOKS:

1. Raymond Gallardo, Scott Hommel, Sowmya Kannan, Joni Gordon, Sharon Bicocca Zak hour, The Java Tutorial: A Short Course on the Basics , sixth edition

OTHER LEARNING RESOURCES:

1. http://www.tutorialspoint.com/java/
2. http://academy.javacodegeeks.com/course/advanced-java/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Compute algorithmic solutions to problems	3&5
2	Design and code a medium application	4&5
3	Justify, understand and modify code written by others	4&5

SEMESTER – II									
Course Title	**EFFECTIVE ENGLISH FOR ENGINEERS** (Communicative English & Soft Skills)								
Course code	**22UBPD124R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40P		**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. This course will Enable the students to acquire the important knowledge on grammar like the formation of sentences. 2. To Enable the students to use vocabulary meaningfully for a successful conversation. 3. To establish Reputation and Rapport, a dress code session is much needed								
CO1	Enable students to understand grammar to write effectively and speak flawlessly, knowing correct usage of tenses and rectifying grammatical errors.								
CO2	Students will acquire the technique of expanding vocabulary and creating new words and use them in different contexts.								
CO3	Encouraging and helping them to sharpen their listening skills and to become good listeners.								
CO4	To make them prepare for various public and private sector exams & placement drives.								
CO5	To enhance the analytical skill and problem-solving skill of the students								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Interchange of Interrogative and Assertive Sentences, Interchange of Exclamatory and Assertive Sentences, Analysis of Sentences, Types of Tenses, Exercises on Tense	**12**	Students will be able to analyse and transform the different types of sentences.	1,2
II	Synonyms, Antonyms, Homonyms	**8**	Helpful in integrating the skills of reading and speaking in professional communication.	3,4
III	Techniques of Effective, Reading, Gathering ideas and information from a text, The SQ3R Technique, Interpret the text	**8**	Helps in analysing the techniques of effective reading, gathering ideas and information from a text	3,4
IV	Introduction to Dress Code Ethics, ii. Purpose and Importance, iii. How to Make FIRST IMPRESSION iv. What to Wear During Interviews or Any Other Formal Meetings – Male & Female Activity:	**6**	Dress code etiquette will boost their confidence.	3,4
V	Introduction to Time Management Purpose And Importance of Time Management, Basic Tips to Maintain Time.	**6**	Students will learn to utilize time effectively.	3,4

TEXT BOOKS:

1. Wren,P.C and Martin,H. 1995. High School English Grammar and Composition, S Chand publishing.
2. Barrett, Grant. 2016. Perfect English Grammar: The Indispensable Guide to Excellent Writing

REFERENCE BOOKS:

1. McCarthy. (2008) English Vocabulary in Use Upper - Intermediate with
2. CD-ROM, Cambridge University Press

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Enable students to understand grammar to write effectively and speak flawlessly, knowing correct usage of tenses and rectifying grammatical errors.	9,10
2	Students will acquire the technique of expanding vocabulary and creating new words and use them in different contexts.	10
3	Encouraging and helping them to sharpen their listening skills and to become good listeners.	9,10,11
4	To make them prepare for various public and private sector exams & placement drives.	1,2,12
5	To enhance the analytical skill and problem-solving skill of the students	4,5

SEMESTER – II									
Course Title	**Computational Systems and Digital World**								
Course code	**22UUDL103R**	**Total credits: 4** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Students will be able to understand the fundamentals of computer systems and Internet search along with advanced features of MS-Office. 2. Students will be able to learn data management, statistical analysis and visualization. 3. Students will be able to use social media and e-commerce portals, Digital Payment systems, and other utility software.								
CO1	Students will have basic understanding of Computer Systems and Internet search.								
CO2	Students will be able to solve data analysis, management and visualization issues using MS-Office products.								
CO3	Students will be able to efficiently and ethically use Social Media and e-commerce sites.								
CO4	Students will have introduction to various utility software used in research and information management.								
CO5	Application of basic accounting using utility software								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Fundamentals of Computer Systems, Office Automation and Internet Search	**7**	Basic understanding of Computer Systems and Internet search.	2,3, 4
II	Internet & Cyber World	**5**	Able to solve data analysis, management and visualization issues using MS-Office products.	2,3 4,
III	Introduction to Social Media and E-Commerce	**3**	Enabled to efficiently and ethically use Social Media and e-commerce sites.	2,3 4
IV	Digital Payments and Digital Transactions	**2**	Introduction to various utility software used in research and information management.	2,3 4
V	Basic Accounting and Utility Software	**3**	Application of basic accounting using utility software	2,3, 4

TEXT BOOKS:

1. Sinha Pradeep K. and Priti Sinha. Computer Fundamentals: Concepts Systems & Applications. 3rd ed. New Delhi: BPB Publications.
2. Goel, A, 2010. Computer Fundamentals, PearsonIndia.

REFERENCE BOOKS:

1. Balaguruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.

2. Balaguruswamy, 2014. E. Fund Of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-HillEducation.

3. Lawson, C. 2022. Introduction to Social Media, Oblahoma StateUniversity.

OTHER LEARNING RESOURCES:

1. https://www.w3schools.com
2. https://edu.gcfglobal.org
3. https://www.tutorialspoint.com
4. https://www.javatpoint.com

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will have basic understanding of Computer Systems and Internet search.	3,4&5
2	Students will be able to solve data analysis, management and visualization issues using MS-Office products.	3,4&5
3	Students will be able to efficiently and ethically use Social Media and e-commerce sites.	8,9,10
4	Students will have introduction to various utility software used in research and information management.	4,11
5	Application of basic accounting using utility software	4,5

SEMESTER – II									
Course Title	UNIVERSAL HUMAN VALUES (UHV) + PROFESSIONAL ETHICS								
Course code	**22UUHV101R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40P	**1**	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature								
CO1	Develop a basic understanding of Computer Hardware, Software, and Computer handling.								
CO2	Acquire the skills to solve basic information management issues using MS Office Products.								
CO3	Acquire the skill to efficiently search the Internet for required information.								
CO4	Acquire the skill to use computing technically ethically, safely, securely, and legally for day-to-day use.								
CO5	Develop self-exploration skills which will help Enable the students to critically evaluate their pre-conditionings and present beliefs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	**12**	Students will be able to analyse and transform the different types of sentences.	1,2
II	Understanding Harmony in the Human Being - Harmony in Myself	**8**	Helpful in integrating the skills of reading and speaking in professional communication.	3,4
III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	**8**	Helps in analysing the techniques of effective reading, gathering ideas and information from a text	3,4
IV	Understanding Harmony in the Nature and Existence - Whole existence as Co-	**6**	Dress code etiquette will boost their confidence.	1,2

	existence			
V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	**6**	Students will learn to utilize time effectively.	3,4

TEXT BOOKS:

1. The text book R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excelbooks, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

REFERENCE BOOKS:

1. The text book R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze the need for value education and its impact on personal and societal well-being.	1,4
2	Evaluate the concepts of self-exploration, natural acceptance, and experiential validation as mechanisms for understanding human aspirations.	3,4,7
3	Differentiate between happiness and prosperity and assess their implications on human aspirations in the current scenario.	6,8,10
4	Demonstrate understanding of harmony in human relationships, family, society, nature, and existence.	4,6,8
5	Apply principles of professional ethics to develop sustainable and humanistic solutions in their professional practice.	7,11

<table>
<tr><th colspan="10">SEMESTER – II</th></tr>
<tr><td>Course Title</td><td colspan="9">CO-CURRICULAR ACTIVITIES</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22UBCC121</td><td rowspan="2">Total credits: 1
Total hours: 10P</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>4</td><td>0</td><td>0</td><td>1s</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">B. Tech Mechanical Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">Fall/ II semester of first year of the programme</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents.
2. To stimulate the interests in the students and provide equal opportunities to all the students to participate
3. To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.</td></tr>
<tr><td>CO1</td><td colspan="9">Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.</td></tr>
<tr><td>CO2</td><td colspan="9">Organize: Students will be able to organize and execute workshops, exhibitions, and guest lecturers that foster a deeper understanding of their academic subjects.</td></tr>
<tr><td>CO3</td><td colspan="9">Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.</td></tr>
<tr><td>CO4</td><td colspan="9">Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.</td></tr>
<tr><td>CO5</td><td colspan="9">Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="4">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.</td><td>10</td><td colspan="4">Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.</td><td>1,2, 3,4, 5</td></tr>
</table>

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.	1,3
2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.	3,4,7
3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.	6,8
4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.	4,6
5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.	7,11

SEMESTER – II									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop soft and social skills 2. To promote a holistic development of the learners 3. To enhance the learning experience in different stages etc.								
CO1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc								
CO2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.								
CO3	The students will be trained to represent ADTU in various inter university, state and national level competitions**.**								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Different types of activities outside regular curriculum	**10**	1. AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest. These activities are aimed to develop the social and soft skills and promote a holistic development of the learners. 2. Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc. 3. The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies. 4. The student members of the club are trained represent AdtU in various inter University student and national level	1,2,3 ,4,5

			competitions. 5. Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc	1,3
2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.	3,4,7
3	The students will be trained to represent ADTU in various inter university, state and national level competitions**.**	6,8
4	The students will be given a platform to earn from invited experts in their respective fields.	4,6
5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.	7,11

SEMESTER – II									
Course Title	**Community Engagement and Social Responsibility**								
Course code	**22MOSY123R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop knowledge about community 2. To promote different culture and its livelihood 3. Development of rural programmes and institutions								
CO1	Helps in understanding the concept of ethics								
CO2	Learn the different stages of components, community etc.								
CO3	Understand the principles of community development and utility of public resources.								
CO4	Creating different self-help groups that can helped each other in different situations								
CO5	Development rural programmes and institutions								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Concept, Ethics and Spectrum of Community engagement	**3**	Helps in understanding the concept of ethics	1,2,
2	Local community, Rural culture and Practice of community engagement	**5**	Understanding the culture of local community	1,2
3	Stages, Components and Principles of community development, Utility of public resources.	**5**	Learn the different stages of components, community etc.	1,2,3, 4
4	Contributions of self-help groups	**4**	Creating different self-help groups that can helped each other in different situations	5,6
5	Rural Development Programs and Rural institutions	**3**	Development rural programmes and institutions	5,6

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Helps in understanding the concept of ethics	8
2	Understanding the culture of local community	9,10
3	Learn the different stages of components, community etc.	9,10

4	Creating different self-help groups that can helped each other in different situations	11,12
5	Development rural programmes and institutions	11,12

Mapping Table

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME121R	Engineering Mathematics II	3	2	2	2								1
22BTME124R	Engineering Graphics and Design	2	1	1	2								1
22BTME123R	Programming for Problem Solving	2	2	2	2	2				1		1	1
22BTME122R	Engineering Chemistry	2	1										1
22UBPD124R	Effective English For Engineers						2			2	3	2	2
22BTME125R	Techno-professional Skill	3	2	2	2	2	1			2			1
22UUDL103R	Computational Systems and Digital World	3	2	2	2	2	1			2	2		1
22UUHV1011	Universal Human Values (UHV) + Professional Ethics						2			2	3	2	2
22MOSY123R	MOOCS I					1	2	2	2	3			1
22UBCC121	Co-Curricular Activity							2		2	1		1
22UBEC111	Extra-Curricular Activity							1		2	1		1

<table>
<tr><th colspan="10">SEMESTER – III</th></tr>
<tr><td>Course Title</td><td colspan="9">Biology for Engineers</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTME211R</td><td rowspan="2">Total credits: 3
Total hours: 36T</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="7">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">Bachelor of Technology in Mechanical Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">Fall/ III semester of second year of the programme</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. To introduce the students about the biological concepts from an engineering perspective.
2. To Enable the students to have a strong knowledge of functioning of an ecosystem and identification of organisms.
3. To introduce with the concepts of genetics and mechanisms related to it.</td></tr>
<tr><td>CO1</td><td colspan="9">Discuss biological sciences, its scope and perspectives.</td></tr>
<tr><td>CO2</td><td colspan="9">Discuss regarding the ecological energetics, its working mechanism, identification of organisms.</td></tr>
<tr><td>CO3</td><td colspan="9">Analyze the mechanism of transfer of character from parent to next generation.</td></tr>
<tr><td>CO4</td><td colspan="9">Explain the genetic code and production of proteins.</td></tr>
<tr><td>CO5</td><td colspan="9">Interprets the relation between various physiological processes of our body</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">Introduction
• Importance and scope of Biology as an important scientific discipline.
• Branches of biological sciences.
• Fundamental differences between science and engineering.
• Comparison between the working mechanism of eye and camera, Bird flying and aircraft.
• Biological observations of 18th century that lead to major discoveries in the world
• Steps in scientific research works.
• Brownian motion in biological sciences.</td><td>10</td><td colspan="3">Discuss biological sciences, its scope and perspectives..</td><td>1,2,5</td></tr>
<tr><td>II</td><td colspan="3">Classification & Ecology

• Classification of organisms, Basis of classification: Morphological,</td><td>10</td><td colspan="3">Discuss regarding the ecological energetics, its working</td><td>2,3</td></tr>
</table>

	biochemical or ecological, level of organization, symmetry, germ layer organization, segmentation, notochord. • Concept of unicellular and multicellular organisms; prokaryotes and eukaryotes; Habitat & Adaptations. • Concept of Ecosystem: Structure & Function. • Energy flow in an ecosystem: Lindemann ten percent law. • Types of excretion: Ammonotelism, Ureotelism and Uricotelism. • Animal Kingdom: Characters of phylum with examples. •Model organisms for the study of biology come from different groups. E. coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus		mechanism, identification of organisms.	
III	**Genetics & Biomolecules** •Concept of Allele; Dominance & Recessive; Monohybrid, Dihybrid & Trihybrid cross; Mitosis & Meiosis. •Mendel's laws, Concept of Segregation and Independent assortment. •Concept of co-dominance and incomplete dominance with illustrations. •Sex determination in human. •Genetic disorders in human beings. •DNA & RNA as genetic material. •Enzymes: Classification; Mechanism of enzyme action	**6**	Analyse the mechanism of transfer of character from parent to next generation.	2,6

IV	**Information Transfer & Metabolism** •Genetic code: Properties •Structure of DNA •Concept of recombination and crossing over •Proteins: Primary secondary, tertiary and quaternary structure. •Concept of Central dogma •ATP as an energy currency of cell. •Concept of docking: Protein Ligand interaction	**4**	Explain the genetic code and production of proteins..	1,3
V	**Physiology** •Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosis fetalis •Neuroendocrine system of human: Endocrine glands and their functions. •Human Excretory system: Structure of Kidney and Nephron •Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse. •Human Respiratory System: 4Structure of lungs and exchange of gases. •Human digestive enzymes: Components and enzymes. •Mechanism of muscle contraction.	**6**	Interprets the relation between various physiological processes of our body	2,3,5

TEXT BOOKS:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.

3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

REFERENCE BOOKS:

1. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS PuBLisher

2. Microbiology, Prescott, L.M J.P. Harley and C.A. Blein 1995. 2nd edition Wm, C.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Discuss biological sciences, its scope and perspectives.	**7,12**
2	Discuss regarding the ecological energetics, its working mechanism, identification of organisms.	**7,12**
3	Analyse the mechanism of transfer of character from parent to next generation.	**8,9**
4	Explain the genetic code and production of proteins.	**8,9**
5	Interprets the relation between various physiological processes of our body	**7,12**

SEMESTER – III									
Course Title	**Mathematics III (PDE, Probability and Statistics)**								
Course code	**22BTME212R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40T	**4**	**0**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering. 2. To introduce the solution methodologies of initial and boundary value problems. 3. To introduce the solution methodologies of random variables. 4. To provide an overview of probability to engineers. 5. To provide an overview of statistics to engineers.								
CO1	Enable to solve fields problems in engineering involving PDEs.								
CO2	Enable to solve fields problems in engineering involving PDEs.								
CO3	Enable to formulate and solve problems involving random variables								
CO4	Enable to solve problems of various probability distribution.								
CO5	Analyzing experimental data by applying statistical methods.								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**BL**

I	**Partial Differential Equation:** First order partial differential equations, solutions of first order linear and non-linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification.	**8**	To solve fields problems in engineering involving PDEs.	1,2
II	**Initial and Boundary value problem:** Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, and solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.	**10**	To solve fields problems in engineering involving PDEs.	2,3,4
III	**Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.	**8**	To formulate and solve problems involving random variables	2,3,4,5
IV	**Continuous Probability Distributions:** Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	**5**	To solve problems of various probability distribution.	5,6

V	**Basic Statistics:** Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	**9**	Analyzing experimental data by applying statistical methods.	5,6

TEXT BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &

Sons, 2006.

2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition,

2000.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Enable to solve fields' problems in engineering involving PDEs.	1,2,4
2	Enable to solve fields' problems in engineering involving PDEs.	1,3,4
3	Enable to formulate and solve problems involving random variables	1,2,4
4	Enable to solve problems of various probability distributions.	1,2,4

5	Analysing experimental data by applying statistical methods.	1,2,4

SEMESTER – III									
Course Title	**Basic Electronics Engineering**								
Course code	**22BTME213R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ III semester of 2nd year of the programme**								
Course Objectives (Minimum 3)	1. To provide an overview of electronic device components to Mechanical engineering students 2. To provide an overview of Basic knowledge of Digital electronics 3. To provide an overview of communication system								
CO1	Uses of the Diode and Transistors in various Circuits.								
CO2	Operations of the OPAMP in various kinds of Circuits.								
CO3	Applications of IC 555 timer circuit.								
CO4	Determination of the Fundamentals of Digital Electronics.								
CO5	Summarization of the basics of Electronic Communication Systems.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Semiconductor Devices and Applications:** Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth.	**5**	To provide an overview of electronic device components to Mechanical engineering students	1,2
II	**Operational amplifier and its applications:** Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator.	**5**	To summarize the different types of components used in Electronics Engineering	1,2
III	**Timing Circuits and Oscillators:** RC-timing circuits, IC 555 and its applications as stable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.	**10**	To summarize the different types of components used in Electronics Engineering	1,2
IV	**Digital Electronics Fundamentals:** Difference between analogy and digital signals, Boolean algebra, Basic and	**8**	To provide an overview of Basic knowledge of Digital electronics	1,2

	Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.			
V	**Electronic Communication Systems:** The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and Block diagram of GSM system.	**8**	To provide an overview of communication system	1,2

TEXT BOOK:

1. Basic Electrical Engineering by Mehta V.K. & Mehta Rohit

REFERENCES BOOK:

1. Basic Electronics, B.L Thereja

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Uses of the Diode and Transistors in various Circuits.	2,3&4
2	Operations of the OPAMP in various kinds of Circuits.	1,2&4
3	Applications of IC 555 timer circuit.	1,2&4
4	Determination of the Fundamentals of Digital Electronics.	3,4,5
5	Summarization of the basics of Electronic Communication Systems.	5,6

SEMESTER – III									
Course Title	**Engineering Mechanics**								
Course code	**22BTME214R**	**Total credits: 3** **Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Confidently tackle equilibrium equations, moments and inertia problems. 2. Master calculator/computing basic skills to use to advantage in solving mechanics problems. 3. Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering.								
CO1	Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.								
CO2	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.								
CO3	Apply basic knowledge of mathematics and physics to solve real-world problems.								
CO4	Understand basic structural analysis covering and review of particle dynamics								
CO5	Understanding the concepts of Virtual Work and introduction to Kinetics of Rigid Bodies								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Engineering Mechanics covering:** Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy	**7**	To understand force systems, resultant, equilibrium of forces, equations of equilibrium of Coplanar systems.	2,3

II	**Friction covering & Mechanical Vibrations covering:** Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums.	**7**	To understand Friction covering and Mechanical Vibrations covering	2,3
III	**Basic Structural Analysis covering & Review of particle dynamics:** Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines; Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).	**7**	To understand basic structural analysis covering and review of particle dynamics	2,4
IV	**Centroid and Centre of Gravity covering:** Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of	**8**	To understand the concept of Centroid and Centre of Gravity.	3,4,5

	circular plate, Cylinder, Cone, Sphere, Hook			
V	**Virtual Work and Energy Method & Introduction to Kinetics of Rigid Bodies covering:** Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation	**7**	Understanding the concepts of Virtual Work and introduction to Kinetics of Rigid Bodies	2,3,4

Text Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

Reference Books:

1. R. C. HibBLer (2006), Engineering Mechanics: Principles of Statics and Dynamics Pearson Press.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Use scalar and vector analytical techniques for analysing forces in statically determinate structures.	1,2,3&4
2	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.	1,2,3&4
3	Apply basic knowledge of maths and physics to solve real-world problems.	3,4
4	Understand basic structural analysis covering and review of particle dynamics	3,4
5	Understanding the concepts of Virtual Work and introduction to Kinetics of Rigid Bodies	3,4

<table>
<tr><th colspan="10">SEMESTER – III</th></tr>
<tr><td>Course Title</td><td colspan="9">Thermodynamics</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTME215R</td><td rowspan="2">Total credits: 3
Total hours: 36T</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td colspan="2">Nil</td><td>Co-requisite</td><td colspan="6">Nil</td></tr>
<tr><td>Programme</td><td colspan="9">Bachelor of Technology in Mechanical Engineering</td></tr>
<tr><td>Semester</td><td colspan="9">Fall/ III semester of second year of the programme</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="9">1. To learn about work and heat interactions, and balance of energy between system and its surroundings.
2. To learn about application of I law to various energy conversion devices.
3. To evaluate the changes in properties of substances in various processes.
4. To understand the difference between high grade and low grade energies and II law limitations on energy conversion.</td></tr>
<tr><td>CO1</td><td colspan="9">After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions</td></tr>
<tr><td>CO2</td><td colspan="9">Students can evaluate changes in thermodynamic properties of substances.</td></tr>
<tr><td>CO3</td><td colspan="9">The students will be able to evaluate the performance of energy conversion devices</td></tr>
<tr><td>CO4</td><td colspan="9">The students will be able to differentiate between high grade and low grade energies</td></tr>
<tr><td>CO5</td><td colspan="9">The students will understand Claudius Inequality, Entropy, Availability, unavailability, Exergy analysis, Brayton cycle, Rankine cycle, Carnot cycle</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work - Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work.</td><td>7</td><td colspan="3">Students can evaluate changes in thermodynamic properties of substances.</td><td>2,3</td></tr>
</table>

II	Temperature, Definition of thermal equilibrium and Zeroth law; Temperature scales; Various Thermometers- Definition of heat; examples of heat/work interaction in systems- First Law for Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy	**7**	The students will be able to evaluate the performance of energy conversion devices	2,3
III	Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollier's chart	**7**	To understand the properties of pure substance	3,4
IV	First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume	**8**	To understand the concept of Centroid and Centre of Gravity.	3,4
V	Clausius inequality; Definition of entropy S ; Demonstration that entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of s from steam tables- Principle of increase of entropy; Illustration of processes in T-s coordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume. Exergy balance equation and Exergy analysis, Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with	**7**	Understanding the concepts of Virtual Work and introduction to Kinetics of Rigid Bodies	3,4

	Carnot cycle			

TEXT BOOKS:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India

REFERENCE BOOKS:

1. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
2. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions	1,2&3
2	Students can evaluate changes in thermodynamic properties of substances.	2,3&4
3	The students will be able to evaluate the performance of energy conversion devices	1,3&4
4	The students will be able to differentiate between high grade and low grade energies	2,3&4
5	The students will understand Clausius Inequality, Entropy, Availability, unavailability, Exergy analysis, Brayton cycle, Rankine cycle, Carnot cycle	1,3&4

SEMESTER – III									
Course Title	**Techno professional Skills II**								
Course code	**22BTME216R**	**Total credits: 2 Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. This course will help the students to learn about the different engineering graphical view in 2D as well as 3D. 2. Different types of machining processes used in the industry can be learnt through this course 3. Learn the importance of critical thinking								
CO1	Illustrate various projected views of objects of engineering graphics and design.								
CO2	Demonstrate various machining processes in workshop.								
CO3	Learn real time applications of logic and coding								
CO4	Encourage the students towards Non-traditional thinking								
CO5	Effectively communicate scientific and technical knowledge in a professional manner								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Different types of projected view in engineering application.	**5**	Illustrate various projected views of objects of engineering graphics and design.	1,2
II	Different types of machining processes	**7**	Demonstrate various machining processes in workshop.	1,2
III	Applications of logic and coding	**3**	Learn real time applications of logic and coding	3,4
IV	Critical thinking and learning	**3**	Encourage the students towards Non-traditional thinking	3,4
V	Communication in a scientific and professional way	**2**	Effectively communicate scientific and technical knowledge in a professional manner	3,4

TEXT BOOKS:

1. Workshop Technology, Hazra and Choudhury

REFERENCE BOOKS:

1. Fundamentals of C programming, by Abubeker K M

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Illustrate various projected views of objects of engineering graphics and design.	1,2,3&4
2	Demonstrate various machining processes in workshop.	1,2,3&4
3	Learn real time applications of logic and coding	3,4
4	Encourage the students towards Non-traditional thinking	3,4
5	Effectively communicate scientific and technical knowledge in a professional manner	3,4

SEMESTER – III									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ III semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2. To stimulate the interests in the students and provide equal opportunities to all the students to participate 3. To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.								
CO2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.								
CO3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.								
CO4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.								
CO5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**10**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2, 3,4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.	1,3
2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lecturers that foster a deeper understanding of their academic subjects.	3,4,7
3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.	6,8
4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.	4,6
5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.	7,11

SEMESTER – III									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC2111**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ III semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop soft and social skills 2. To promote a holistic development of the learners 3. To enhance the learning experience in different stages etc.								
CO1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc								
CO2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.								
CO3	The students will be trained to represent ADTU in various inter university, state and national level competitions**.**								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Different types of activities outside regular curriculum	**10**	1. AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest. These activities are aimed to develop the social and soft skills and promote a holistic development of the learners. 2. Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc. 3. The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies. 4. The student members of the club are trained represent AdtU in various inter University student and national level competitions. 5. Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	1,2,3 ,4,5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc	1,3
2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.	3,4,7
3	The students will be trained to represent ADTU in various inter university, state and national level competitions**.**	6,8
4	The students will be given a platform to earn from invited experts in their respective fields.	4,6
5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.	7,11

SEMESTER – III									
Course Title	**English for Employability for Engineers**								
Course code	**22UBPD213R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To Enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be aBLe to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	The mastery of Basic English grammar will make the students confident to use English for all professional purposes.								
CO2	The communication skills facilitated in this course will help them make meaningful and successful conversations.								
CO3	The students will have their communication improved in all domains.								
CO4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.								
CO5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Parts of Speech Articles Auxiliary Verbs Affirmative and Negative Sentences	**5**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and meaningful sentences.	1, 2
II	Determiners Sentence Construction Types of Sentences (Assertive, Imperative, etc.) Degree of Comparison Comprehension Exercises	**5**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and	2, 3, 4

			exclamatory). The concept of the degree of comparison (positive, comparative, and superlative) will be explored. The module will also include comprehension exercises designed to enhance students' ability to understand and interpret written texts effectively	
III	What is listening? The Process of Listening Factors that adversely affect Listening Difference between Listening and Hearing, Purpose and Importance of Effective Listening How to Improve Listening Process.	**5**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	Introducing yourself Self-discovery Basics of Phonetics, pronunciation Extempore speech Video Recording for Self reflection	**10**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	Introduction to Communication, Importance of Communication Skills, Purpose of Communication, Types of Communication, Formal and informal communication Importance of Communication, Barriers to Communication, How to improve/ tips to improve Communication skills. Responding to different questions in various situations (formal/informal)	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	2, 3, 4, 5

TEXT BOOKS:

1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.
2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & Company Ltd.: New Delhi.

REFERENCE BOOKS:

1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India
2. Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Blett

OTHER LEARNING RESOURCES:

1. https://youtu.be/bEB8-SWMYhI

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The mastery of Basic English grammar will make the students confident to use English for all professional purposes.	6,10
2	The communication skills facilitated in this course will help them make meaningful and successful conversations.	6,10
3	The students will have their communication improved in all domains.	6,10
4	Develop and deliver professional presentations using appropriate engineering language and communication techniques.	6,10
5	Analyze and adapt communication strategies for diverse engineering workplace scenarios, demonstrating cross-cultural competence.	6,10

SEMESTER – III									
Course Title	**Basic Life Saving Skills**								
Course code	**22UULS212R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15T	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with essential knowledge and skills in basic life-saving techniques, including CPR and first aid. 2. Develop the ability to assess emergency situations and respond effectively to various types of injuries and medical conditions. 3. Foster an understanding of preventive measures and safety protocols to minimize the occurrence of emergencies and enhance overall community safety.								
CO1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).								
CO2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care								
CO3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.								
CO4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.								
CO5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Unit 1: Introduction to Life-Saving Skills** • Importance of life-saving skills • Basic principles of first aid • Legal and ethical aspects of providing first aid • Personal safety and use of protective equipment • Assessing the scene of an emergency	**5**	This unit covers the importance of life-saving skills and the basic principles of first aid. It discusses the legal and ethical aspects of providing first aid, emphasizing the importance of personal safety and the use of protective equipment. Students will learn how to assess the scene of an emergency to ensure safety and efficiency in providing aid.	1, 2
II	**Unit 2: Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillators (AED)** • Anatomy and physiology relevant to	**5**	Students will delve into the anatomy and physiology relevant to CPR, learning the steps for performing CPR on adults, children, and infants. This unit includes the principles and procedures for using an AED, with	2, 3, 4

	CPR • Steps for performing CPR on adults, children, and infants • Use of an AED: principles and procedures • Hands-on practice sessions for CPR and AED use • Recognizing and responding to cardiac emergencies		hands-on practice sessions to ensure proficiency. The unit also focuses on recognizing and responding to cardiac emergencies.	
III	**Unit 3: First Aid Techniques** • Managing Bleeding, wounds, burns, and fractures • Providing first aid for choking, poisoning, and shock • Practical sessions for bandaging, splinting, and other first aid procedures	**5**	This unit teaches essential first aid techniques for managing Bleeding, wounds, burns, and fractures. Students will learn how to provide first aid for choking, poisoning, and shock. The unit includes practical sessions to practice bandaging, splinting, and other first aid procedures	1, 2, 3, 4
IV	**Unit 4: Emergency Medical Conditions** • Recognizing symptoms of heart attacks, strokes, asthma attacks, and diabetic emergencies • Immediate response actions for medical emergencies • Ongoing care until professional help arrives • Importance of staying calm and effective communication during emergencies	**5**	Students will explore common medical emergencies such as heart attacks, strokes, asthma attacks, and diabetic emergencies. This unit covers the recognition of symptoms, immediate response actions, and ongoing care until professional help arrives. Emphasis is placed on staying calm and effective communication during emergencies.	1, 2
V	**Unit 5: Safety and Prevention** • Home and workplace safety measures • Fire prevention and electrical safety	**5**	The final unit focuses on preventive measures to minimize the occurrence of emergencies. Students will learn about home and workplace safety, including fire prevention, electrical safety, and accident prevention. The	2, 3, 4, 5

	• Accident prevention strategies • Community safety programs • Advocating for safety and preventive measures within the community		unit also covers community safety programs and how to advocate for safety and preventive measures within the community.	

TEXT BOOKS:

1. "First Aid Manual" by British Red Cross, St John Ambulance, St Andrew's First Aid, 2016.
2. "Emergency Care and Transportation of the Sick and Injured" by American Academy of Orthopaedic Surgeons (AAOS), 2016.
3. "Advanced First Aid, CPR, and AED" by American Academy of Orthopaedic Surgeons (AAOS), 2011.

REFERENCE BOOKS:

1. "Wilderness First Responder: How to Recognize, Treat, and Prevent Emergencies in the Backcountry" by Buck Tilton, 2010.
2. "Prehospital Trauma Life Support" by National Association of Emergency Medical Technicians (NAEMT), 2014.
3. "Fundamentals of Basic Emergency Care" by Richard W. O. Beebe, Deborah L. Funk, 2013.
4. "CPR and AED" by Alton L. Thygerson, Steven M. Thygerson, 2011.
5. "Basic Life Support (BLS) Provider Manual" by American Heart Association, 2020.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).	6,9
2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care	6,9
3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.	6,9
4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.	6,9
5	Advocate for and promote safety and preventive	6,9

	measures within the community, contributing to a safer environment.	

SEMESTER – III									
Course Title	**Personal Financial Planning**								
Course code	**22UUFL213R**	**Total credits: 1** **Total hours: 15T**	**L** **0**	**T** **0**	**P** **2**	**S** **0**	**R** **0**	**O/F** **0**	**C** **1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Understand the fundamental principles and concepts of personal financial planning. 2. Develop skills in setting SMART financial goals and creating effective budget plans. 3. Gain knowledge of various investment vehicles, their risks, returns, and suitability for different financial goals. 4. Learn strategies for tax-efficient financial planning and retirement savings. 5. Acquire knowledge of estate planning essentials and legal considerations for asset distribution.								
CO1	Ability to create comprehensive personal financial plans aligned with individual goals and values.								
CO2	Proficiency in analyzing and selecting appropriate investment options based on risk tolerance and financial objectives.								
CO3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.								
CO4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.								
CO5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	UNIT 1- Fundamentals of Financial Planning • Principles of financial planning • Setting financial goals • Budgeting and cash flow management	**5**	This unit covers the foundational principles of financial planning, including setting financial goals, creating budgets, and managing cash flow effectively. It emphasizes the importance of understanding personal financial statements and the role of financial planning in achieving long-term financial security.	1, 2
II	UNIT 2- Investment Planning • Types of investments (stocks, bonds, mutual funds, etc.) • Risk and return analysis • Portfolio management strategies	**5**	This unit focuses on different types of investments such as stocks, bonds, mutual funds, and real estate. It explores risk and return analysis, asset allocation strategies, and portfolio management techniques to help individuals build and manage their investment portfolios	2, 3, 4

			effectively.	
III	UNIT 3- Retirement Planning • Retirement savings vehicles (401(k), IRA, pension plans) • Estimating retirement needs • Social Security and Medicare considerations	**5**	Retirement planning addresses the process of saving and investing for retirement. It covers retirement savings vehicles like 401(k) plans and IRAs, estimating retirement needs based on lifestyle expectations, and navigating Social Security and Medicare benefits to optimize retirement income.	1, 2, 3, 4
IV	UNIT 4- Tax Planning • Tax-efficient investment strategies • Tax deductions and credits • Tax implications of retirement distributions	**5**	Tax planning involves strategies to minimize tax liabilities and maximize after-tax income. This unit discusses tax-efficient investment strategies, deductions, credits, and tax implications related to retirement contributions, distributions, and estate planning.	1, 2
V	UNIT 5-Estate Planning • Wills, trusts, and probate • Power of attorney and healthcare directives • Charitable giving and legacy planning	**5**	Estate planning encompasses the process of managing and distributing assets in accordance with an individual's wishes upon death. It covers essential topics such as wills, trusts, probate, power of attorney, healthcare directives, charitable giving, and strategies for minimizing estate taxes.	2, 3, 4, 5

TEXT BOOKS:

1. "Personal Finance" by Jeff Madura, 2016.
2. "Personal Financial Planning" by Lawrence J. Gitman, Michael D. Joehnk, and Randy Billingsley, 2013.
3. "Fundamentals of Financial Planning" by Michael A. Dalton, James F. Dalton, 2011.

REFERENCE BOOKS:

1. "The Bogleheads' Guide to Retirement Planning" by Taylor Larimore, Mel Lindauer, Richard A. Ferri, Laura F. Dogu, 2009.
2. "The Financial Planning Workbook: A Practical Guide to Creating Your Own Financial Plan" by Coventry House Publishing, 2018.
3. "The Millionaire Next Door: The Surprising Secrets of America's Wealthy" by Thomas J. Stanley, William D. Danko, 2010.

4. "Your Money or Your Life: 9 Steps to Transforming Your Relationship with Money and Achieving Financial Independence" by Vicki Robin, Joe Dominguez, 2008.
5. "Smart Couples Finish Rich: 9 Steps to Creating a Rich Future for You and Your Partner" by David Bach, 2009.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Ability to create comprehensive personal financial plans aligned with individual goals and values.	11,12
2	Proficiency in analysing and selecting appropriate investment options based on risk tolerance and financial objectives.	10,11
3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.	9,11
4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.	11,12
5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.	11,12

SEMESTER – III									
Course Title	**MOOCSII (Introduction to Artificial Intelligence)**								
Course code	**22MOSY211R**	**Total credits:2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 20T	**0**	**0**	**0**	**0**	**0**	**0**	**21**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Understanding AI Fundamentals 2. Exploring AI Techniques and Algorithms 3. Future Trends in AI								
CO1	Understanding AI Fundamentals, AI Techniques and Algorithms								
CO2	Understanding AI Concepts and Terminology								
CO3	Understanding AI Ethics and Principles								
CO4	Predicting Future Applications of AI								
CO5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	What is AI? Applications and Examples of AI	**5**	Understanding AI Fundamentals, AI Techniques and Algorithms	1, 2
II	AI Concepts, Terminology, and Application Areas	**5**	Understanding AI Concepts and Terminology	2, 3, 4
III	AI: Issues, Concerns and Ethical Considerations	**5**	Understanding AI Ethics and Principles	1, 2, 3, 4
IV	The Future with AI, and AI in Action	**5**	Predicting Future Applications of AI	3,4

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understanding AI Fundamentals ,AI Techniques and Algorithms	1, 3
2	Understanding AI Concepts and Terminology	4,5
3	Understanding AI Ethics and Principles	3,4,5
4	Predicting Future Applications of AI	3,4,5
5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.	1,7

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME211R	Biology for Engineers	1		2	1	2		1	1				1
22BTME212R	PDE and Transform Mathematics	3	2	2	2								1
22BTME215R	Thermodynamics	3	3	2		1		1	1				2
22BTME214R	Engineering Mechanics	3	2	2	2	2	1			2			1
22BTME213R	Basic Electronics Engineering	3	2	2	2	2	1			2	2		1
22UBPD213R	English for Employability for Engineers						2			2	3	2	2
22BTME216R	Techno-Professional Skills II	2	2	3	2	3							1
22UBCC211	Co-Curricular							2		2	1		1
22UBEC211	Extra-Curricular	2	1	2	1								1
22MOSY211R	MOOCS II					2	2	2	2	3			1
22UULS212R	Basic Life Saving Skills							1	1	2	2		2
22UUFL213R	Personal Financial Planning					2	1		2	1	1		1

SEMESTER – IV									
Course Title	**Fluid Mechanics and Fluid Machines**								
Course code	**22BTME222R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Winter/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To learn about the application of mass and momentum conservation laws for fluid flows 2. To understand the importance of dimensional analysis 3. To obtain the velocity and pressure variations in various types of simple flows								
CO1	Learn to discover the importance of various fluid properties at rest and in transit.								
CO2	Learn to outline the students to classify the importance of dimensional analysis.								
CO3	Learn to point out to choose the velocity and pressure variations in various types of simple flows.								
CO4	Learn to relate the students to analyze the flow in water pumps and turbines.								
CO5	Learn to utilize mathematically to analyze fluid dynamic properties.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Definition of fluid, Newton's law of viscosity, Units and dimensions- Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow, Bernoulli's equation and its applications.	**6**	Learning about the types of fluid, units and measurement. Derivation of Bernoulli's equation and its application.	2,4
II	Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness – Darcy Weisbach equation, friction factor, Moody's diagram	**6**	Learning about the flow of fluid in channels and ducts. Derivation of Darcy-Weisbach equation	2,4, 5
III	Need for dimensional analysis – methods of dimension analysis – Similitude – types of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis	**4**	Learning about the dimensional analysis through different methods.	2,4, 5
IV	Euler's equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps Reciprocating pump – working principle	**10**	Learning about the different types of pumps and working principles. Derivation of Euler's equation and its application	2,4, 5
V	Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines-	**10**	Learning about the different types of turbines and its parts.	2,4, 5

	Pelton wheel, Francis turbine and Kaplan turbines, working principles – draft tube-Specific speed, unit quantities, performance curves for turbines – governing of turbines.			

TEXT BOOKS:

1. Fluid Mechanics and hydraulic machines, R. K. Bansal
2. Fluid Mechanics by Yunus Cengel, Jhon Cimbala, Tata Macgraw Hill, New Delhi

REFERENCE BOOKS:

1. Fluid Mechanics by Streeter & Wylie, Tata McGraw Hill

OTHER LEARNING RESOURCES:

1. Home :: NPTEL

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to discover the importance of various fluid properties at rest and in transit.	1&2
2	Learn to outline the students to classify the importance of dimensional analysis.	2,3
3	Learn to point out to choose the velocity and pressure variations in various types of simple flows.	1,2
4	Learn to relate the students to analyze the flow in water pumps and turbines.	2,4
5	Learn to utilize mathematically to analyze fluid dynamic properties.	2,3

SEMESTER – IV									
Course Title	**Strength of Materials**								
Course code	**22BTME223R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres for various types of simple loads. 2. To calculate the elastic deformation occurring in various simple geometries for different types of loading								
CO1	Analyze and calculate different types of stresses and strains, including axial, torsional, bending, and shear stresses.								
CO2	Determine material properties such as elasticity, plasticity, and creep, and their effects on the behavior of materials under various loading conditions.								
CO3	Analyze and calculate the deformation and stability of structural elements, such as beams, columns, and shafts.								
CO4	Choose appropriate materials for specific engineering applications based on their mechanical properties, durability, and cost.								
CO5	Identify and analyze the different failure criteria of materials and their effects on the performance and safety of structures.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Deformation in solids- Hooke's law, stress and strain- tension, compression and shear stresses- elastic constants and their relations- volumetric, linear and shear strains- principal stresses and principal planes- Mohr's circle.	**8**	Learn about Hooke's law. To find the shear stress and shear strain by graphical method (Mohr's Circle)	1
II	Beams and types, transverse loading on beams- shear force and bend moment diagrams- Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.	**6**	Lean about different types of beams and their analysis.	2
III	Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.	**6**	Learn about Maxwell's reciprocal theorems, moment of inertia etc.	3
IV	Torsion, stresses and deformation in circular and hollow shafts, stepped	**6**	Learn about different types of helical springs and their analysis.	4

	shafts, deflection of shafts fixed at ends, stresses and deflection of helical springs.			
V	Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure.	**10**	Learn about thick cylinders and their analysis	6
Practical	Impact Test (Izod) Impact Test (Charpy) Torsion Test of Metal rod Hardness (Rockwell & Brineil)	**20**	Learn about the hardness and toughness of the materials through different methods.	1,2, 3,4

TEXT BOOKS:

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
2. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
3. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGraw Hill Publishing Co. Ltd., New Delhi 2005.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze and calculate different types of stresses and strains, including axial, tensional, bending, and shear stresses.	2,3
2	Determine material properties such as elasticity, plasticity, and creep, and their effects on the behaviour of materials under various loading conditions.	1,2
3	Analyze and calculate the deformation and stability of structural elements, such as beams, columns, and shafts.	1,3&4
4	Choose appropriate materials for specific engineering applications based on their mechanical properties, durability, and cost.	1,4&5
5	Identify and analyze the different failure criteria of materials and their effects on the performance and safety of structures.	1,3&4

SEMESTER – IV									
Course Title	**Materials Engineering**								
Course code	22BTME224R	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Winter/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	**1.** To provide knowledge of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria. **2.** To provide a detailed interpretation of equilibrium phase diagrams. **3.** To learn about different phases and heat treatment methods to tailor the properties of Fe-C alloys								
CO1	Learn to identify the crystal structures of different materials and understand the defects in such structures.								
CO2	Learn the different mechanical property measurement methods and evaluate their performances.								
CO3	Learn how to tailor the material properties of ferrous and non-ferrous alloys.								
CO4	Learn to identify and understand different heat treatment processes and determine their specific application in different manufacturing processes.								
CO5	Learn to evaluate the performance of alloying steels in manufacturing applications.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Crystal Structure:** Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.	**4**	Learn to identify the crystal structures of different materials and understand the defects in such structures.	2,4
II	**Mechanical Property Measurement:** Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength	**6**	Learn the different mechanical property measurement methods and evaluate their performances.	2,4, 5
III	**Static failure theories:** Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximum normal stress, Mohr-Coulomb and Modified Mohr-Coulomb; Fracture mechanics: Introduction to Stress-intensity factor approach and Griffith criterion.	**6**	Learn how to tailor the material properties of ferrous and non-ferrous alloys.	2,4, 5

	Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of mean stress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT)			
IV	**Alloys, substitutional and interstitial solid solutions:** Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron.	**8**	Learn to identify and understand different heat treatment processes and determine their specific application in different manufacturing processes.	2,4, 5
V	**Heat treatment of Steel:** Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening, Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titanium alloys	**12**	Learn to evaluate the performance of alloying steels in manufacturing applications.	2,4, 5

TEXT BOOKS:

1. Willam Calliister,2002, Materials Science and Engineering.
2. V. Raghavan, 1974, Materials Science and Engineering.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to identify the crystal structures of different materials and understand the defects in such structures.	1,4
2	Learn the different mechanical property measurement	3,4

	methods and evaluate their performances.	
3	Learn how to tailor the material properties of ferrous and non-ferrous alloys.	1,3
4	Learn to identify and understand different heat treatment processes and determine their specific application in different manufacturing processes.	1,3&4
5	Learn to evaluate the performance of alloying steels in manufacturing applications.	1,3&4

SEMESTER – IV									
Course Title	**Instrumentation and Control**								
Course code	**22BTME225R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Winter/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with the knowledge to critically evaluate the performance of various measurement systems, focusing on key parameters such as accuracy, range, resolution and potential error sources. 2. Teach and fundamental principles of control systems between open- loop and closed- loop configurations and guide students through the design of Block diagrams representing control processes. 3. Provide hands- on experience in selecting and integrating actuators (pneumatic, hydraulic, and electric) for correction elements and in choosing and tuning control methods (P, PI, PID) to achieve desired system performance.								
CO1	The uses of Measurement systems and performance								
CO2	To generalization of the Instrumentation system elements								
CO3	Analysis of the Signal processing and conditioning; correction elements								
CO4	Outlining the Control systems								
CO5	To learn the other Controlling methods								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Measurement system and performance-**accuracy, range, resolution, error sources	**3**	The uses of Measurement systems and performance.	2,4
II	**Instrumentation system element-** sensors for common engineering measurement	**8**	To generalization of the Instrumentation system elements	2,3, 4,5
III	**Signal processing and conditioning correction element-**actuators, pneumatic, hydraulic, electric	**7**	Analysis of the Signal processing and conditioning; correction elements	2,4, 5
IV	**Control system-**basic elements, open/closed loop, design of Block diagram	**8**	Outlining the Control systems	2,4, 5
V	**Control method-** P, PI,PID, when to choose what, tuning of controllers, system models, transfer function and system response, frequency response, Nyquist diagram and their uses	**10**	To learn the other Controlling methods.	2,4, 5

TEXT BOOKS:

1. Instrumentation and control system by W. Bolton, 2nd edition, Newnes,200Bishnoi OP. 2007. Principles of Agricultural Meteorology. Oxford Book Co

2. Thomas G Beckwith, Roy D. Maragoni, JohnHLienhardV, Mechanical Measurements 6th edition, Pearson Education India 2007Bishnoi OP. 2007. Principles of Agricultural Meteorology. Oxford Book Co.
3. Gregory K. McMillan, Process/ Industrial Instruments and controls Handbook, 5th edition, McGrow-Hill: New York, 1999

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The uses of Measurement systems and performance	1,2&3
2	To generalization of the Instrumentation system elements	2,3&4
3	Analysis of the Signal processing and conditioning; correction elements	3,4&5
4	Outlining the Control systems	1,2&3
5	To learn the other Controlling methods	1,2&3

SEMESTER – IV									
Course Title	**ENVIRONMENTAL SCIENCE**								
Course code	**22BTME227R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 24T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To prepare students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective. 2. To develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge, Skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and prevention of new ones. 3. The student will be made aware of our environment in general, Natural Resources, Ecosystems and the importance of Social issues related to environment and Human Population.								
CO1	Students will acquire knowledge about different resources and the Impact of depletion of resources.								
CO2	Correlating the relationship between Human Population and the Environment.								
CO3	Elaboration on food chains, food webs and ecological pyramids.								
CO4	Students will be able to illustrate on Biodiversity and its conservation								
CO5	Brief outline on Disaster management.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Introduction To Environment:** Definition and scope, components of environment, atmosphere, hydrosphere, lithosphere and biosphere, structure and composition. Life systems, pro and eukaryotic organizations, Metabolic principles; types of plants and animals. Producers, consumers and decomposers.	**6**	Students will acquire knowledge about different resources and the Impact of depletion of resources.	2,4
II	**Ecology:** Terminology and approach, ecosystem, types of ecosystem; structure and function, mineral cycling, energy flow and tropic chains. Development and evolution	**3**	Correlating the relationship between Human Population and the Environment.	2,4, 5
III	**Environmental Pollution:** Sources, causes, assessment, effect, prevention and control of water pollution, air pollution, noise and land pollution. Strategies of management, concept of sustainability. Energy, environment and their relationship with human activities. Water Resources and utilization, forest resources.	**9**	Elaboration on food chains, food webs and ecological pyramids.	2,4, 5
IV	**Global Environmental Problems:**	**3**	Students will be able to illustrate	2,4,

	Human health, settlements, management of rivers, lakes, forests, wild life and catchments. Role of society, NGO and Govt. agencies. Concept of urbanization and green cities Global Warming, green house causes and effects, carbon Sequestration.		on Biodiversity and its conservation	5
V	**International Agreements and Protocols:** National forest policy and Environmental laws and act. EIA	**3**	Brief outline on Disaster management.	2,4, 5

TEXT BOOKS:

1. H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International.
2. J. G. Henry and G.H. Heinke, Environmental Science and Engineering, Prentice Hall International.
3. G.M. Masters, Introduction to Environmental Engineering and Science, Pearson Education.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will acquire knowledge about different resources and the Impact of depletion of resources.	7,12
2	Correlating the relationship between Human Population and the Environment.	7,12
3	Elaboration on food chains, food webs and ecological pyramids.	7,12
4	Students will be able to illustrate on Biodiversity and its conservation	7,12
5	Brief outline on Disaster management.	7,12

SEMESTER – IV										
Course Title	**Techno-Professional Skills-III**									
Course code	**22BTME226R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 20P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To learn about the different parts and operations of Lathe Machine 2. To learn about the operations of drilling, shaper and milling operations 3. To work on different work piece and jobs using different machines available in the workshop								
CO1	Learn about the parts and operation of a Lathe Machine								
CO2	Learn about the operations to be performed in Drilling, Shaper and Milling Machine								
CO3	Learn about different tools that are to be used in workshop.								
CO4	Learn about the safety measures to be taken while performing Jobs								
CO5	Perform different Jobs with different Work pieces								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Tapping	**4**	Learn about tapping and its operations	2,4
II	Drilling	**5**	Learn about Drilling and Drill Machines and its parts	2,4, 5
III	Turning	**3**	Learn about the operation of turning in Lathe	2,4, 5
IV	Facing	**4**	Learn about Facing operation in Lathe	2,4, 5
V	Knurling and Tapper turning	**4**	Learn about Knurling and Tapper turning operation in Lathe machine	2,4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn about the parts and operation of a Lathe Machine	1,2,3
2	Learn about the operations to be performed in Drilling, Shaper and Milling Machine	1,3,4
3	Learn about different tools that are to be used in workshop.	3,4,5
4	Learn about the safety measures to be taken while performing Jobs	3,4,5

5	Perform different Jobs with different Work pieces	3,4,5

SEMESTER – IV									
Course Title	**Applied Thermodynamics**								
Course code	**22BTME227R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To understand the application of 1st law and 2nd law of thermodynamics 2. To understand the conversion of available energy 3. To create a bridge between theory and practical application of thermodynamics								
CO1	Learn to apply energy balance to systems and control volumes								
CO2	Learn to compute the changes in thermodynamic properties of substances								
CO3	Learn to classify the performance of energy conversion devices								
CO4	Learn to differentiate between high grade and low-grade energies								
CO5	Learn to associate work and heat interactions, and the balance of energy between the system and its surroundings								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Availability:** Available and unavailable energy, Available energy referred to a cycle, Availability in non-flow or closed system (Non-cyclic), Availability of steady-flow systems, Helmohltz and Gibb's functions, Irreversibility and loss in availability, Effectiveness.	**8**	Learn to apply energy balance to systems and control volumes	2,4
II	**Boiler:** Classification of boilers, mountings, accessories, evaporation capacity, equivalent evaporation, boiler efficiency, selection of a boiler, boiler feed water treatment and boiler troubles.	**4**	Learn to compute the changes in thermodynamic properties of substances	2,4, 5
III	**Basic steam power cycles:** Carnot and Rankine cycles, Modified Rankine cycle, Regenerative and Reheat cycles	**7**	Learn to classify the performance of energy conversion devices	2,4, 5
IV	**Steam nozzles:** Expansion of steam through nozzles, velocity and pressure variation in nozzles, Critical pressure ratio, mass flow rate and maximum mass flow rate, Representation of heat drop in nozzles in Mollier diagram, Nozzle efficiency.	**10**	Learn to differentiate between high grade and low-grade energies	2,4, 5
V	**Steam turbines & condensers:** Classification, Flow of steam through impulse and reaction turbines, Velocity diagrams, Reheating, Bleeding, Reheat	**14**	Learn to associate work and heat interactions, and the balance of energy between the system and its surroundings	2,4, 5

	factor, Compounding and governing of steam turbines, Back pressure turbines, Pass out turbines, Function of steam condenser, Elements of a condenser plant, vacuum production, Delton's law of partial pressure, Classification of condensers, Removal of air from the condensers, Vacuum efficiency and condenser efficiency, Determination of cooling water, Cooling towers and cooling ponds.			

TEXT BOOKS:

1. Domkundwar, Kothendaraman, Khajuria,Arora, "A Course in Thermodynamics and Heat Engines", Dhanpat Rai and Sons.
2. Rajput, "Thermal Engineering", Laxmi Publications.
3. Patel, Karamchandani, "Elements of Heat Engines"

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to apply energy balance to systems and control volumes	1,3&7
2	Learn to compute the changes in thermodynamic properties of substances	1,2&4
3	Learn to classify the performance of energy conversion devices	1&7
4	Learn to differentiate between high grade and low-grade energies	7&12
5	Learn to associate work and heat interactions, and the balance of energy between the system and its surroundings	3&7

SEMESTER – IV									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ IV semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2. To stimulate the interests in the students and provide equal opportunities to all the students to participate 3. To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.								
CO2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lecturers that foster a deeper understanding of their academic subjects.								
CO3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.								
CO4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.								
CO5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.								
Unit-No.	**Content**		**Contact Hour**			**Learning Outcome**			**BL**
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree		**10**			Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.			1,2 ,3, 4,5

	perspective.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.	1,3
2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lecturers that foster a deeper understanding of their academic subjects.	3,4,7
3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.	6,8
4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.	4,6
5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.	7,11

SEMESTER – IV									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC221**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 10P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ IV semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop soft and social skills 2. To promote a holistic development of the learners 3. To enhance the learning experience in different stages etc.								
CO1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc								
CO2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.								
CO3	The students will be trained to represent AdtU in various inter university, state and national level competitions**.**								
CO4	The students will be given a platform to earn from invited experts in their respective fields.								
CO5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Different types of activities outside regular curriculum	**10**	1. AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest. These activities are aimed to develop the social and soft skills and promote a holistic development of the learners. 2. Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc. 3. The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies. 4. The student members of the club are trained represent AdtU in various inter University student and national level competitions.	1,2,3 ,4,5

			5. Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The students will be engaged in different activities headed under different clubs namely dance, music, photography, drama, literacy, etc	9,12
2	The students will participate in regular club activities like workshops, competitions as per their interest and hobbies.	9,10,12
3	The students will be trained to represent ADTU in various inter university, state and national level competitions**.**	9,10
4	The students will be given a platform to earn from invited experts in their respective fields.	9,10
5	The students will get an exposure of 360 degree learning methodology considering the overall growth along with the academics.	8,12

SEMESTER – IV									
Course Title	**BASIC ACCLIMATIZING SKILLS (BAS)**								
Course code	**22UULS201R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To impart knowledge of the fundamentals of Hospitality industry and its applications. 2. Students will be able to familiarize with the cooking equipment & Utensils. 3. Students will be able to handle different modes of reservations.								
CO1	Students will have basic knowledge of cooking methods.								
CO2	Students will gain the knowledge of organizing & Cleaning of Rooms.								
CO3	Students will be able to gain the travel management concept.								
CO4	Students will be able to acquire the knowledge of basic households' amenities for day- to-day use.								
CO5	Learn to associate work and heat interactions, and the balance of energy between the system and its surroundings								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction to Accommodation Management** Telephone handling technique Organizing of Rooms. Cleaning agents. Cleaning equipment and uses. Bed making Process.	**8**	Learn the art of handling telephone, organizing rooms, cleaning equipment and bed making.	2,4
II	**Fundamentals of Cooking:** Definition of cookery –Aim & Objectives of cooking. Use of basic Cooking equipment Personal Hygiene and Safety Use of Fire & Fuels	**6**	Learning the fundamentals of cooking, using basic cooking equipment.	2,4, 5
III	**Methods of Cooking:** Different Cuts. Use of Herbs and Spices. Basic Food and Beverage Preparation. Regional food Habits.	**10**	Understanding the different methods of Cooking, cutting techniques and learning the food habits in different regions.	2,4, 5
IV	**Forms & Format's:** C –form Reservation form Registration form Passport Application form Legal Rent Agreement	**12**	Learning different forms and formats.	2,4, 5

TEXT BOOKS:

1. Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt. Ltd-New Delhi.
2. Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restaurateur, Guides.
3. Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.
4. Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will have basic knowledge of cooking methods.	9&12
2	Students will gain the knowledge of organizing & Cleaning of Rooms.	9&12
3	Students will be able to gain the travel management concept.	9&12
4	Students will be able to acquire the knowledge of basic households' amenities for day- to-day use.	9&12
5	Learn to associate work and heat interactions, and the balance of energy between the system and its surroundings	9&12

SEMESTER – IV									
Course Title	**ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD224R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions. Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Writing Skills** Paragraph Writing & Narratives Letter Writing Technical Writing **Pipe and cistern** Introduction of pipes and cistern Solving different types of questions Worksheet1 and Worksheet 2	**7**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** SWOT Analysis Goal Setting and Personal Hygiene **Mixture allegation and Clock** Introduction of basics Solving questions on mixture and allegation. Worksheet1 and Worksheet 2	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and allegations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** Understanding different aspects of a word (such as the use of say, tell, speak). Learning strategies to develop vocabulary	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2

	Contextual vocabulary learning Use of phrasal verbs and idioms in a conversation Effectively using dictionary, thesaurus **Statement and Course of action** Revision of syllogism Statement and conclusion Course of action based on statement Worksheet1 and Worksheet 2			
IV	**Interview Skills & Dress Code Ethics** Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview Common interview questions and answering strategies Dress Code Ethics during Interviews Mock Interview Session **Sitting arrangement (puzzle)** Linear arrangement puzzle Circular arrangement puzzle Matrix Worksheet1	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** Introduction to basics Introduction to discount Problems related on the topics Worksheet1 and Worksheet 2	**7**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

TEXT BOOKS:

1. Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.
2. McDowell, Gayle Laakmann. 2008.Cracking the Coding Interview (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams

REFERENCE BOOKS:

1. Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction
2. Fast track Objective mathematics for Competitive exam by Arihant
3. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	5, 7
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	8
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	7.9,10
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	11,12
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioural questions confidently.	10

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME221R	Applied Thermodynamics	3	2	2		1		1	1				3
22BTME222R	Fluid Mechanics and Fluid Machines	3	3	1		2		1	1				2
22BTME223R	Strength of Materials	3	2	2		1		1	1				3
22BTME224R	Materials Engineering	3	3	1		2		1	1				3
22BTME225R	Instrumentation and Control	2	1	1		2		1	2				2
22UULS221R	Basic Acclimatizing Skills							2	2	2	1		2
22BTME227R	Environmental Science			2	2	1				2			2
22MOSY221R	English language proficiency for engineers		2	1	2	2		1	1	1			
22BTME226R	Techno-Professional Skills III	2	2	3	2	3							1
22UBCC221	Co-Curricular							2		2	1		1

22UBEC221	Extra-Curricular	2	1	2	1								1

SEMESTER – V									
Course Title	**Heat Transfer**								
Course code	**22BTME311R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T+ 20P	**3**	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ V semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. The aim of the course is to build a solid foundation in heat transfer exposing students to the three basic modes namely conduction, convection and radiation. 2. Rigorous treatment of governing equations and solution procedures for the three modes will be provided, along with solution of practical problems using empirical correlations. 3. The course will also briefly cover boiling and condensation heat transfer, and the analysis and design of heat exchangers.								
CO1	Understand the basic modes of heat transfer.								
CO2	Discuss conduction heat transfer for steady and unsteady flows.								
CO3	Summarize the correlations for forced and free convection.								
CO4	Explain the interaction of radiations with materials.								
CO5	Solve numerical by applying gained theoretical knowledge.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to three modes of heat transfer, Derivation of heat balance equation- Steady one dimensional solution for conduction heat transfer in Cartesian, cylindrical and spherical geometry, concept of conduction and film resistances, critical insulation thickness, lumped system approximation and Biot number, heat transfer through pin fins- Two dimensional conduction solutions for both steady and unsteady heat transfer- approximate solution to unsteady conduction heat transfer by the use of Haussler charts	**12**	Analyze the basic modes of heat transfer	1,2
II	Heat convection, basic equations, boundary layers- Forced convection, external and internal flows- Natural convective heat transfer- Dimensionless parameters for forced and free convection heat transfer-Correlations for forced and free convection- Approximate solutions to laminar boundary layer equations (momentum and energy) for both internal and external flow- Estimating heat transfer	**8**	Analyze different types of convection methods	3,4

	rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection.			
III	Interaction of radiation with materials, definitions of radioactive properties, Stefan Boltzmann's law, Black and gray body radiation, Calculation of radiation heat transfer between surfaces using radioactive properties, view factors and the grandiosity method.	**6**	Explain the interaction of radiations with materials.	3,4
IV	Types of heat exchangers, Analysis and design of heat exchangers using both LMTD and ε-NTU methods.	**6**	Design devices such as heat exchangers and also estimate the insulation needed to reduce heat losses where necessary.	5,6
V	Boiling and Condensation heat transfer, Pool boiling curve. Introduction mass transfer, Similarity between heat and mass transfer.	**4**	Students will learn to understand boiling and condensation phenomenon	5,6
Practical	1. Emissivity measurement 2. Heat transfer through composite wall 3. Natural convection and forced convection	**20**	Study to find out the emissivity of Black body and grey body, Study to find out the heat transfer coefficient of composite wall, Study to find out the convection coefficient.	

TEXT BOOKS:

1. Bejan, Heat Transfer John Wiley, 1993
2. J.P.Holman, Heat Transfer, Eighth Edition, McGraw Hill, 1997.
3. F.P.Incropera, and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley, Sixth Edition, 2007.

REFERENCE BOOKS:

1. MassoudKaviany, Principles of Heat Transfer, John Wiley, 2002
2. Yunus A Cengel, Heat Transfer: A Practical Approach, McGraw Hill, 2002

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic modes of heat transfer.	1&2
2	Discuss conduction heat transfer for steady and unsteady flows.	1,2,3
3	Summarize the correlations for forced and free convection.	1,2,3,4
4	Explain the interaction of radiations with materials.	1&2
5	Solve numerical by applying gained theoretical knowledge.	1,2,3

SEMESTER – V									
Course Title	**Solid Mechanics**								
Course code	**22BTME312R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ V semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To understand the theories of design 2. To calculate the pressure in any pressure vessel 3. To understand the materials behaviour under different load conditions								
CO1	Compute the multidimensional stress problems								
CO2	Interpret the boundary value problems in stressed body								
CO3	Illustrate the analysis of the n-Dimensional forces acting on an article								
CO4	Assess the stresses on various type of cylinders								
CO5	Transform the concepts of solid mechanics into different real-time models								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction to Cartesian tensors, Strains: Concept of strain, derivation of small strain tensor and compatibility, Stress: Derivation of Cauchy relations and equilibrium and symmetry equations, principal stresses and directions	**5**	Compute the multidimensional stress problems	2,4
II	Constitutive equations: Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems: concepts of uniqueness and superposition.	**5**	Interpret the boundary value problems in stressed body	2,4, 5
III	Plane stress and plane strain problems, introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.	**7**	Illustrate the analysis of the n-Dimensional forces acting on an article	2,4, 5
IV	Application to thick cylinders, rotating discs, torsion of non-circular cross-sections, stress concentration problems, thermo-elasticity, 2-d contact problems.	**10**	Assess the stresses on various type of cylinders	2,4, 5
V	Solutions using potentials. Energy methods. Introduction to plasticity	**9**	Transform the concepts of solid mechanics into different real-time models	2,4, 5

TEXT BOOKS:

1. G. T. Mase, R. E. Smelser and G. E. Mase, Continuum Mechanics for Engineers, Third
   Edition, CRC Press, 2004.
2. Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall International, 1965.
3. Lawrence. E. Malvern, Introduction to Mechanics of a Continuous Medium, Prentice Hall International, 1969.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Compute the multidimensional stress problems	1,2,3,4
2	Interpret the boundary value problems in stressed body	1,2,3,4
3	Illustrate the analysis of the n-Dimensional forces acting on an article	1,2,3
4	Assess the stresses on various type of cylinders	1&2
5	Transform the concepts of solid mechanics into different real-time models	1&2

SEMESTER – V									
Course Title	**Manufacturing Processes**								
Course code	**22BTME313R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ V semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods. 2. Understand the application of machining processes 3. Application of the non-conventional machining processes.								
CO1	Understand different casting processes and their application for producing different products								
CO2	Analyze the different forming processes and their application								
CO3	Understand the mechanism of metal cutting processes and their application in different machining operations								
CO4	Understand the additive manufacturing and the welding principles, design and application								
CO5	Distinguish between different non-conventional manufacturing processes and study their working principle, mechanism of metal removal and the effect of various process parameters								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.	**5**	Learn the different process of casting, moulding and forming	1,2
II	Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming(forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy	**4**	Learn the different forming processes and their application	3,4
III	Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating; Turning, Drilling, Milling and finishing processes,	**8**	Understand the mechanism of metal cutting processes	3,4

	Introduction to CNC machining			
IV	Additive manufacturing: Rapid prototyping and rapid tooling, Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding	**7**	Learn the application of additive manufacturing, and different joining processes	5,6
V	Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters, Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & masking, process parameters, MRR and surface finish, Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining	**12**	Application of non-conventional machining processes	5,6

TEXT BOOKS:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems

REFERENCE BOOKS:

1. Degarmo, BLack &Kohser, Materials and Processes in Manufacturing

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand different casting processes and their application for producing different products	1,2&3
2	Analyze the different forming processes and their application	1,2,3,4
3	Understand the mechanism of metal cutting processes and their application in different machining operations	1,2,3

4	Understand the additive manufacturing and the welding principles, design and application	1,2&3
5	Distinguish between different non-conventional manufacturing processes and study their working principle, mechanism of metal removal and the effect of various process parameters	1,2&3

SEMESTER – V									
Course Title	**Kinematics and Theory of Machines**								
Course code	**22BTME314R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ V semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To understand the kinematics and rigid- body dynamics of cinematically driven machine components. 2. To understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link. 3. To be able to design some linkage mechanisms and cam systems to generate specified output motion. 4. To understand the kinematics of gear trains.								
CO1	Ability to conduct static and dynamic force analysis and equilibrium of forces for mechanical systems.								
CO2	Apply basic principles of mechanisms in mechanical systems.								
CO3	Perform balancing of rotating and reciprocating masses.								
CO4	Illustrate gear operation								
CO5	Know the various link mechanism								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Classification of mechanisms- Basic kinematic concepts and definitions- Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain and slider crank chains-Limit positions- Mechanical advantage Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line generators- Universal Joint- Rocker mechanisms.	**5**	Ability to conduct static and dynamic force analysis and equilibrium of forces for mechanical systems.	1,2
II	Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centres, velocity and acceleration analysis using loop closure equations- kinematic analysis of simple mechanisms- slider crank mechanism dynamics Coincident points- Carioles component of acceleration- introduction to linkage synthesis three position graphical synthesis for motion and path generation.	**10**	Apply basic principles of mechanisms in mechanical systems.	1,2 3,4
III	Classification of cams and followers- Terminology and definitions- Displacement diagrams-Uniform velocity, parabolic, simple	**10**	Perform balancing of rotating and reciprocating masses.	3,4

	harmonic and cyclical motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers.			
IV	Involutes and cyclical gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting- helical, bevel, worm, rack & pinion gears, epicyclical and regular gear train kinematics.	**6**	Illustrate gear operation	3,4 5,6
V	Surface contacts- sliding and rolling friction- friction drives- bearings and lubrication, friction clutches- belt and rope drives- friction in brakes.	**5**	Know the various link mechanism	3,4, 5,6

TEXT BOOKS

1. Thomas Bevan, Theory of Machines, 3rd edition, CBS Publishers & Distributors, 2005.
2. Cleghorn W.L., Mechanisms of Machines, Oxford University Press, 2005.

REFERENCE BOOKS:

1. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill, 2009.
2. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East- West Pvt. Ltd, New Delhi, 1988.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Ability to conduct static and dynamic force analysis and equilibrium of forces for mechanical systems.	1,2&3
2	Apply basic principles of mechanisms in mechanical systems.	1,2&4
3	Perform balancing of rotating and reciprocating masses.	1,2&4
4	Illustrate gear operation	1,2&4
5	Know the various link mechanism	1,2&4

SEMESTER – V									
Course Title	**COMPETENT ENGLISH FOR ENGINEERS** (Communicative English & Soft Skills)								
Course code	**22UBPD314R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ V semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To improve the comprehension skills of the students. 2. Understanding key concepts and characteristics of email, report and notice. 3. To gain confidence with the chance to reflect on their non-verbal and verbal communication abilities.								
CO1	The course adds to the learning and practicing of English grammar lessons.								
CO2	The course adds to learning and effective practice in different types of writing.								
CO3	It will help to learn how to answer difficult questions								
CO4	Develop interview strategies								
CO5	Improve communication skills, and reduce your stress before an actual job interview								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Grammar** Forming Who-Questions Comprehension skills	**5**	Course will add to the learning and practicing of English grammar lessons.	1,2
II	**Writing Skills** Project Proposal writing Report writing Notice writing	**5**	Course will add to learning and effective practice in different types of writing.	1,2
III	**Email Etiquette** Effective Email Communication What does a customer expect, Understanding Email writing, Email Response Magic Words &Wonder Phrases, Email Code of Ethics, Improvement Areas, General Feedback, Mock Session and Feedback.	**10**	It will help to learn how to answer difficult questions	3,4
IV	**Common interview Questions** Practical session	**5**	Develop interview strategies	3,4
V	**Mock Interview** Practical Mock Interview, Feedback- Receiving Feedback, Giving Feedback, Advantages of Effective Feedback, How to deal with negative feedback.	**5**	Improve communication skills, and reduce your stress before an actual job interview	3,4

Text Books:

1. Barrett, Grant. 2016. Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking, Zephyros Press.
2. McDowell, Gayle Laakmann. 2008. Cracking the Coding Interview (Indian Edition).

Reference Books:

1. Sharma, R C., Mohan, Krishna. Nirban, Virendra Singh. (2020) Business Correspondence and Report Writing - A Practical Approach to Business and Technical Communication, McGraw Hill
2. Vas, Prem. (2020) How to Sharpen Your Interview Skills - Be a Rockstar @ Interviews. A must read from an Intern to a CEO, Guru cool Publishers

Other Learning Resources:

1. https://slite.com/learn/how-to-write-project-proposal
2. https://www.mailmodo.com/guides/email-etiquette/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The course adds to the learning and practicing of English grammar lessons.	**6,8&10**
2	The course adds to learning and effective practice in different types of writing.	**6,8&10**
3	It will help to learn how to answer difficult questions	**6,8&10**
4	Develop interview strategies	**6,8&10**
5	Improve communication skills, and reduce your stress before an actual job interview	**6,8&10**

SEMESTER – V									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC311	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ V semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavours. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**15**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

SEMESTER –V									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better	**15**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2

	from a 360 degree perspective.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7,9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – V									
Course Title	Competent English for Engineers								
Course code	22UBPD314R	**Total credits: 2** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	4	0	0	0	2
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions. Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** i. Introduction of pipes and cistern ii. Solving different types of questions iii. Worksheet1 and Worksheet 2	**6**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i. Introduction of basics ii. Solving questions on mixture and allegation. iii.Worksheet1 and Worksheet 2	**6**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and allegations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2

III	**Vocabulary Development** i. Understanding different aspects of a word (such as the use of say, tell, speak). ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i. Revision of syllogism ii. Statement and conclusion iii. Course of action based on statement iv. Worksheet1 and Worksheet 2	**6**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i. Linear arrangement puzzle ii. Circular arrangement puzzle iii. Matrix Iv. Worksheet1	**6**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i. Introduction to basics ii. Introduction to discount iii. Problems related on the topics iv. Worksheet1 and Worksheet 2	**6**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensable Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

5. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
6. Fast track Objective mathematics for Competitive exam by Arihant
7. General Mental Ability & Logical Reasoning Compendium by R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7, 9&10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME311R	Heat Transfer	3	3	3	2	1		1	1	1	3		
22BTME312R	Solid Mechanics	3	1	3	2			2	2	2	2	1	1
22BTME313R	Manufacturing Process	3	3	3	3		1	2		1			
22BTME314R	Kinetics and Theory of Machines	3	2	3	2		1	1					
22UBPD314R	Competent English for Engineers		2	1	2	2		1	1	1			
22UBCC311	Co-curricular							2		2	1		1
22UBEC311	Extra-curricular	2	1	2	1								1

<table>
<tr><td colspan="9">SEMESTER – VI</td></tr>
<tr><td>Course Title</td><td colspan="8">Manufacturing Technology</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTME321R</td><td rowspan="2">Total credits: 3
Total hours: 36T</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td>Co-requisite</td><td colspan="6">Nil</td></tr>
<tr><td>Programme</td><td colspan="8">Bachelor of Technology in Mechanical Engineering</td></tr>
<tr><td>Semester</td><td colspan="8">Fall/ VI semester of third year of the programme</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="8">1. To provide knowledge on machines and related tools for manufacturing various components.
2. To understand the relationship between process and system in manufacturing domain.
3. To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.</td></tr>
<tr><td>CO1</td><td colspan="8">Enable to the tooling needed for manufacturing the dimensional accuracy and tolerances of products</td></tr>
<tr><td>CO2</td><td colspan="8">Understand the assembly of different components</td></tr>
<tr><td>CO3</td><td colspan="8">Understand the application of optimization methods in manufacturing</td></tr>
<tr><td>CO4</td><td colspan="8">To analyze the flow in water pumps and turbines.</td></tr>
<tr><td>CO5</td><td colspan="8">Understanding Pelton wheel, Francis turbine and Kaplan turbines, working principles</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="2">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">Tooling for conventional and non-conventional machining processes: Mould and die design, Press tools, Cutting tools; Holding tools: Jigs and fixtures, principles, applications and design; press tools – configuration, design of die and punch; principles of forging die design.</td><td>7</td><td colspan="2">Enable to the tooling needed for manufacturing the dimensional accuracy and tolerances of products</td><td>1,2</td></tr>
</table>

II	**Metrology:** Dimensions, forms and surface measurements, Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; Metrology in tool wear and part quality including surface integrity, alignment and testing methods; tolerance analysis in manufacturing and assemBLy. Process metrology for emerging machining processes such as micro-scale machining, Inspection and workpiece quality.	**7**	Introduction to Metrology and its various uses in linear and angular measurements	2,3
III	**Assembly practices:** Manufacturing and assembly, process planning, selective assembly, Material handling and devices.	**7**	Understand the assembly of different components	3,4
IV	**Linear programming:** Objective function and constraints, graphical method, Simplex and duplex algorithms, transportation assignment, Traveling Salesman problem; Network models: shortest route, minimal spanning tree, maximum flow model- Project networks: CPM and PERT, critical path scheduling	**8**	Introduction to linear programming and its applications, Simplex and Duplex algorithms, Transportation, Network models and Project networks	4,5
V	**Production planning& control:** Forecasting models, aggregate production	**7**	To analyze the flow in water pumps and turbines.	4,5

	planning, materials requirement planning. Inventory Models: Economic Order Quantity, quantity discount models, stochastic inventory models, practical inventory control models, JIT. Simple queuing theory models			

Text Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill

2. Taha H. A., Operations Research, 6th Edition, Prentice Hall of India, 2003.

Reference Books:

1. Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern, 1994.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Enable to the tooling needed for manufacturing the dimensional accuracy and tolerances of products	**1,3&5**
2	Understand the assembly of different components	**1,2&4**
3	Understand the application of optimization methods in manufacturing	**1,2&5**
4	To analyze the flow in water pumps and turbines.	**3&5**
5	Understanding Pelton wheel, Francis turbine and Kaplan turbines, working principles	**3,4**

<table>
<tr><td colspan="9">SEMESTER – VI</td></tr>
<tr><td>Course Title</td><td colspan="8">Design of Machine Elements</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">22BTME322R</td><td rowspan="2">Total credits: 4 Total hours: 36T</td><td>L</td><td>T</td><td>P</td><td>S</td><td>R</td><td>O/F</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>2</td><td>0</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>Pre-requisite</td><td colspan="2">Nil</td><td>Co-requisite</td><td colspan="5">Nil</td></tr>
<tr><td>Programme</td><td colspan="8">Bachelor of Technology in Mechanical Engineering</td></tr>
<tr><td>Semester</td><td colspan="8">Fall/ VI semester of third year of the programme</td></tr>
<tr><td>Course Objectives (Minimum 3)</td><td colspan="8">1. A strong background in mechanics of materials based failure criteria underpinning the safety-critical design of machine components.
2. An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations
3. An overview of codes, standards and design guidelines for different elements.
4. An appreciation of parameter optimization and design iteration
5. An appreciation of the relationships between component level design and overall machine system design and performance</td></tr>
<tr><td>CO1</td><td colspan="8">Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components</td></tr>
<tr><td>CO2</td><td colspan="8">Understand the designing of shafts under static and fatigue loadings</td></tr>
<tr><td>CO3</td><td colspan="8">Understand bearings, its types and the design aspects</td></tr>
<tr><td>CO4</td><td colspan="8">Understanding gears, gear transmission, drives, springs etc.</td></tr>
<tr><td>CO5</td><td colspan="8">Analysis of Joints, Screws, Brakes and Couplings</td></tr>
<tr><td>Unit-No.</td><td colspan="3">Content</td><td>Contact Hour</td><td colspan="3">Learning Outcome</td><td>BL</td></tr>
<tr><td>I</td><td colspan="3">Design considerations - limits, fits and standardization, Review of failure theories for static and dynamic loading (including fatigue failure)</td><td>9</td><td colspan="3">Understanding the design aspects such as limits, fits and standardization</td><td>1,2</td></tr>
</table>

II	Design of shafts under static and fatigue loadings	**9**	Designing of shafts under static and fatigue loadings	2,3,4,5
III	Analysis and design of sliding and rolling contact bearings	**6**	Understand bearings, its types and the design aspects	2,3,4,5
IV	Design of transmission elements: spur, helical, bevel and worm gears; belt and chain drives, Design of springs: helical compression, tension, torsional and leaf springs	**6**	Understanding gears, gear transmission, drives, springs etc.	4,5
V	Design of joints: threaded fasteners, pre-loaded bolts and welded joints, Analysis and applications of power screws and couplings, Analysis of clutches and brakes	**6**	Analysis of Joints, Screws, Brakes and Couplings.	2,3,4,5

Text Books:

1. Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-Hill International; 1989.

2. Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan, 1992.

Reference Books:

1. Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley, 1994.

2. Spottes, M.F., Design of Machine elements, Prentice-Hall India, 1994.

3. R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall, 1998.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components	**1,**2,**3**
2	Understand the designing of shafts under static and fatigue loadings	**1,**2,**3**
3	Understand bearings, its types and the design aspects	**2,3**
4	Understanding gears, gear transmission, drives, springs etc	**1,2,4**
5	Analysis of Joints, Screws, Brakes and Couplings	**2,3,4**

SEMESTER –VI									
Course Title	**Mechatronic systems**								
Course code	**22BTME325E**	**Total credits: 36 Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. To understand the structure of microprocessors and their applications in mechanical devices. 2. To understand the principle of automatic control and real time motion control systems, with the help of electrical drives and actuators. 3. To understand the use of micro-sensors and their applications in various fields.								
CO1	Enable to understand an overview of mechatronics applications								
CO2	Enable to understand the use of micro-sensors and microprocessors								
CO3	Enable to understand the interdisciplinary concepts of Mechanical and Electronics Engineering								
CO4	Enable to understand Smart materials, Smart and Dynamic Characteristics								
CO5	Enable to understand drives and actuators, embedded systems, programmable logic devices								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modelling, Analysis and Simulation, Man-Machine Interface	**6**	Understand the overview of mechatronics applications	2
II	Sensors and transducers: classification, Development in Transducer technology, Optoelectronics-Shaft encoders, CD Sensors, Vision System, etc.	**6**	Enable to understand the use of micro-sensors and microprocessors	
III	Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servo motor and Stepper motor, Drive circuits, open and closed loop control; Embedded Systems: Hardware Structure, Software Design and	**6**	Understanding drives and actuators, Embedded systems, programmable logic	2

	Communication, Programmable Logic Devices, Automatic Control and Real Time Control Systems		devices	
IV	Smart materials: Shape Memory Alloy, Piezoelectric and Magnetostrictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.	**8**	Understanding Smart materials, Static and Dynamic characteristics	2
V	Micromechatronic systems: Microsensors, Microactuators; Micro-fabrication techniques LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology	**10**	Enable to understand the interdisciplinary concepts of Mechanical and Electronics Engineering.	2

Text Books:

1. Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.)

2. A Textbook of Mechatronics, R. K. Rajput, S. Chand & Company Private Limited

Reference Books:

1. Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education

2. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Enable to understand an overview of mechatronics applications	**2&3**
2	Enable to understand the use of micro-sensors and microprocessors	**1,2&4**
3	Enable to understand the interdisciplinary concepts of Mechanical and Electronics Engineering	**2,3**
4	Enable to understand Smart materials, Smart and Dynamic Characteristics	**2&3**
5	Enable to understand drives and actuators, embedded systems, programmable logic devices	**2&3**

SEMESTER –VI									
Course Title	**Internal Combustion Engines**								
Course code	**22BTME326E**	**Total credits: 3 Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. To familiarize with the terminology associated with IC engines. To understand the importance of dimensional analysis. 2. To understand the basics of IC engines. 3. To understand combustion, and various parameters and variables affecting it in various types of IC engines. 4. To learn about various systems used in IC engines and the type of IC engine required for various applications								
CO1	Students will have a good understanding of the basics of IC engines								
CO2	Understanding how different parameters influence the operational characteristics of IC Engines								
CO3	To obtain the velocity and pressure variations in various types of simple flows								
CO4	To analyze the flow in water pumps and turbines.								
CO5	Understanding Pelton wheel, Francis turbine and Kaplan turbines, working principles								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Review of ideal cycles; Details of fuel-air cycles.	**6**	Knowledge of ideal cycles and details of fuel-air cycles	1,2
II	Combustion in SI and CI engines, Combustion stages, Combustion chambers and Abnormal combustion	**8**	Understanding working principles of SI and CI engines and combustion	1,2

III	Fuel supply systems in SI and CI engines, carburettors, Port fuel injection	**8**	Understanding fuel supply systems in SI and CI engines.	3,4
IV	Direct injection and Common rail injection. Ignition system, Lubrication system and Cooling system	**6**	Understanding the various systems used in ALCO engines	3,4
V	Testing of IC engines. Engine emissions and control. Advanced IC Engine concepts	**6**	Testing of IC engines, emissions and control.	1,2,4

Text Books:

1. Obert E. F, "Internal Combustion Engines and Air Pollution", Harper and Row Publication Inc. NY, 1973.

2. Heisler H, "Advanced Engine Technology", Edward Arnold, 1995.

Reference Books:

1. Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY, 1989

2. Heldt P. M, "High Speed Combustion Engines", Oxford & IBH publishing Co. India, 1985.

3. Stockel M W, Stockel T S and Johanson C, "Auto Fundamentals", The Goodheart, Wilcox Co. Inc., Illinois, 1996

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will have a good understanding of the basics of IC engines	**2,3&4**
2	Understanding how different parameters influence the operational characteristics of IC Engines	**1,2&3**
3	To obtain the velocity and pressure variations in various types of simple flows	**2,3&4**

4	To analyze the flow in water pumps and turbines.	**1,3&4**
5	Understanding Pelton wheel, Francis turbine and Kaplan turbines, working principles	**1,2&4**

SEMESTER – VI										
Course Title	**CORPORATE PROFICIENCY FOR ENGINEERS**									
Course code	**22UBPD324R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**B. Tech Mechanical Engineering**									
Semester	**Fall/ VI semester of third year of the programme**									
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions. Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.									
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.									
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.									
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.									
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.									
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** ii. Introduction of pipes and cistern iii. Solving different types of questions iv. Worksheet1 and Worksheet 2	**7**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and	1,2

	ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i. Introduction of basics ii. Solving questions on mixture and allegationion. iii.Worksheet1 and Worksheet 2		allegations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	
III	**Vocabulary Development** i. Understanding different aspects of a word (such as the use of say, tell, speak). ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i. Revision of syllogism ii. Statement and conclusion Iii. Course of action based on statement Iv. Worksheet1 and Worksheet 2	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i. Linear arrangement puzzle ii. Circular arrangement puzzle iii. Matrix Iv. Worksheet1	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i. Introduction to basics ii. Introduction to discount iii. Problems related on the topics Iv. Worksheet1 and Worksheet 2	**7**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensable Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

1. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
2. Fast track Objective mathematics for Competitive exam by Arihant
3. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**

3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – VI									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC321**	**Total credits: 1 Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new	**30**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1, 2

	development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7.9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – VI									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC321	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B. Tech Mechanical Engineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavours. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn	**30**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

	from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	5, 7
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	8
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	7.9,10
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	11,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	10

SEMESTER – VII									
Course Title	**Process Planning and Cost Estimation**								
Course code	22BTME416E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**VII**								
Course Objectives (Minimum 3)	1. To understand the different stages of planning 2. To understand the cost estimation methods 3. To understand the different forecasting methods								
CO1	Upon completion the students will get a clear understanding of planning								
CO2	Enable to understand the process variations								
CO3	Learn and develop skills for operating projects								
CO4	Enable to understand the setting up of an industry								
CO5	Demonstrate layout of industry.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction of Process Planning- methods of process planning, drawing interpretation, material evaluation, steps in process selection, production equipment and tooling selection.	**7**	Upon completion the students will get a clear understanding of planning	1,2
II	Process planning activities- process parameter calculation for various production processes, selection of jigs and fixtures, selection of quality assurance methods, documents for process planning, economics of process planning, case studies	**8**	Enable to understand the process variations	2,3
III	Introduction to cost estimation- importance of costing and estimation, methods of costing, elements of cost estimation, types of estimates, estimating procedure, estimation of labor cost, material cost, allocation of overhead charges, calculation of depreciation cost	**8**	Learn and develop skills for operating projects	3,4
IV	Machining time estimation- importance of machine time calculation, machining time for different lathe operations, drilling and boring time calculations, Machining time calculation for Milling, Shaping, Planning and Grinding	**6**	Enable to understand the setting up of an industry	4,5
V	Production costs- different production processes for different jobs, estimation of forging cost, estimation of welding cost, estimation of foundry cost, estimation of machining cost	**7**	Demonstrate layout of industry.	4,5

MAPPING TABLE:

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME321R	Manufacturing Technology	3	3	2	2	1				1			1
22BTME322R	Design of Machine Elements	3	3	2	2	1				1			1
22BTME325E	Mechatronics System	3	2	3	2	2				1			1
22BTME326E	Internal Combustion Engines	3	2	2	2	2	1			2			1
22UBPD324R	Corporate Proficiency for Engineers								1	1	1	1	
22UBCC321	Co-curricular									1	1		1
22UBEC321	Extra-curricular									1	1		1

TEXT BOOKS:

1. Peter Scalon, Process Planning, Design/ Manufacture Interface, Elsevier Sci.&Tech. 2002.
2. Ostwaal P.F. and Munez J., Manufacturing Processes and Systems, 9th ed., John Wiley 1998.

REFERENCE BOOKS:

1. Chitale A.V. and Gupta R.C., Product Design and Manufacturing, 2nd ed., Prentice Hall 2002.

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S2666449624000045

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Upon completion the students will get a clear understanding of planning	**1,2, 4**
2	Enable to understand the process variations	**2,4,5**
3	Learn and develop skills for operating projects	**8,9,10**
4	Enable to understand the setting up of an industry	**5,8,9**
5	Demonstrate layout of industry.	**8,9,10**

SEMESTER – VII									
Course Title	**Power Plant Engineering**								
Course code	22BTME417E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VII semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To provide an overview of power plants and the associated energy conversion. 2. To understand the concept of renewable energy for sustainable development 3. To understand basics of thermodynamics								
CO1	Upon completion of the course, the students can understand the principles of operation for different power plants and their economics.								
CO2	the students can understand power plants economics								
CO3	Learn and develop skills for operating boiler								
CO4	Enable to understand the setting up of an boiler industry								
CO5	Demonstrate power generation in power plants.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Coal based thermal power plants, basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems	**6**	Upon completion of the course, the students can understand the principles of operation for different power plants and their economics.	1,2
II	Gas turbine and combined cycle power plants, Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.	**7**	the students can understand power plants economics	1,2
III	Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.	**9**	Learn and develop skills for operating boiler	1,2
IV	Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems	**8**	Enable to understand the setting up of an boiler industry	1,2
V	Energy, economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal	**6**	Demonstrate power generation in power plants.	1,2

	options for coal and nuclear plants.			

TEXT BOOKS:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOKS:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/abs/pii/S0360319923006523

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Upon completion of the course, the students can understand the principles of operation for different power plants and their economics.	**1,2, 3,4**
2	the students can understand power plants economics	**5, 6, 7**
3	Learn and develop skills for operating boiler	**3,4,5**
4	Enable to understand the setting up of an boiler industry	**1,2,3**
5	Demonstrate power generation in power plants.	**1,2,3**

SEMESTER – VII										
Course Title	**Introduction to Nano Technology**									
Course code	22BTME418E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VII semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. The objective of the course is to introduce students to the fascinating world of Nanotechnology, the technology of the 21st Century 2. The objectives included introduction to novel properties of nonmaterial, their synthesis and applications. 3. Application of nanomaterial in practical life								
CO1	Learn about the basics of Nanotechnology								
CO2	Understand the concepts of extraordinary properties exhibit at nanoscale.								
CO3	Learn different synthesis/ fabrication techniques of nanomaterials.								
CO4	Learn about different characterization methods of nanomaterials.								
CO5	Learn the software used for analysis of characterized data.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Basics of Nanotechnology: Importance of Nano-technology, History of Nano-Technology, Properties of Nano materials, Difference between Bulk and Nanomaterial, Molecular building blocks for nanostructure systems, Forces between atoms and molecules - Particles and grain boundaries – strong Intermolecular forces – Electrostatic and Vander Waals forces between surfaces	**8**	Learn about the basics of Nanotechnology	1,2
II	Physics of nanomaterials: Atomic scale structure of nanoparticles, nanotubes, nanowires, nanodots etc.; electronic and optical characteristic properties of quantum dots, quantum wires and quantum wells; concept of quantum confinement: 0D, 1D and 2D nanostructures; Size effects – Fraction of Surface Atoms – specific Surface Energy and Surface Stress. Nanofluidics, Nanophotonics, Nanothermodynamics, Plasmonics – plasmons and surface plasmons, SPR, Core-shell quantum dots and quantum-dot-quantum wells.	**10**	Understand the concepts of extraordinary properties exhibit at nanoscale.	2,3, 4
III	Synthesis/fabrication techniques of nanomaterials: Top down approach, Lithography – electron beam and ion beam techniques, Etching – wet and dry etching,	**6**	Learn different synthesis/ fabrication techniques of nanomaterials.	2,3, 4

	Bottom up approach - Solvent based and template based synthesis, other important synthesis methods like CVD, PVD etc.; Doping, Nucleation, Growth and Stability of colloidal nanoparticles, concept of selfassembly.			
IV	Characterization methods: Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), Atomic force microscopy (AFM) and X-ray diffraction Spectroscopy (XRD).	**6**	Learn about different characterization methods of nanomaterials.	2,3, 4
V	Applications: Nanosensors and nanoelectronics, Micro & Nano electromechanical systems, Photonic crystals, Nano pizotronics, Nanomedicine.	**6**	Learn the software used for analysis of characterized data.	2,3, 4

Text Books:

1. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanoscience, CRC Press.
2. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanotechnology, CRC Press.

Reference Books:

1. T. Pradeep, Nano: The essentials, McGraw Hill.
2. D. Maclurcan & N. Radywyl (Eds.), Nanotechnology and global sustainability, CRC Press.
3. E. Lichtfouse, J. Shwarzbauer, D. Robert, Environmental chemistry for sustainaBLe world, vol.2, Springer verlag.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn about the basics of Nanotechnology	**1,2,3,4**
2	Understand the concepts of extraordinary properties exhibit at nanoscale.	**3,4,5**
3	Learn different synthesis/ fabrication techniques of nanomaterials.	**2,3,4**
4	Learn about different characterization methods of nanomaterials.	**1,2,3,4**
5	Learn the software used for analysis of characterized data.	**5,6,7**

SEMESTER – VII									
Course Title	**Automation in Manufacturing**								
Course code	22BTME411R	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VII semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To understand the importance of automation in the of field machine tool based manufacturing 2. To get the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC. 3. To understand the basics of product design and the role of manufacturing automation.								
CO1	The students will get a comprehensive picture of computer based automation of manufacturing operations.								
CO2	The students will be able to learn and evaluate and will get accustomed to various automated techniques that are used now-a-days in automated manufacturing industries.								
CO3	The students will be able to get an idea regarding modeling and simulation and also about techniques related to optimization.								
CO4	The students will be able to get an idea of automatic system								
CO5	The students will be able to generate prototype by using the concept of automation								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers.	**5**	The students will get a comprehensive picture of computer based automation of manufacturing operations.	1,2
II	NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing.	**5**	The students will be able to learn and evaluate and will get accustomed to various automated techniques that are used now-a-days in automated manufacturing industries.	1,2
III	Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modelling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC Adaptive Control.	**10**	The students will be able to get an idea regarding modelling and simulation and also about techniques related to optimization.	1,2
IV	Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies.	**8**	The students will be able to get an idea of automatic system	1,2
V	Introduction to Modelling and Simulation: Product design, process route modelling, Optimization techniques, Case studies & industrial applications.	**8**	The students will be able to generate prototype by using the concept of automation	1,2

TEXT BOOKS:

1. Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing, prentice Hall.
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology, 7th edition, Pearson.

REFERENCE BOOKS:

1. YoramKoren, Computer control of manufacturing system, 1st edition.

2. Ibrahim Zeid, CAD/CAM : Theory & Practice, 2nd edition.

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S187705092400245X

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM

OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The students will get a comprehensive picture of computer based automation of manufacturing operations.	**1,3,4**
2	The students will be able to learn and evaluate and will get accustomed to various automated techniques that are used now-a-days in automated manufacturing industries.	**5,6**
3	The students will be able to get an idea regarding modelling and simulation and also about techniques related to optimization.	**1,3&4**
4	The students will be able to get an idea of automatic system	**1,2,3,4**
5	The students will be able to generate prototype by using the concept of automation	**1,2,3,4**

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTME411R	Automation in Manufacturing	3	3	2	2	1				1			1
22BTME416E	Process Planning and Cost Estimation	3	3	2	2	1				1			1
22BTME417E	Power Plant Engineering	3	2	3	2	2				1			1
22BTME418E	Introduction to Nano Technology	3	2	2	2	2	1			2			1

SEMESTER – VIII										
Course Title	**Principle of Management**									
Course code	22BTME422E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Mechanical Engineering**									
Semester	**Fall/ VIII semester of 3rd year of the programme**									
Course Objectives (Minimum 3)	1.To understand the principles of management 2. To apply the management principles in organization 3. To understand the concept of entrepreneur									
CO1	Explain the managerial approach to implement in practical field									
CO2	Recognise the nature and purpose of planning									
CO3	Integrate the management theories to organise formal or informal institutions									
CO4	Develop the leadership quality to socio-economic benefits									
CO5	Justify the management functions in an organisation									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Definition of management, science or art, manager vs entrepreneur; Types of managers managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, puBLic and private enterprises; Organization culture and environment; Current trends and issues in management	**5**	Explain the managerial approach to implement in practical field	1,2
II	Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes	**5**	Recognise the nature and purpose of planning	2,3, 4
III	Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.	**10**	Integrate the management theories to organise formal or informal institutions	2,3, 4
IV	Directing, individual and group behavior, motivation, motivation theories,	**8**	Develop the leadership quality to socio-economic benefits	3,4, 5

	motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication			
V	Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting	**8**	Justify the management functions in an organisation	2,3, 4

TEXT BOOKS:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009

2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004

REFERENCE BOOKS:

1. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S2589004224006941

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the managerial approach to implement in practical field	**1, 6**,9,10,11
2	Recognise the nature and purpose of planning	**6,** 9,10,11
3	Integrate the management theories to organise formal or informal institutions	**6**,9,10,11
4	Develop the leadership quality to socio-economic benefits	**1, 6**,9,10,11
5	Justify the management functions in an organisation	**1, 6**,9,10,11

SEMESTER – VIII										
Course Title	**Economics for Engineers**									
Course code	22BTME423E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VIII semester of 3rd year of the programme**								
Course Objectives (Minimum 3)	1. To understand the basics of Economics 2. To Apply the concepts of Economics in Engineering 3. To understand the Industrial Laws								
CO1	Understand the principles of economics								
CO2	Apply the concepts of Economics in Engineering problems								
CO3	Explain the rights to comprehend the working hour and over duty								
CO4	Illustrate the ways to mitigate the hurdles to Indian Economy								
CO5	Appraise the financial aspects of projects								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Introductory Macroeconomics**: What is Macroeconomics, Basic concepts in macroeconomics: significance of economics, LPG meaning, demand and supply. Law of demand, law of supply. Difference of macroeconomics and microeconomics	**5**	Understand the principles of economics	1,2
II	**Economic Indexes**: Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross Domestic Product (GDP) and Net Domestic Product (NDP). Fixed, Variable, Marginal & Average Costs, Recurring and Nonrecurring Costs, Break Even Analysis, ROI, Payback period	**5**	Apply the concepts of Economics in Engineering problems	3,4
III	**Industrial Statistics**: Measures of central tendency, Relation between mean, median and mode, Measure of dispersion, moments, skewness, Kurtosis, Probability distribution, Binomial distribution, Poisson distribution, Test of hypothesis, Chi-square distribution, application of chi square test, ANOVA test, Level of confidence, Regression model, Simple linear regression analysis, coefficient of correlation, correlation coefficient, Mean absolute deviation (MAD), Mean squared error(MSE)	**10**	Explain the rights to comprehend the working hour and over duty	4,5
IV	Industrial laws: Laws related to Industrial Relations and Industrial Disputes: Industrial disputes act, 1947: definition and authorities,	**8**	Illustrate the ways to mitigate the hurdles to Indian Economy	3,4, 5

	awards, settlement, strike lockouts, lay off, retrenchment and closure. The Trade Union Act, 1926, Laws related to health, safety and welfare: The Workmen's Compensation Act, 1923 Provisions, and Social Legislation: Employee State Insurance Act 1948: Definition, employees' provident fund. Miscellaneous Provision Act 1948: Schemes, Administration and determination of dues, Laws related to compensation management: The payment of Wages Act 1948: Objectives, Definition, and Authorised Deductions.			
V	**Challenges in Indian Economy:** Poverty- Main programmes for poverty alleviation, Human Capital Formation: How people become resource; Role of human capital in economic development; alternative farming - organic farming Employment: Growth and changes in work force participation rate in formal and informal sectors; Energy and Health: Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming.	**8**	Appraise the financial aspects of projects	2,3, 4,5

TEXT BOOKS:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia

2. V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill

REFERENCE BOOKS:

1. M Chakravarty, Estimating, Costing Specifications & Valuation

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the principles of economics	**1, 10, 11**
2	Apply the concepts of Economics in Engineering problems	**1, 2, 3**
3	Explain the rights to comprehend the working hour and over duty	**2,6,9,10,11**
4	Illustrate the ways to mitigate the hurdles to Indian Economy	**2,4,9,10,11**

5	Appraise the financial aspects of projects	**10,11,12**

SEMESTER – VIII										
Course Title	**Total Quality Management**									
Course code	22BTME424E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Mechanical Engineering**								
Semester	**Fall/ VIII semester of 4th year of the programme**								
Course Objectives (Minimum 3)	1. To facilitate the understanding of total quality management principles and processes. 2. To facilitate the understanding of TQM tools and techniques. 3. To facilitate the understanding of Quality systems								
CO1	To understand the basic components of total quality management								
CO2	To discuss about quality and the processes of continuous improvement								
CO3	To summarize the concept of six sigma								
CO4	To understand the various tools and techniques of TQM								
CO5	To distinguish different ISO systems								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	**Introduction**, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.	**5**	To understand the basic components of total quality management	1,2
II	**TQM principles**; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.	**5**	To discuss about quality and the processes of continuous improvement	2,3, 4
III	**TQM tools and techniques I**, the seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.	**10**	To summarize the concept of six sigma	5,6
IV	**TQM tools and techniques II**, control charts, process capability, concepts of six	**8**	To understand the various tools and techniques of TQM	1,2, 5,6

	sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM-concepts, improvement needs, performance measures.			
V	**Quality systems**, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation; Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.	**8**	To distinguish different ISO systems	1,2, 3,4

TEXT BOOKS:

1. Besterfield D.H. et al., Total qualityManagement, 3rd ed., Pearson Education Asia, 2006.

2. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.

REFERENCE BOOKS:

1. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	To understand the basic components of total quality management	**2,9,10**
2	To discuss about quality and the processes of continuous improvement	**3,6,8,9**
3	To summarize the concept of six sigma	**9,10,11**
4	To understand the various tools and techniques of TQM	**2,5,11**
5	To distinguish different ISO systems	**9,10,11**

SEMESTER – VIII										
Course Title	**History of Science and Engineering**									
Course code	22BTME425E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Mechanical Engineering**									
Semester	**Fall/ VIII semester of 4th year of the programme**									
Course Objectives (Minimum 3)	1. Develop a culture of critical reflection, intellectual curiosity, tolerance of ambiguity, scholarly engagement, and learning together 2. Identify and understand tools to inquire into the history and philosophy of engineering education, and develop skills for using these tools 3. Make use of these tools to problematize different perspectives as well as synthesize perspectives to form arguments for both oneself and others about the nature of engineering, education, and engineering education									
CO1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period									
CO2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.									
CO3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.									
CO4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)									
CO5	It explores how science and technology have been used to make sense of the world, and to control it.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Historical Perspective: The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.	**5**	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	1,2
II	Science and Technology- The Beginning: Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine 2. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. 3. Development of Geography: Geography in Ancient Indian Literature	**5**	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	1,2,3, 4
III	Developments in Science and Technology in Medieval India: 1. Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up. 2. Developments in the fields of Mathematics, Chemistry, Astronomy and	**10**	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	3,4

	Medicine. 3. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.			
IV	Developments in Science and Technology in Colonial India: 1. Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service. 2. Indian Response to new Scientific Knowledge, Science and Technology in Modern India 3. Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.	**8**	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	3,4
V	Prominent scientist of India since beginning and their achievement: 1. Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna 2. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali 3. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha and Dr. Vikram Sarabhai.	**8**	It explores how science and technology have been used to make sense of the world, and to control it.	4,5

TEXT BOOKS:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58

2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.

REFERENCE BOOKS:

1. Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Developlemnt, K., Nayudamma Memorial Science Foundation, Chennai – 8

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	**8,9**
2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	**8,9,10**
3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	**9,10,11**

4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	**8,9,10**
5	It explores how science and technology have been used to make sense of the world, and to control it.	**5,8,9,10**

MAPPING TABLE

Subject Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
22BTME422E	Principles of Management	2	2	1		2	2	2	2	2	2	2	
22BTME423E	Economics for Engineers											2	1
22BTME424E	Total Quality Management	2	2	1		2	2	2	2	3	2	2	
22BTME425E	History of Science & Engineering		1										2

Assam down town University

Curriculum and Syllabus

Bachelor of Technology
in
Civil Engineering

OUTCOME BASED EDUCATION FRAMEWORK
CHOICE BASED CREDIT SYSTEM
Version: 2.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Assam down town University
Guwahati-26
Panikhaiti

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, Dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators.

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

The professional practise of designing and developing infrastructure projects is known as civil engineering. This can be done on a large scale, such as the construction of national transportation systems or water supply networks, or on a smaller scale, such as the construction of individual roads or buildings**.**

I. Specific Features of the Curriculum (To be derived from PSOs. **Not more than 100 words**)

The Program Specific Outcomes (PSOs) for Civil Engineering graduates focus on three main areas. First, graduates should excel in research and reasoning, capable of identifying, formulating, reviewing literature, and analyzing complex Civil Engineering problems using logical and critical thinking and scientific principles. Second, they should demonstrate techno-professional efficiency by applying multidisciplinary concepts and interdisciplinary approaches to serve mankind. Lastly, graduates should exhibit global competency by addressing interdisciplinary Civil Engineering issues and enhancing their expertise through international certification courses.

II. **Eligibility Criteria:** Minimum 45% in 10+2 with Physics, Chemistry& Mathematics. 5% relaxation for SC/ST, EWS, and Specially abled candidates.

III. Program Educational Objectives (PEOs):

PEO-1: To understand and incorporate the ability to apply, update, extend, and build deep knowledge through a flexible, research-intensive programme tailored to suit current academic and industry demands.

PEO-2: Establish professional integrity and an ethical attitude while being aware of global and national competencies, and consider the social implications of their job, particularly its impact on safety, health, and the environment for long-term growth.

PEO-3: Participate in individual and team-oriented, open-ended activities promoting productive thinking to provide opportunities for students to manage and work on multidisciplinary projects through interaction with their peers in the industry

IV. Program Specific Outcomes (PSOs):

PSO1: Research and Reasoning: Identify, formulate, review literature, and analyze complex Civil Engineering problems reaching substantial conclusions using logical and critical thinking, and scientific principles.

PSO2:Techno-Professional Efficiency: Apply the understanding of multidisciplinary concepts of Civil Engineering with interdisciplinary approaches in the service of mankind.

PSO3: Global Competency: Demonstrate global competency in addressing interdisciplinary Civil Engineering issues through international certification courses.

V. Program Outcome: (8-12)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VI. Total Credits to be Earned:185

VII. Career Prospects:

When it comes to graduate programmes in India, civil engineering remains at the top of the list because of its flexibility and capacity to adapt to changing requirements, as well as providing students with the required information and skills for a successful career.

Some of the opportunities for civil engineering graduates are:

- Construction manager
- Geotechnical engineer
- Environmental engineer
- Public Health engineer
- Transportation engineer
- Urban planning engineer.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

A. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination)*	30
2.	In-Sem Exam – II (ISE-II) (Written Examination)*	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in the any of the component without any valid reason he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absent.

2. The report of evaluation of an activity towards the in-semester (sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

B. SEMESTER END EXAMINATION:

Time table for end semester examination is published at least 25 days prior to the start of Examination.

I. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

II. Admit Card:

Admit card for the examination may be downloaded through ERP where the system will generate a Unique ID Cards through online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

III. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.
Table

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.
3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyze	Classify, outline, categorize, analyze, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on basis of **all 6 knowledge levels.**

The format of the question paper across all the program follow a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl no	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

IV. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

V. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

VI. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the center may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the exam with new answer sheet or may expel the student from appearing the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribe expulsion form. The student may not be allowed to write that examination.

VII. Instruction to the Students:

(i) The students shall not bring to the Examination Hall, any electronic gadget used as a means of communication or record except electronic calculator, if required.

(ii) The students shall not receive any book or printed or hand written or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

VIII. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

C. Credit Point:

It is the product of grade point and number of credits for a course, thus, CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades 'O' to 'P' shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in Table 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average

P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrollment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrollment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit

Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the ith completed Course and Ci is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

D. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a University appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or

viva voce and wish to appear again may apply to be evaluated can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric

methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. Student- centric / Constructivist Approach:

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centric classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programme the student has to undergo project-based learning at least 4 months duration. This approach will help the student to think critically, evaluate, analyze, make decisions, collaborate, and more.

b. Inquiry-Based Learning: The teacher/ students are supposed to list at least five questions in each contact hour and student solve these question or search for answer which becomes the home work for the students "question-driven" learning approach. The teacher may look for the correctness of the solution or the best possible answer and discuss in the successive class. This will help in the preparation for various competitive examination and develop a habit for search for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watchvideo or lecture prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are

more passive to an approach where students are active participants. As a result, this approach is also a student-centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

The teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework

Breakdown of Credits(for 2022-23 Syllabus)

Sl. No	Category	Total number of Credits
1	University Core(UC)	47
2	University Elective (UE)	21
3	Program Core(PC)	68
4	Program Elective (PE)	42
5	Faculty Elective (FE)	7
Total number of credit		**185**

Breakdown bycategory of courses (for 2022-23 Syllabus)

Sl. No	Category	Credits	Percentage %
1	Engineering	150	81.08%
2	Science	22	11.98%
3	Computer Technology	4	2.1%
4	Humanities	8	4.3%
5	Commerce and Management	1	0.54%
Total number of credits		**185**	**100%**

SEMESTER WISE COURSE DISTRIBUTION

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester I	1	22BTCE111R	Engineering Mathematics I	UC	3	1	0	0	0	0	4	40	60	0	100
	2	22BTCE112R	Introduction to Basic Mathematics, Logic and Coding	UC	2	1	2	0	0	0	4	40	60	100	200
	3	22BTCE113R	Engineering Physics	UC	2	1	2	0	0	0	4	40	60	100	200
	4	22BTCE114R	Basic Electrical Engineering	PE	2	1	2	0	0	0	4	40	60	100	200
	5	22BTCE115R	Workshop/Manufacturing Practices	PE	1	0	4	0	0	0	3	40	60	100	200
	6	22UBPD114R	Introductory English	UE	0	0	4	0	0	0	2	0	0	100	100

			for Engineers												
	7	22UBEC111	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	Total				10	4	14	4	0	0	22	200	300	600	1100

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester II	1	22BTCE121R	Engineering Mathematics II	UC	3	1	0	0	0	0	4	40	60	0	100
	2	22BTCE122R	Engineering Chemistry	UC	2	1	2	0	0	0	4	40	60	100	200
	3	22BTCE123R	Programming for Problem Solving	PE	3	0	2	0	0	0	4	40	60	100	200
	4	22BTCE124R	Engineering Graphics and Design	PC	1	0	4	0	0	0	3	40	60	100	200
	5	22UBPD12R	Effective English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	6	MOOCSCECE1	MOOCS I	FE	0	0	0	0	0	0	2	0	0	100	100
	7	22UBCC121	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	8	22UBEC121	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22BTCE125R	Techno-Professional Skills I	PC	0	0	2	0	0	0	1	0	0	100	100
	10	22UUHV102R	Universal Human Values (UHV) + Professional Ethics	UC	1	0	2	0	0	0	2	40	60	100	200
	11	22UUDL103R	Computational Systems and Digital World	UC	0	0	2	0	0	0	1	0	0	100	100
	Total				10	2	18	8	0	0	25	200	300	1000	1500

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester III	1	22BTCE211R	Engineering Mechanics	PC	2	1	0	0	0	0	3	40	60	0	100
	2	22BTCE212R	Engineering Geology	PC	1	0	2	0	0	0	2	40	60	100	200
	3	22BTCE213R	Biology for Engineers	FC	2	1	0	0	0	0	3	40	60	0	100
	4	22BTCE214R	Computer Aided Design (CAD)	PC	0	0	4	0	0	0	2	0	0	100	100
	5	22BTCE215R	Introduction to Civil Engineering	PC	2	0	0	0	0	0	2	40	60	0	100
	6	22BTCE216R	PDE and transform mathematics	PC	2	1	0	0	0	0	3	40	60	0	100
	7	22BTCE217R	Techno-Professional Skills II	PC	0	0	2	0	0	0	1	0	0	100	100
	8	22BTCE218R	Material Testing and Evaluation	PC	1	1	2	0	0	0	3	40	60	100	200
	9	22UBPD213R	English for Employabilityfor Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	10	22UBCC211	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	11	22UBEC211	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	12	22UULS212R	Basic Life Saving Skills	UC	0	0	2	0	0	0	1	0	0	100	100
	13	22UUFL213R	Personal Financial Planning	UC	0	0	2	0	0	0	1	0	0	100	100
	14	22MOCE211R	MOOCS II	FE	0	0	0	0	0	0	2	0	0	0	100
	Total				10	4	18	8	0	0	27	240	360	900	1600

Semester IV	S. N.	Course Code	Course Title	Course Category	Engagement						C	Maximum Marks for			
					L	T	P	S	R	O		IA*	SEE*	PE*	Total
	1	22BTCE221R	Solid Mechanics	PC	3	0	0	0	0	0	3	40	60	0	100
	2	22BTCE222R	Introduction to Fluid mechanics	PC	2	0	2	0	0	0	4	40	60	100	200
	3	22BTCE223R	Surveying and Geomatics	PC	3	0	2	0	0	0	4	40	60	100	200
	4	22BTCE224R	Geotechnical Engineering	PC	3	0	2	0	0	0	4	40	60	100	200
	5	22BTCE225R	Basic Electronics for Civil Engineering Application	PC	2	0	2	0	0	0	3	40	60	100	200
	6	22BTCE226R	Environmental Science	UC	2	0	0	0	0	0	2	40	60	0	100
	7	22UBPD223R	English Language Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	8	22UBCC221	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22UBEC221	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22BTCE227R	Techno-Professional Skills III	PC	0	0	2	0	0	0	1	0	0	100	100
	12	22MOCE221R	MOOCS III	FE	0	0	0	0	0	0	1	0	0	100	100
	14	22UULS221R	Basic Acclimatizing Skills (BAS)	UC	0	0	2	0	0	0	1	0	0	100	100
	Total				15	0	16	8	0	0	27	240	360	1100	1600

Semester V	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
	1	22BTCE311R	Environmental Engineering	PC	2	0	2	0	0	0	3	40	60	100	200
	2	22BTCE312R	Mechanics of Materials	PC	3	0	0	0	0	0	3	40	60	0	100
	3	22BTCE313R	Structural Analysis I	PC	2	1	0	0	0	0	3	40	60	0	100
	4	22BTCE314R	Transportation Engineering	PC	2	0	2	0	0	0	3	40	60	100	200
	5	22BTCE315R	Hydrology and Water Resource Engineering	PC	2	1	0	0	0	0	3	40	60	0	100
	6	22BTCE316R	Construction Engineering& Management	PC	3	0	0	0	0	0	3	40	60	0	100
	7	22BTCE317R	Hydraulics Engineering	PC	2	0	0	0	0	0	2	40	60	0	100
	8	22UBPD314R	Competent English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	9	22UBCC311	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22UBEC311	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	11	22BTCE317R	Techno-Professional Skills IV	PC	0	0	2	0	0	0	1	0	0	100	100
		MOOCSCECE4	MOOCS IV	FE	0	0	0	0	0	0	1	0	0	0	100
	Total				16	2	10	8	0	0	26	280	420	600	1400

ster	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			

					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
1	22BTCE321R	Design of RC Structure	PC	2	1	0	0	0	0	3	40	60	0	100
2	22BTCE322R	Estimation and Costing	PC	2	0	2	0	0	0	3	40	60	100	200
3	22BTCE324R	Structural Analysis II	PC	3	0	0	0	0	0	3	40	60	0	100
4	22BTCE324E	Professional Elective I	PE	3	0	0	0	0	0	3	40	60	0	100
5	22BTCE325E	Professional Elective II	PE	3	0	0	0	0	0	3	40	60	0	100
6	22BTCE326E	Professional Elective III	PE	3	0	0	0	0	0	3	40	60	0	100
7	22BTCE327E	Generic (Open) Elective I	UE	2	0	0	0	0	0	2	40	60	0	100
8	22UBPD324R	Corporate Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
9	22UBCC321	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
10	22UBEC321	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
11	22BTCE323R	Techno-Professional Skills V	PC	0	0	2	0	0	0	1	0	0	100	100
12	MOOCSCECE5	MOOCS V	FE	0	0	0	0	0	0	1	0	0	100	100
Total				15	1	8	8	0	0	26	240	360	600	1200

Semester VII	S. N.	Course Code	Course Title	Course Category	Engagement						C	Maximum Marks for			Total
					L	T	P	S	R	O		IA*	SEE*	PE*	

	1	22BTCE411R	Design of Steel Structure	PC	2	0	0	0	0	0	2	40	60	0	100
	2	22BTCE415E	Professional Elective IV	PE	3	0	0	0	3	3	3	40	60	0	100
	3	22BTCE414E	Generic Elective II	UE	3	0	0	0	3	3	3	40	60	0	100
	4	22BTCE412R	Project I	PC	0	0	12	0	6	6	6	0	0	100	100
	5	22BTCE413R	Industrial Mock Viva	PC	0	0	0	0	0	0	0	0	0	100	100
	6	22BTCE414R	Techno-Professional Skills VI	PC	0	0	2	0	1	1	1	0	0	100	100
	7	22UBCC411	Co-curricular	UC	0	0	0	4	1	1	1	0	0	100	100
	Total				8	0	14	4	14	14	16	120	180	400	700

Semester VIII	**S. N.**	**Course Code**	**Course Title**	**Course Category**	**Engagement**							**Maximum Marks for**			
					L	**T**	**P**	**S**	**R**	**O**	**C**	**IA***	**SEE***	**PE***	**Total**
	1.	22BTCE423R	Railway and Airport Engineering	PC	3	0	0	0	0	0	3	40	60	0	100
	2	22BTCE422E	Professional Elective V	PE	3	0	0	0	0	0	3	40	60	0	100
	3	22BTCE424E	Generic Elective III	UE	2	0	0	0	0	0	2	40	60	100	200
	4	22BTCE425E	Generic Elective IV	UE	2	0	0	0	0	0	2	40	60	100	200
	5	22BTCE422R	Project II	PC	0	0	12	0	0	0	6	0	0	100	100
	Total				10	0	12	0	0	0	16	160	240	300	700

SEMESTER – I									
Course Title	**Engineering Mathematics I**								
Course code	**22BTCE111R**	**Total credits: 4** **Total hours: 60T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To make understand to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma function must be introduced. 2. To provide the application of differential and integral calculus. 3. To make understand the convergence and divergence of sequence and series								
CO1	Enabling solving skills of definite and improper integrals.								
CO2	Understand the concept of calculus and linear algebra.								
CO3	Understand the application of differential and integral calculus.								
CO4	Evaluate functions of multiple variables, apply theorems of vector calculus, and solve optimization problems using Lagrange multipliers.								
CO5	Analyze complex functions, perform complex integration, and apply convergence tests and series representations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit 1:**Techniques of integration: Integration by parts, trigonometric integrals, and hyperbolic functions; Application of integration to solve differential equations: Separable and exact equations; Improper integrals and their convergence criteria; Numerical methods for integration: Trapezoidal rule, Simpson's rule, and Romberg integration; Applications of integration in physics and engineering: Center of mass, moments of inertia, and fluid pressure.	**5**	Upon completing this unit, students will be proficient in various techniques of integration, including integration by parts, trigonometric integrals, and hyperbolic functions. They will learn to apply integration methods to solve separable and exact differential equations, understand and evaluate improper integrals, and determine their convergence criteria. Additionally, students will acquire skills in numerical integration techniques such as the trapezoidal rule, Simpson's rule, and Romberg integration. The unit also equips students to apply integration in practical physics and engineering problems, such as calculating the center of mass, moments of inertia, and fluid pressure.	1, 2
II	**UNIT 2:** Unit 2. Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.	**10**	Students will gain a thorough understanding of fundamental theorems in calculus, including Rolle's Theorem and the Mean Value Theorem, as well as Taylor’s and Maclaurin theorems with remainders.	1, 2, 3, 4

			They will learn to handle indeterminate forms using L'Hospital's rule and develop the ability to find the maxima and minima of functions. This unit strengthens the students' grasp of the theoretical underpinnings of calculus and enhances their problem-solving skills in optimization.	
III	**UNIT 3:** Complex numbers and functions: Analyticity and Cauchy-Riemann equations; Complex integration: Cauchy's theorem and Cauchy's integral formula; Power series and Laurent series; Classification of singularities: Poles and essential singularities; Residue theorem and applications to evaluating complex integrals; Convergence tests for series: Ratio test, root test, and comparison test; Representation of functions using series: Taylor and Laurent series	**5**	In this unit, students will explore the realm of complex numbers and functions, focusing on concepts such as analyticity and the Cauchy-Riemann equations. They will delve into complex integration through Cauchy's theorem and Cauchy's integral formula. The unit covers power series and Laurent series, classification of singularities, and the residue theorem, providing students with the tools to evaluate complex integrals. Furthermore, students will learn various convergence tests for series and how to represent functions using Taylor and Laurent series, equipping them with a solid foundation in complex analysis.	1, 2, 3, 4, 5
IV	**UNIT 4:** Limit, continuity, and partial derivatives; directional derivatives, total derivative, tangent plane and normal line, Maxima, minima, and saddle points, Method of Lagrange multipliers, Gradient, curl, and divergence, Multiple integrals and their applications (double and triple integrals), Line integrals and surface integrals, Green's theorem, Stokes' theorem, and the Divergence theorem	**5**	Students will become adept at handling functions of multiple variables, learning about limits, continuity, and partial derivatives. They will understand directional derivatives, total derivatives, and the geometric interpretations of the tangent plane and normal line. The unit covers methods for finding maxima, minima, and saddle points, and introduces the method of Lagrange multipliers for constrained optimization. Students will also study vector calculus concepts, including the gradient, curl, and divergence, and apply multiple integrals in various contexts. The unit concludes with an exploration of line and surface integrals, and key theorems such as Green's, Stokes', and the Divergence theorem.	2, 3, 4
V	**UNIT 5:** Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation	**5**	This unit equips students with a comprehensive understanding of linear algebra concepts, focusing on the inverse and rank of a matrix, and the rank-nullity theorem. Students will learn to solve systems of linear equations and explore properties of symmetric, skew-symmetric, and	2, 3, 4, 5

			orthogonal matrices. The unit covers determinants, eigenvalues, and eigenvectors, and teaches students how to diagonalize matrices and apply the Cayley-Hamilton theorem. Additionally, students will learn about orthogonal transformations, gaining skills crucial for various applications in mathematics and related fields.	

TEXT BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3.Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Enabling solving skills of definite and improper integrals.	1,2
2	Understand the concept of calculus and linear algebra.	3,5
3	Understand the application of differential and integral calculus.	6,9,10
4	Evaluate functions of multiple variables, apply theorems of vector calculus, and solve optimization problems using Lagrange multipliers.	5,9
5	Analyze complex functions, perform complex integration, and apply convergence tests and series representations.	4,1,11

SEMESTER – I									
Course Title	**Introduction to Basic Mathematics, Logic and Coding**								
Course code	**22BTCE112R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60T	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	. 1. To understand and be able to use the language, symbols and notation of mathematics 2. To develop the ability to create a programmable model for a given problem. 3. To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations								
CO1	1. The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding								
CO2	2. Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.								
CO3	3. Solve and devise solutions to a range of elementary real-world problems in mathematics and programming								
CO4	4. Explore and apply key concepts in logical thinking to business problems.								
CO5	5. Enable students to critically analyze information in order to evaluate evidence and construct reasoned arguments								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basics of Set Theory and Functions:** **Sets**: Basic definitions, cardinality of a set, principle of exclusion and inclusion, combination of sets: union, intersection, difference, complement etc., De Morgan laws, Venn Diagram **Cartesian Products and Relations:** Basic Definitions, binary relations – composition and inverse, binary relation on a set : properties – reflexive, irreflexive, symmetric, anti-symmetric, transitive, equivalence relations, partial order relations **Functions:** Basic definition, domain and co-domain, image and range, identity function, one-to-one and onto functions, bijections, characteristic function, composition of functions, inverse of a function, operations on sets: unary operators – idempotence, binary operators – associativity, commutativity **Number systems:** Natural numbers, whole numbers, integers, rational numbers, real numbers, operations on numbers: addition, subtraction, multiplication and division	**5**	Students will gain a fundamental understanding of set theory, including basic definitions, cardinality, and operations on sets such as union, intersection, difference, and complement. They will learn the principle of exclusion and inclusion, De Morgan's laws, and how to represent sets using Venn diagrams. The unit covers Cartesian products, basic definitions of relations, and properties of binary relations including reflexivity, irreflexivity, symmetry, antisymmetry, transitivity, equivalence relations, and partial order relations. Additionally, students will explore the basics of functions, including domain, codomain, image, range, identity function, injective, surjective, and bijective functions, characteristic functions, composition and inverse of functions, and operations on sets involving unary and binary operators.	1, 2

II	**Introduction to Mathematical Logic and Induction:** **Mathematical Logic:** Truth values of mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables **Propositional Logic:** Constants, variables, assignment of variables in a formula, tautology, contradiction and satisfiability, truth table of a formula, equivalence of formulas, proving formulas and equivalences by truth table method **Mathematical Induction:** Principle of mathematical induction – induction basis and induction step, examples	**10**	This unit introduces students to various number systems such as natural numbers, whole numbers, integers, rational numbers, and real numbers, along with their basic operations: addition, subtraction, multiplication, and division. In the realm of mathematical logic, students will learn about truth values, logical operators (AND, OR, NOT), De Morgan's laws, and how to construct and interpret truth tables. The unit covers propositional logic, including constants, variables, tautology, contradiction, satisfiability, and equivalence of formulas. Students will also learn to prove formulas and equivalences using truth tables.	1, 2, 3, 4
III	**Introduction to Logic and Reasoning:** Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order , Puzzle, Blood Relations , Analogy, Cube and Dice, Coding-Decoding	**5**	Students will understand the principle of mathematical induction, learning to identify the induction basis and perform the induction step, with various examples to illustrate these concepts. The unit also introduces basic logic and reasoning skills, including alphanumeric series, directional reasoning, logical reasoning, data sufficiency, ranking and ordering, puzzles, blood relations, analogy, and coding-decoding. These topics will develop students' problem-solving abilities and logical thinking skills.	1, 2, 3, 4, 5
IV	**Introduction to Coding:** **C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. **Control Statements:** Decision Making using if statement, Types of if ...else block, Switch case Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement	**5**	This unit introduces students to the fundamentals of C programming, covering the types of programming languages and the evolution of the C language. Students will learn the structure of a C program, and how to execute and debug it. The unit covers C tokens such as keywords, identifiers, operators, constants, variables, data types, and operator precedence. Students will understand the scope and lifetime of variables, arithmetic expressions, and their evaluation. Control statements will be covered, including decision-making using if statements, types of if...else blocks, switch case blocks, and the GOTO statement.	2, 3, 4
V	**Introduction to Arrays, Strings and Functions** **Arrays:** One Dimensional Arrays, Two-Dimensional Arrays,	**5**	Students will delve deeper into C programming, focusing on control structures such as loops (for, while, do-while) and how to manage loop execution using break and continue statements. The	2, 3, 4, 5

	Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.		unit introduces arrays, covering one-dimensional, two-dimensional, multidimensional, and dynamic arrays. Students will also learn about strings, including how to implement string variables and use string handling functions. The concept of functions is explored, differentiating between user-defined and system-defined functions, and understanding how to pass parameters to functions. This unit provides a comprehensive understanding of essential programming constructs and prepares students for more advanced coding tasks.	

TEXT BOOKS:

1. Schaum's Outline of Programming with C by Byron Gottfried, Third Edition
2. Programming in ANSI C by E. Balaguruswamy, Eight Edition
3. Discrete Mathematics by Lipschutz, Lipsonand and Patil, Revised Third Edition
4. A Textbook on Discrete Mathematics by Sastry and Nayak

REFERENCE BOOKS:

1. A Modern Approach To Verbal & Non Verbal Reasoning by R S Agarwal, Revised Edition
2. Analytical and Logical Reasoning by Sijwali B S, Revised Edition
3. The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie, Second Edition
4. 2000 Solved Problems in Discrete Mathematics by Lipschutz and Lipson

OTHER LEARNING RESOURCES:

https://www.javatpoint.com/discrete-mathematics-tutorial
https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logical-reasoning--article--getting-started
https://www.javatpoint.com/c-programming-language-tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	1. The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding	1,8
2	2. Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.	3,7
3	3. Solve and devise solutions to a range of elementary real-world problems in mathematics and programming	6,9,10
4	4. Explore and apply key concepts in logical thinking to business problems.	5,9

5	5. Enable students to critically analyze information in order to evaluate evidence and construct reasoned arguments	7,1,12

SEMESTER – I									
Course Title	**Engineering Physics**								
Course code	**22BTCE113R**	**Total credits: 4** **Total hours: 60T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To understand the theories of physics 2. To apply the concepts in practical problems 3. To understand the physics of any process								
CO1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.								
CO2	Illustrate conservative and non-conservative forces, angular momentum and energy equations								
CO3	Explain basics of non-inertial frames and acceleration and its application in engineering field								
CO4	Comprehend on oscillations and its application in the field of engineering kinematics								
CO5	Understand the three dimensional rigid body motion and determine the moment of inertia.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit I: Electrostatics in Vacuum** Coulomb's law, electric field intensity, Gauss's law and its applications, electric potential and potential energy, conductors in electrostatic equilibrium, capacitors and capacitance calculations.	**10**	By the end of this unit, students will demonstrate a comprehensive understanding of the development of railways in India, including the evolution of permanent way and railway track components. They will be able to explain the significance of different gauges used in India and the process of conning wheels. Students will identify and describe the functions and characteristics of key components such as rails, sleepers, and ballast, detailing their types, spacing, and densities. They will analyze the advantages and disadvantages of various types of ballast and understand the requirements for subgrade and embankment construction. Additionally, students will be able to identify common rail defects, understand rail creep, and explain the principles behind rail joints and welding techniques.	1, 2
II	**Unit II: Magnetostatics** Biot-Savart law, Ampère's law and applications, magnetic vector potential, magnetic properties of materials (diamagnetism,	**10**	Upon completing this unit on the geometric design of railway tracks, students will be able to analyze and design railway track layouts incorporating gradients, grade compensation, speed considerations	1, 2, 3, 4

	paramagnetism, ferromagnetism).		for curves, and principles of super elevation to enhance safety and efficiency. They will understand the concepts of cant deficiency and negative super elevation, applying them appropriately to track design. Furthermore, students will gain proficiency in designing and implementing various track layouts including switches, crossings (such as diamond and scissors crossings), and turnouts (including double turnouts). They will comprehend the operational requirements and design considerations for railway stations and yards, including traction and track resistance, stress analysis on track components (rails, sleepers, ballast), and the equipment necessary in yards. Additionally, students will grasp the fundamentals of signaling and control systems, their objectives, classifications, and the principles of interlocking signals and points to ensure safe railway operations.	
III	**Unit III: Faraday's Law** Electromagnetic induction, Faraday's law (integral and differential forms), magnetic flux, induced electromotive force (emf), practical applications.	**10**	The learning outcome of the unit on air transport and airport planning encompasses a comprehensive understanding of the historical evolution, regulatory frameworks, and operational aspects of air transport systems worldwide. Students will gain knowledge of aircraft types and their characteristics, aerodrome classifications, and the roles of air transport authorities. They will develop proficiency in airport planning principles according to international standards (ICAO and FAA), covering regional planning concepts, airport master planning, site selection criteria, zoning laws, and the design and classification of airport elements such as airfields and terminals. Additionally, students will learn to assess airport and runway capacities, estimate future air traffic demands, and apply principles for developing new airports, culminating in the ability to conceptualize ideal airport layouts.	1, 2, 3, 4, 5
IV	**Unit IV: Displacement Current and Maxwell's Equations** Displacement current, magnetic field due to time-dependent electric field, Maxwell's equations in integral and differential forms,	**10**	Upon completion of this unit on Airfield Design and Planning, students will be able to demonstrate comprehensive knowledge and skills in various critical aspects of airfield infrastructure. They will understand	2, 3, 4

	boundary conditions for electromagnetic fields.		the principles of runway design, including the influence of wind orientation and coverage on runway orientation and length requirements, as well as factors affecting runway length determination and geometric configurations. Students will be proficient in designing taxiways, considering geometric elements, layout, and exit strategies, as well as planning apron locations, sizes, and configurations for efficient aircraft parking and turnaround operations. Additionally, they will grasp the essentials of pavement design using the LCN system, comprehend common airfield pavement failures, and formulate strategies for maintenance and rehabilitation. This unit will equip students with the necessary expertise to contribute effectively to the planning, design, and operational efficiency of airfield facilities.	
V	**Unit V: Electromagnetic Waves** Wave equation for electromagnetic fields, propagation of electromagnetic waves in free space and in materials, energy and momentum of electromagnetic waves, reflection and refraction, polarization, electromagnetic wave applications	**5**	By the end of this unit, learners will demonstrate a comprehensive understanding of terminal area planning and design within an airport context. They will be able to analyze and apply the fundamental elements and requirements of terminal buildings, including functional spaces and spatial requirements. Students will also grasp essential concepts in vehicular parking area design and circulation networks, incorporating considerations for efficient operations and user experience. Furthermore, they will comprehend the significance of airport grading and drainage systems, understanding their roles in ensuring operational safety and efficiency.	2, 3, 4, 5

TEXT BOOKS:

1.Introduction to Electrodynamics. David Griffiths. Prentice Hall, Upper Saddle River, New Jersey, 07458

2.Basic Laws of Electromagnetism. IE IRODOV

REFERENCE BOOKS:

1. Principles of physics. Halliday Resnick

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S0951832022005142

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.	1,2
2	Illustrate conservative and non-conservative forces, angular momentum and energy equations	3,5
3	Explain basics of non-inertial frames and acceleration and its application in engineering field	6,9,10
4	Comprehend on oscillations and its application in the field of engineering kinematics	5,9
5	Understand the three dimensional rigid body motion and determine the moment of inertia.	4,1,11

SEMESTER – I									
Course Title	**Basic Electrical Engineering**								
Course code	**22BTCE114R**	**Total credits: 4** **Total hours: 60T**	**L** **2**	**T** **1**	**P** **2**	**S** **0**	**R** **0**	**O/F** **0**	**C** **4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Explain operative principle of transformer with background of magnetic circuits. 2. Classify and compare different types of Electrical machines. 3.								
CO1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems								
CO2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.								
CO3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.								
CO4	Explain the working priciples of common electrica instruments and their characteristics.								
CO5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and and elementary calculations for energy consumption								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**DC Circuits:** Electrical circuit elements (R,L,C), voltage and current source, Kirchoff's current and voltage law, analysis of simple circuit, Thevenin, Norton and Superposition theorem	**10**	Students will understand the properties of electrical circuit elements (R, L, C) and the behavior of voltage and current sources.	1, 2
II	**AC Circuit**: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single phase ac circuits consisting of R,L,C.RL,RC,RLC combination(series and parallel), voltage and current relationship in star and delta connection	**10**	Students will apply the concepts of sinusoidal waveforms, including peak and RMS values, and phasor representation.	2, 3, 4
III	**Transformer:** Magnetic materials, ideal and practical transformer, equivalent circuit, losses in transformer, regulation and efficiency, auto transformer,	**10**	Students will understand the properties of magnetic materials and the construction and operation of ideal and practical transformers.	1, 2, 3, 4

	three phase transformer connection			
IV	**Electrical Machines:** Generation of rotating magnetic fields, construction and working of three phase induction motor, torque-slip characteristics, losses and efficiency, Single phase induction motor, working of synchronous generator	**10**	Students will understand the generation of rotating magnetic fields and the construction and working principles of three-phase induction motors.	1, 2
V	**Power converter and electrical installation:** DC-DC buck and boost converter, single phase and three phase voltage source inverter, Fuse, MCB, ELCB, MCCB, Earthing, wires and cables, types of batteries	**5**	Students will apply the principles of DC-DC buck and boost converters, and single-phase and three-phase voltage source inverters.	2, 3, 4, 5

TEXT BOOKS:

1. D. P. Kothari and I. J.Nagrath, Basic Electrical Engineering , Tata McGraw Hill,2010

REFERENCE BOOKS:

1.D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill ,2009

2.E. Hughes, “Electrical and Electronics Technology”, Pearson,2010

OTHER LEARNING RESOURCES:

https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems	1,2
2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.	3,10
3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.	6,9,12
4	Explain the working priciples of common electrica instruments and their characteristics.	5,9
5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and and elementary calculations for energy consumption	4,1,7

SEMESTER – I									
Course Title	**Introductory English for Engineers**								
Course code	22UBPD114R	**Total credits: 2** **Total hours: 30T**	**L** **0**	**T** **0**	**P** **4**	**S** **0**	**R** **0**	**O/F** **0**	**C** **2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be able to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.								
CO2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.								
CO3	Understand the process and purpose of listening, differentiate between listening and hearing, identify factors affecting listening, and implement strategies to improve their listening skills.								
CO4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.								
CO5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Module 1 - Grammar** i. Parts of Speech i. Articles i. Auxiliary Verbs v. Affirmative and Negative Sentences	**10**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and meaningful sentences.	1, 2
II	**Module 2- Grammar** i. Determiners i. Sentence Construction i. Types of Sentences (Assertive, Imperative, etc.) v. Degree of Comparison	**10**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and exclamatory). The concept of the degree of comparison (positive, comparative,	2, 3, 4

	v. Comprehension Exercises		and superlative) will be explored. The module will also include comprehension exercises designed to enhance students' ability to understand and interpret written texts effectively	
III	**Module 3 - Listening Skills** i. What is listening? i. The Process of Listening i. Factors that adversely affect Listening v. Difference between Listening and Hearing, v. Purpose and Importance of Effective Listening i. How to Improve Listening Process.	**10**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	**Module 4 - Speaking Skills** i. Introducing yourself i. Self-discovery i. Basics of Phonetics, pronunciation v. Extempore speech v. Video Recording for Self reflection	**10**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	**Module 5- Communication Skills** i. Introduction to Communication, i. Importance of Communication Skills, i. Purpose of Communication, v. Types of Communication, v. Formal and informal communication i. Importance of Communication, i. Barriers to Communication, i. How to improve/ tips to improve Communication skills. x. Responding to different questions in various situations (formal/informal)	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	2, 3, 4, 5

Text Books:

1.Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.

2. 2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & Company Ltd.: New Delhi.

Reference Books:

1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India

2.Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Klett

Other Learning Resources:

https://youtu.be/bEB8-SWMYhI

https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.	1,2
2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.	3,5
3	Understand the process and purpose of listening, differentiate between listening and hearing, identify factors affecting listening, and implement strategies to improve their listening skills.	6,9,10
4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.	5,9
5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.	4,1,11

SEMESTER – I									
Course Title	**Workshop/Manufacturing Practices**								
Course code	**22BTCE115R**	**Total credits: 4** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course	1.Learning this course will lead you to understand basic concepts of workshop and								

Objectives (Minimum 3)	manufacturing 2. Apply fundamental knowledge of workshop and manufacturing in day-to-day life. 3. Recognize components using different materials.
CO1	Infer about various manufacturing methods like casting, forming, machining etc
CO2	Apply fitting oparation and power tools in manufacturing works
CO3	Demonstrate to Carpentry & fitting operations and its application in industries
CO4	Enhance skills in machining operations like material cutting and preparation of mould etc.
CO5	Critique the different types of welding, metal cassting and its field of application.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Manufacturing Methods** Casting, forming, machining, joining, advanced manufacturing methods	**10**	Students will gain a comprehensive understanding of traditional manufacturing methods, including casting, forming, machining, and joining processes. They will explore the fundamentals of each method, learning about the materials and techniques used to shape and assemble components. The unit also introduces advanced manufacturing methods, focusing on CNC (Computer Numerical Control) machining and additive manufacturing. Students will gain an overview of the CNC machining process, including the programming, setup, and operation of CNC machines. They will also learn about additive manufacturing, covering its principles, technologies, and applications in modern manufacturing	1, 2
II	**CNC machining, Additive Manufacturing** Overview of CNC machining process, overview of additive manufacturing	**10**	This unit covers essential skills and knowledge in carpentry and fitting operations. Students will become familiar with various carpentry tools and their uses, as well as common carpentry operations such as cutting, shaping, and assembling wooden components. The unit also includes fitting tools and operations, teaching students how to measure, mark, cut, and assemble metal components with precision. These skills are fundamental for producing and maintaining high-quality mechanical systems and structures.	2, 3, 4
III	**Carpentry & Fitting operations** Carpentry tools, carpentry operations, fitting tools, fitting operations	**10**	Students will delve into machining operations, focusing on turning and milling processes. They will learn the principles and techniques involved in turning, such as setting up the lathe, selecting cutting tools, and executing turning operations to produce cylindrical parts. The unit also covers milling processes, including the setup and	1, 2, 3, 4

			operation of milling machines, and the selection of appropriate milling tools. Students will gain practical skills in producing components with complex shapes and precise dimensions.	
IV	**Machining operations** Turning, milling, turning processes, milling processes	**10**	In this unit, students will explore various welding techniques, with a focus on arc welding and gas welding. They will learn about the equipment, materials, and safety procedures involved in these welding methods. The unit also covers brazing, teaching students the principles and techniques for joining metals using a filler material that melts at a lower temperature than the base materials. Through hands-on practice, students will develop the skills needed to create strong, durable welds for a variety of applications.	1, 2
V	**Welding** Arc welding & gas welding, brazing	**5**	Students will gain an in-depth understanding of advanced manufacturing technologies, particularly CNC machining and additive manufacturing. The unit provides an overview of the CNC machining process, highlighting its precision, flexibility, and automation capabilities. Students will learn about the various types of CNC machines, programming techniques, and practical applications in industry. The unit also covers additive manufacturing, discussing its revolutionary impact on product design and production. Students will explore different additive manufacturing technologies, materials, and the wide range of applications, from prototyping to production of complex, custom parts.	2, 3, 4, 5

TEXT BOOKS:

1.Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010

2.Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K Media promoters and publishers private limited, Mumbai.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Infer about various manufacturing methods like casting, forming, machining etc	1,3,5

2	Apply fitting oparation and power tools in manufacturing works	2,4
3	Demonstrate to Carpentry & fitting operations and its application in industries	6,8
4	Enhance skills in machining operations like material cutting and preparation of mould etc.	7,10,12
5	Critique the different types of welding, metal cassting and its field of application.	8,9

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE111R	Engineering Mathematics I	3	3	1	1	1		1					1
22BTCE112R	Introduction to Basic Mathematics, Logic and Coding	2	3	2	1	1	1	1					1
22BTCE113R	Engineering Physics	3	3	1	1	1		1					1
22BTCE114R	Basic Electrical Engineering	3	2	2	3	2	1				1		
22BTCE115R	Workshop/Manufacturing Practices			2	1	1	2	1	2	1			2
22UBPD114R	Introductory English for Engineers						1		1	2	3	2	2

SEMESTER – II									
Course Title	**Engineering Mathematics II**								
Course code	**22BTCE121R**	**Total credits: 4** **Total hours: 30T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Describe the concept of first order differential equation and apply them in understanding complex problems. 2. Apply the concept ofordinary differential equations of higher orders. 3. Analyze: To develop students' skills in basic probability and statistics, including the analysis of probability distributions, measures of central tendency, and statistical parameters, and to apply these concepts to real-world data and hypothesis testing.								
CO1	Apply complex variable and its differentiation in solving various complex problems.								
CO2	Understand the basic principles of probability and apply them in solving different complex problems.								
CO3	Apply the concepts of basic and applied Statistics. Apply complex variable differentiation techniques								
CO4	Calculate basic probability measures within probability spaces, including conditional probability, independence, and the behaviour of discrete random variables.								
CO5	Evaluate statistical parameters such as moments, skewness, and kurtosis for binomial, Poisson, and normal distributions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	***First order ordinary differential equations:*** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	**7**	First-order ordinary differential equations include understanding and solving exact, linear, and Bernoulli equations, as well as Euler's equations for rigid body dynamics. Students will also learn to handle equations not of the first degree, including those solvable for pp, yy, or xx, and Clairaut's type equations. These outcomes focus on enhancing analytical and problem-solving skills in differential equations.	1,2
II	***Ordinary differential equations of higher orders:*** Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.	**9**	Method of variation of parameters. Students will also understand and solve the Cauchy-Euler equation, which is a specific type of second-order linear differential equation	1,2

			useful in various applications.	
III	***Complex variable-Differentiation:*** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions(exponential, trigonometric, logarithm) and their properties.	**8**	Gaining proficiency in solving second-order linear differential equations with variable coefficients using techniques like the variation of parameters. Additionally, students will learn to solve the Cauchy-Euler equation, a particular type of second-order differential equation, and comprehend its applications and solution methods. This expertise prepares students to tackle complex differential equations found in various scientific and engineering contexts	1,2
IV	***Basic probability:*** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution.	**8**	Understanding the foundational concepts of probability spaces and the ability to calculate conditional probability and determine the independence of events. Students will also learn about discrete random variables and how to analyze distributions involving independent random variables. Additionally, they will gain proficiency in working with the multinomial distribution and applying the Poisson approximation to the binomial distribution, equipping them with essential tools for solving a variety of probabilistic problems.	1,2
V	***Basic and applied Statistics:*** ***Basic:*** Measures of central tendency: Moments, skewness and Kurtosis- Probability distributions: Binomial, Poisson and Normal- evaluation of statistical parameters for these three distributions, Correlation and regression. ***Applied:*** Test of significance: Large sample test for single proportion. Difference of proportions, single mean, difference of means and difference of standard deviations.	**8**	Understanding and calculating measures of central tendency such as mean, median, and mode. Students will also learn to compute moments, and analyze skewness and kurtosis to describe data distribution shapes. Additionally, they will gain proficiency in working with key probability distributions (Binomial, Poisson, and Normal), including evaluating their statistical parameters. Furthermore, students will develop skills in correlation and regression analysis to examine relationships between variables.	1,2

TEXT BOOKS:

1. **Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.**

2. **N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.**

REFERENCE BOOKS:

1. **S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.**

S. L. Ross, Differential Equations, 3rd Ed. Wiley India, 1984.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply complex variable and its differentiation in solving various complex problems.	1,2
2	Understand the basic principles of probability and apply them in solving different complex problems.	3,4,8
3	Apply the concepts of basic and applied Statistics. Apply complex variable differentiation techniques	6,8,10
4	Calculate basic probability measures within probability spaces, including conditional probability, independence, and the behaviour of discrete random variables.	4,6
5	Evaluate statistical parameters such as moments, skewness, and kurtosis for binomial, Poisson, and normal distributions.	7,11,12

SEMESTER – II									
Course Title	**Engineering Chemistry**								
Course code	**22BTCE122R**	**Total credits: 5.5** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop a deep understanding of atomic and molecular structures, including the application of quantum mechanics to solve complex problems. 2. To apply theoretical concepts to real-world scenarios, such as predicting molecular properties and understanding spectroscopic techniques. 3. To foster critical thinking and analytical skills necessary for interpreting complex chemical phenomena.								
CO1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.								
CO2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.								
CO3	Analyze molecular orbitals of diatomic molecules and multicenter orbitals using quantum mechanical equations and visualize these orbitals through plots.								
CO4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.								
CO5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties								
Unit-No.	**Content**		**Contact Hour**		**Learning Outcome**				**KL**
I	Atomic and molecular structure Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures		**6**		Demonstrate proficiency in solving quantum mechanical problems related to atomic and molecular structures.				1

II	Spectroscopic techniques and applications Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.	**6**	Analyze spectroscopic data to deduce molecular structures and dynamics.	2
III	Use of free energy in chemical equilibria Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.	**6**	Evaluate the impact of intermolecular forces on the physical and chemical properties of substances.	3
IV	Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces. Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.	**6**	Apply thermodynamic principles to chemical equilibria and electrochemical systems.	4
V	**Stereochemistry** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds **Organic reactions and synthesis of a drug molecule** Introduction to reactions involving substitution, addition, elimination,	**6**	Interpret periodic trends and their implications on chemical behavior and reactivity.	5

	oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule			

Text Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

Reference Books:

1. Physical Chemistry, by P. W. Atkins
2. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.	1,3
2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.	3,4,7
3	Analyze molecular orbitals of diatomic molecules and multicenter orbitals using quantum mechanical equations and visualize these orbitals through plots.	6,8,12
4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.	4,6
5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties	7,11,12

SEMESTER – II									
Course Title	**Programming for Problem Solving**								
Course code	**22BTCE123R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours:	**3**	**0**	**2**	**0**	**0**	**0**	**4**

		45T+30P							
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1.To learn the fundamentals of computers. 2.To understand the various steps in program development. 3.To learn the syntax and semantics of C programming language. 4.To learn the usage of structured programming approach in solving problems								
CO1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.								
CO2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.								
CO3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.								
CO4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.								
CO5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**					
I	Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)	**11**	Demonstrate proficiency in constructing and interpreting flowcharts and pseudocode for algorithm design.	1,2					
II	Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.	**10**	Apply knowledge of variables, data types, and arithmetic expressions with appropriate precedence in programming tasks.	1,2					
III	Arrays (1-D, 2-D), Character arrays and Strings	**10**	Implement conditional branching and iterative structures to control program flow and optimize algorithm efficiency.	1,2					
IV	Basic Algorithms: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity Function and Recursion: Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.	**7**	Develop proficiency in manipulating arrays, character arrays, and strings to manage and process data effectively.	1,2					
V	Structure and Pointers: Pointers, Structures (including self referential structures e.g., linked list, notional introduction) File handling	**7**	Analyze and evaluate algorithm efficiency through the application of basic searching and sorting techniques, understanding time complexity implications.	1,2					
Practical		**30**		1,2, 3,4					

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.	1,3
2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.	3,4,8
3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.	6,8,12
4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.	4,6
5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.	7,11,12

SEMESTER – II									
Course Title	**Engineering Graphics and Design**								
Course code	**22BTCE124R**	**Total credits: 3** **Total hours: 10T+40P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								

Semester	Fall/ II semester of 1st year of the programme			
Course Objectives (Minimum 3)	1. To introduce students to the principles and techniques of traditional and computer-based engineering graphics. 2. To equip students with the skills necessary to interpret, create, and analyze technical drawings and models. 3. To familiarize students with modern engineering graphics software and its applications in design and visualization.			
CO1	Introduction to engineering design and its place in society.			
CO2	Exposure to the visual aspects of engineering design.			
CO3	Exposure to engineering graphics standards.			
CO4	Exposure to solid modelling.			
CO5	Exposure to computer-aided geometric design			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Unit 1: Traditional Engineering Graphics**:** Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles.	**3**	Upon completion of the course, students will be able to demonstrate the application of orthographic projection using Descriptive Geometry principles.	1,2
II	Unit 2: Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.	**2**	Students will be able to interpret and create technical drawings incorporating isometric projection, sectional views, and accurate dimensioning.	1,2
III	Unit 3: Computer Graphics: Engineering Graphics Software; - Spatial Transformations; Orthographic Projections; Model Viewing.	**2**	Students will develop proficiency in utilizing engineering graphics software for spatial transformations, model viewing, and orthographic projections.	1,2
IV	Unit 4: Co-ordinate Systems; Multi-view Projection; Exploded Assembly	**2**	Upon completion, students will understand the principles of co-ordinate systems and multi-view projection, and apply them effectively in technical drawings.	1,2
V	Unit 5:Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)	**1**	Students will be able to utilize surface and solid modeling techniques in BIM to design and visualize complex engineering structures.	1,2

Text Books:

1. Bhatt, N.D., Engineering Drawing, Charotar Publishing House Pvt. Ltd.
2. John, K.C. Engineering Graphics, Prentice Hall India Publishers.

Reference Books:

1. Anilkumar, K.N., Engineering Graphics, Adhyuth narayan Publishers
2. Agrawal, B. And Agrawal, C.M., Engineering Darwing, Tata McGraw Hill
3. Varghese, P.I., Engineering Graphics, V I P Publishers

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Introduction to engineering design and its place in society.	1,3,6
2	Exposure to the visual aspects of engineering design.	3,4,7
3	Exposure to engineering graphics standards.	6,8,12
4	Exposure to solid modelling.	4,6,8
5	Exposure to computer-aided geometric design	7,11

SEMESTER – II									
Course Title	**Effective English for Engineers**								
Course code	**22UBPD12R**	**Total credits: 2** **Total hours: 40P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objective	1. To introduce students to fundamental grammatical concepts and sentence analysis techniques. 2. To enhance vocabulary skills through the study of synonyms, antonyms, and homonyms.								

s (Minimum 3)	3. To develop practical skills in reading comprehension and information interpretation.			
CO1	Identify and classify different types of sentences using grammatical rules and structures.			
CO2	Demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.			
CO3	Apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.			
CO4	Apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.			
CO5	Demonstrate effective time management skills by prioritizing tasks and meeting deadlines.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Module 1- Grammar** i. Interchange of Interrogative and Assertive Sentences ii. Interchange of Exclamatory and Assertive Sentences iii. Analysis of Sentences iv. Types of Tenses v. Exercises on Tense	**3**	Students will be able to identify and classify different types of sentences using grammatical rules and structures.	1,2
II	**Module 2- Vocabulary** i. Synonyms ii. Antonyms iii. Homonyms	**2**	Students will demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.	1,2
III	**Module 3- Reading Skills** i. Techniques of Effective Reading ii. Gathering ideas and information from a text iii. The SQ3R Technique iv. Interpret the text	**2**	Students will apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.	1,2
IV	**Module 4- Dress Code Ethics** i. Introduction to Dress Code Ethics, ii. Purpose and Importance, iii. How to Make FIRST IMPRESSION iv. What to WearDuringInterviews or Any Other Formal Meetings – Male & Female Activity:	**1**	Students will apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.	1,2
V	**Module 5- Time-Management Skills** i. Introduction To Time Management,	**2**	Students will demonstrate effective time management skills by prioritizing tasks and meeting deadlines.	1,2

	ii. Purpose And Importance of Time Management, iii. Basic Tips to Maintain Time. Activity: Problem solving activity: A situation will be given to the students and they will have to tell us how to handle the situation or solve the problem			

Text Books

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2. Solid Mechanics by Dr. Utasv Chandra Kalita

Reference Books:

1. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.

2. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979

3. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will be able to identify and classify different types of sentences using grammatical	1,3

	rules and structures.	
2	Students will demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.	3,4,7
3	Students will apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.	6,8
4	Students will apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.	4,6,8
5	Students will demonstrate effective time management skills by prioritizing tasks and meeting deadlines.	7,12

SEMESTER – II									
Course Title	**Universal Human Values (UHV) + Professional Ethics**								
Course code	**22UUHV102R**	**Total credits: 2** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings								

(Minimum 3)	2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature
CO1	**Analyze** the need and significance of Value Education, understanding its basic guidelines, content, and processes.
CO2	**Evaluate** the concepts of self-exploration, natural acceptance, and experiential validation in achieving continuous happiness and prosperity.
CO3	**Apply** the principles of right understanding, relationship, and physical facilities to prioritize and fulfill basic human aspirations.
CO4	**Synthesize** the knowledge of harmony within the self, family, society, and nature, and formulate strategies to maintain this harmony.
CO5	**Create** a framework for integrating human values and professional ethics into personal and professional practices, ensuring the development of eco-friendly and socially responsible technologies and systems.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation** 1. Understanding the need, basic guidelines, content and process for Value Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the currentscenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	**3**	Students will **understand** the need for value education and its basic guidelines, content, and process.	1
II	**Understanding Harmony in the Human Being - Harmony in Myself!** 1. Understanding human being as a co-existence of the sentient 'I' and the material'Body' *2.* Understanding the needs of Self ('I')	**3**	Students will **comprehend** the concept of self-exploration, including its content and process, and the mechanisms of natural acceptance and experiential validation.	2

	and 'Body' - *Sukh* and *Suvidha* 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correctappraisal of Physical needs, meaning of Prosperity in detail Programs to ensure *Sanyam* and *Swasthya*- Practice Exercises and Case Studies will be taken up in Practice Sessions.			
III	**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship** 1. Understanding Harmony in the family – the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of *Nyaya* and programfor its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship 3. Understanding the meaning of *Vishwas*; Difference between intention and competence 4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship 5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals 6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!- Practice Exercises and Case Studies will be taken up in Practice Sessions.	**5**	Students will **gain insight** into the basic human aspirations of continuous happiness and prosperity and how to achieve them through right understanding, relationships, and physical facilities.	3
IV	**Understanding Harmony in the Nature and Existence - Whole existence asCo-existence** 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-	**4**	Students will **recognize** the importance of harmony in human relationships, family, society, and nature, and how it contributes to a universal harmonious order.	4

	regulation in nature 3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting unitsin all-pervasive space 4. Holistic perception of harmony at all levels of existence-Practice Exercises and Case Studies will be taken up in Practice Sessions.			
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic UniversalOrder 4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universalhuman order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and managementpatterns for above production systems. 5. Case studies of typical holistic technologies, management models and productionsystems 6. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations	**5**	Students will **develop** competence in professional ethics by understanding human values, ethical human conduct, and strategies for transitioning to a universal human order.	5

Text Books:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values andprofessional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

2. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986,1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins,USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III,1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) KrishiTantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze the need for value education and its impact on personal and societal well-being.	1,4
2	Evaluate the concepts of self-exploration, natural acceptance, and experiential validation as mechanisms for understanding human aspirations.	3,4,7
3	Differentiate between happiness and prosperity and assess their implications on human aspirations in the current scenario.	6,8,10
4	Demonstrate understanding of harmony in human relationships, family, society, nature, and existence.	4,6,8
5	Apply principles of professional ethics to develop sustainable and humanistic solutions in their professional practice.	7,11

SEMESTER – II									
Course Title	**Computational Systems and Digital World**								
Course code	**22UUDL103R**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objective	To provide a comprehensive understanding of computer systems, office automation tools, and their practical applications.								

s (Minimum 3)	To equip students with skills for effective data management, analysis, and visualization using MS-Excel. To enhance knowledge of the internet, social media, e-commerce, and digital payment systems, including their ethical and legal aspects
CO1	**Identify** the components of a computer system and explain their functions.
CO2	**Apply** office automation tools like MS-Word, MS-Excel, and MS-PowerPoint for creating, managing, and presenting data.
CO3	**Analyze** statistical data and create visualizations using MS-Excel.
CO4	**Demonstrate** the use of computer networks, the Internet, and web searching techniques.
CO5	**Evaluate** the impact of social media, e-commerce, and digital payment systems in modern society, including associated crimes and legal frameworks.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Fundamentals of Computer Systems, Office Automation and Internet Search** i. Components of a Computer and their functions. ii. Office Automation using MS-Word, MS-Excel, and MS-PowerPoint. iii. Data management, Statistical Data Analysis and Data Visualization with MS-Excel. iv. Use of Functions, Graphs & Charts in MS-Excel.	**2**	Students will **understand** the fundamental components of computer systems and their respective functions.	
II	**Internet & Cyber World** i. Introduction to Computer Networks, Internet and World Wide Web, Websites and Web portals. ii. Creation and use of Email Accounts. iii. Web browsing, Web Searching, Different aspects of Web Searching- Search Keywords, conditions and combinations. iv. Study of different Search Engines like Google, Microsoft Bing, Yahoo, Yandex, DuckDuckGo, Ask.com etc. v. Cyber Crimes, Cyber Laws and IT Act 2000, India	**2**	Students will **be proficient in** using MS-Word, MS-Excel, and MS-PowerPoint for office automation tasks.	
III	**Introduction to Social Media and E-Commerce** i. Relevance of Social Media in present scenario. Posting different types of contents in Social Media. ii. Creating accounts and using some popular Social media portals and Apps like WhatsApp, Facebook, etc. Social Media Etiquettes & Crimes. iii. Definition of E-Commerce; E-Commerce versus traditional Commerce. iv. Case studies of popular E-Commerce portals like Amazon. v. E-commerce Etiquettes & Crimes.	**2**	Students will **be able to** manage and analyze data, and create data visualizations using MS-Excel.	

IV	**Digital Payments and Digital Transactions** i. Introduction to Digital Payment Systems. ii. Creating accounts and using Digital Payment Systems like Credit Cards, Debit Cards, Netbanking, UPI. iii. Digital payments Etiquettes & Crimes.	**2**	Students will **gain skills in** web browsing, web searching, and understanding the use of various search engines.	
V	**Basic Accounting and Utility Software** i. Introduction to Basic accounting concepts, Introduction to an Accounting Software like GnuCash or Tally. ii. Introduction to Technical Document writing using LaTex. iii. Introduction to Data Visualization software – Sigma, Google Charts, Tableau.	**2**	Students will **acquire knowledge of** digital payment systems, social media, e-commerce, and their related etiquettes and crimes.	

Text Books:

1. Sinha Pradeep K. and Priti Sinha. *Computer Fundamentals: Concepts Systems & Applications*. 3rd ed. New Delhi: BPB Publications.
2. Goel, A, 2010. Computer Fundamentals, Pearson India.

Reference Books:

1. Balaguruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.
2. Balaguruswamy, 2014. E. Fund Of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-Hill Education.
3. Lawson, C. 2022. Introduction to Social Media, Oklahoma State University.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	**Identify** the components of a computer system and explain their functions.	1,3,6
2	**Apply** office automation tools like MS-Word, MS-Excel, and MS-PowerPoint for creating, managing, and presenting data.	3,4,7

3	**Analyze** statistical data and create visualizations using MS-Excel.	6,8,12
4	**Demonstrate** the use of computer networks, the Internet, and web searching techniques.	4,6,8
5	**Evaluate** the impact of social media, e-commerce, and digital payment systems in modern society, including associated crimes and legal frameworks.	7,11

SEMESTER – II									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC121**	**Total credits: 1** **Total hours: 10P**	**L** **0**	**T** **0**	**P** **0**	**S** **4**	**R** **0**	**O/F** **0**	**C** **1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2. To stimulate the interests in the students and provide equal opportunities to all the students to participate 3. To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.								
CO2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.								
CO3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.								

CO4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.
CO5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**10**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2, 3,4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.	1,3
2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.	3,4,7
3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.	6,8
4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.	4,6

5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.	7,11

SEMESTER – II									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**10**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	1,2,3,4,5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,9,11,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,9,11,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,9,11,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,9,11,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,9,11,12

SEMESTER II									
Course Title	**MOOCS I: Ecosystem Services: A Method for Sustainable Development**								
Course code	**MOOCSCECE1**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Techin Civil Engineering**								
Semester	**Fall/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	1. To provide students with a comprehensive understanding of ecosystem services and their role in sustainable development. 2. To equip students with the skills to assess, value, and analyze ecosystem services using various economic, ecological, social, and cultural valuation methods. 3. To enable students to critically evaluate and apply policy and management strategies, tools, and techniques for the sustainable management of ecosystem services.								
CO1	To understand the concept and classification of ecosystem services and their importance in sustainable development.								
CO2	To analyze various methods for valuing ecosystem services and identify the challenges associated with their valuation.								
CO3	To apply knowledge of provisioning, regulating, cultural, and supporting services to assess their impact on human well-being.								
CO4	To evaluate policy and management strategies for integrating ecosystem services into environmental planning and impact assessments.								
CO5	To analyze and utilize tools and techniques, such as GIS and remote sensing, for assessing and mapping ecosystem services.								

Unit-No.	Content	Contact Hour	Learning Outcome	BL
I	**Introduction to Ecosystem Services** • Definition and Classification of Ecosystem Services • History and Evolution of Ecosystem Services Concept • Importance of Ecosystem Services in Sustainable	**8**	Students will understand the definitions, classifications, and ecological foundations of ecosystem services, and recognize their significance in sustainable development through various case studies.	**1,2,3**

	Development • Ecological Foundations of Ecosystem Services • Case Studies of Ecosystem Services			
II	**Valuation of Ecosystem Services** • Economic Valuation Methods: Market Pricing, Hedonic Pricing, Contingent Valuation • Ecological Valuation Methods • Social and Cultural Valuation Methods • Cost-Benefit Analysis in Ecosystem Services • Challenges in Ecosystem Services Valuation	**12**	Students will analyze different economic, ecological, social, and cultural valuation methods for ecosystem services, conduct cost-benefit analyses, and identify challenges associated with the valuation process.	**3,4**
III	**cosystem Services and Human Well-being** • Linkages between Ecosystem Services and Human Well-being • Provisioning Services (e.g., food, water, raw materials) • Regulating Services (e.g., climate regulation, water purification) • Cultural Services (e.g., recreational, aesthetic, spiritual) • Supporting Services (e.g., nutrient cycling, soil formation)	**8**	Students will apply their knowledge to identify and assess the linkages between ecosystem services and human well-being, focusing on provisioning, regulating, cultural, and supporting services.	**3,4**
IV	**Policy and Management of Ecosystem Services** • Integrating Ecosystem Services into Policy and Planning • Ecosystem Services in Environmental Impact Assessment • Ecosystem-Based Management Approaches • Payment for Ecosystem Services (PES) Programs • Case Studies in Policy and Management	**6**	Students will evaluate various policy and management strategies, including the integration of ecosystem services into policy and planning, environmental impact assessments, ecosystem-based management approaches, and payment for ecosystem services programs.	**4**

V	**Tools and Techniques for Ecosystem Services Assessment** • Geographic Information Systems (GIS) in Ecosystem Services • Remote Sensing and Spatial Analysis • Modelling Ecosystem Services • Participatory Approaches and Stakeholder Engagement • Case Studies of Tools and Techniques	**5**	Students will analyze and utilize tools and techniques such as Geographic Information Systems (GIS), remote sensing, spatial analysis, modeling, and participatory approaches for assessing and mapping ecosystem services, supported by relevant case studies.	**4**

TEXT BOOKS:

1. "Ecosystem Services: From Concept to Practice"** by J. Maes, M. L. Paracchini, G. Zulian, M. Thijssen, and E. Bidoglio

REFERENCE BOOKS:

1. "Natural Capital: Theory and Practice of Mapping Ecosystem Services"** edited by Peter Kareiva, Heather Tallis, Taylor H. Ricketts, Gretchen C. Daily, and Stephen Polasky

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To understand the concept and classification of ecosystem services and their importance in sustainable development.	1,2,3,4,
2	To analyze various methods for valuing ecosystem services and identify the challenges associated with their valuation.	3,4,5
3	To apply knowledge of provisioning, regulating, cultural, and supporting services to assess their impact on human well-being.	5,10,12
4	To evaluate policy and management strategies for integrating ecosystem services into environmental planning and impact assessments.	10,12
5	To analyze and utilize tools and techniques, such as GIS and remote sensing, for assessing and mapping ecosystem services.	1,2,3,,10

SEMESTER – II									
Course Title	**Techno Professional Skills-I**								
Course code	**22BTCE125R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ III semester of first year of the programme**								
Course Objectives (Minimum 3)	Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.								
CO1	Understand the basic principles and standards of engineering graphics.								
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.								
CO3	Create accurate and detailed 2D engineering drawings of civil structures.								
CO4	Interpret and visualize engineering designs through graphical representation.								
CO5	Apply engineering graphics skills in practical civil engineering projects.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of orthographic projection, multi-view drawing, and sectional views.	6	Create accurate orthographic projections and sectional views of civil structures.	3, 4
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and perspective drawings. Visualization of 3D objects on 2D planes.	6	Interpret and visualize engineering designs through isometric and perspective drawings.	4, 5
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic principles and standards of engineering graphics.	**5, 7**

2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

MAPPING TABLE (2nd Semester):

Subject Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE121R	Engineering Mathematics II	3	2	2	2	1		1					2
22BTCE122R	Engineering Chemistry	1		2									
22BTCE123R	Programming for Problem Solving	2		3	1	2							2
22BTCE124R	Engineering Graphics and Design	1	2	3		2	1						2
22UBPD12R	Effective English for Engineers						1		1	2	3	2	2
MOOCSCECE1	MOOCS I	2		3	1	2							2
22UBCC121	Co-curricular	1	2	3		2	1						2
22UBEC121	Extra-curricular	1	2	3		2	1						2
22BTCE125R	Techno-Professional Skills I						1		1	2	3	2	2
22UUHV102R	Universal Human Values (UHV) + Professional Ethics						1		1	2	3	2	2
22UUDL103R	Computational Systems and Digital World	2		3	1	2							2

SEMESTER – III

Course Title	Engineering Mechanics								
Course code	22BTCE211R	Total credits: 3 Total hours: 45T	L	T	P	S	R	O/F	C
			2	1	0	0	0	0	3
Pre-requisite	Nil	Co-requisite	Nil						
Programme	Bachelor of Technology in Civil Engineering								
Semester	Fall: Winter/ III semester of second year of the programme								
Course Objectives (Minimum 3)	1. This course teaches students how to apply Newtonian physics to relatively simple real-life applications 2. This course covers statics, dynamics and elementary part of strength of materials 3. This course covers statics, dynamics, and mechanics of materials, offering fundamental principles to analyze engineering problems involving forces, motion, and materials. 4. Students gain a deep understanding of these principles, enabling them to effectively solve engineering problems related to forces, motion, and materials.								
CO1	Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.								
CO2	Study the effect of friction in static and dynamic conditions.								
CO3	Understand the different surface properties, property of masses and material properties.								
CO4	Analyze and solve different problems of kinematics and kinetics.								
CO5	Apply the concepts of mechanics and work in force analysis.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	UNIT I Importance of the knowledge of engineering mechanics in engineering. Introduction to Statics, Concept of particle and rigid body, types of forces; collinear, concurrent, coplanar forces. Concepts of concentrated and distributed forces, vector and scalar quantities, force is a vector, principle of transmissibility. Force is a vector, principle of transmissibility. Introduction of vector algebra, parallelogram law, addition and subtraction vectors, Lami's theorem statement & proof. Free vector, Bound vector, Representation of forces in terms of I, j, k Cross product and Dot product and their applications. Moment of a force about a point and about an axis. Numerical problems discussion Two dimensional force system; resolution of forces; Moment. Varignon's theorem; statement and proof Couple; resolution of a force by its equivalent force - couple system; resultant of forces. Numerical problem discussion	5	Students will be introduced to fundamental concepts of force systems, including types of forces (concurrent, coplanar, and spatial), components of forces in space, and moment of forces. They will learn how to analyze and resolve force systems using principles of equilibrium and free body diagrams. The concept of static indeterminacy will also be covered.	1, 2

II	UNIT II Concept and Equilibrium of forces in two dimensions; Free body concept and diagram, Conditions of equilibrium. Discussion on concept of free body with different examples Numerical problem discussion Concept of Friction; Coulomb's law of dry friction; Angle of friction; Angle of Repose; Coefficient of friction. Angle of friction, cone of friction concept of drawing FBD for different problems Numerical problems discussion Concept of Distributed Force: Centroid and Centre of Gravity;	**10**	Students will study the equilibrium of particles in both two and three dimensions, understanding how forces act to maintain static equilibrium. They will extend this knowledge to rigid bodies, applying principles of equilibrium to analyze systems of forces acting on bodies in static equilibrium. Methods for determining resultant forces, moments of forces, and solving equilibrium equations will be taught.	1, 2, 3, 4
III	UNIT III Centroid of a triangle, quadrilateral, rectangle and circular sector. To determine coordinates of centroid of composite areas consisting of above figures. Theorem of Pappus &Guldinus and its applications To find out the coordinates of the centroid of different composite area, curves etc. Discussion of the different numerical problems. Concept of mass moment of inertia, concept of moment of inertia of areas about an axis in its plane. Parallel axis theorem, perpendicular axis theorem and its applications Mass moment of inertia of symmetrical bodies like cylinder, sphere and cone; To determine MI of plane areas and solid	**10**	Students will calculate centroids of simple figures and composite sections using first principles. They will understand the concept of centre of gravity and its practical implications in engineering applications. The unit includes the calculation of area moment of inertia for plane sections, including theorems of moment of inertia and their applications in structural analysis. Mass moment of inertia for circular plates, cylinders, cones, spheres, and hooks will also be covered.	1, 2, 3, 4, 5
IV	UNIT IV Concept of simple stresses and strains, Normal stress, Shear stress, Bearing stress, Normal strain and shearing strain, L Hooke's Law, Elastic constants and their relation. Poisson's ratio; Stress -strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety Discussion of some numerical applications; Principle of virtual work – Explanation and its applications. Numerical problem based on the principle of virtual work Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to	**10**	The unit revisits particle dynamics, covering rectilinear motion, plane curvilinear motion (rectangular, path, and polar coordinates), and 3-D curvilinear motion. Students will apply Newton's second law of motion in different coordinate systems and study work-kinetic energy, power, potential energy, impulse-momentum (linear and angular), and impact (direct and oblique).	2, 3, 4

	gravity. Rectilinear motion of particles; determination of position, velocity and acceleration under uniform acceleration rectilinear motion; construction of x -t, v -t and a -t graphs non -uniformly accelerated rectilinear motion; construction of x -t, v -t and a -t graphs; Numerical problems on uniform and non - uniform acceleration Plane curvilinear motion of particles: Rectangular components; Normal and tangential components (circular motion).			
V	UNIT V Radial and transverse components of acceleration; Projectile motion. Numerical problem on the above problems; D.Alembert's principle and free body diagram – principle, concept and examples Principle of work and energy applied to particle and rigid bodies; Principle of conservation of energy; Applications of D.Alembert's principle – – numerical discussion. Applications of conservation of energy; Power and efficiency Applications of conservation of work energy & moment principle Kinetics of particles: Newton's second law; Equation of motion.	**10**	Students will understand basic terms and general principles in dynamics, including types of motion and instantaneous centre of rotation in plane motion. They will study D'Alembert's principle and its applications in plane motion and connected bodies. The work-energy principle will be applied to analyze plane motion of connected bodies and kinetics of rigid body rotation	2, 3, 4, 5

Text Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press.

Reference Books:

1. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
2. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
3. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
5. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
6. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

7. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.	1,2,3
2	Study the effect of friction in static and dynamic conditions.	3,5,6
3	Understand the different surface properties, property of masses and material properties.	7,2,4
4	Analyze and solve different problems of kinematics and kinetics.	8,1,9
5	Apply the concepts of mechanics and work in force analysis .	10,4,7

SEMESTER – III									
Course Title	**Engineering Geology**								
Course code	**22BTCE212R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**1**	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of Second year of the programme**								
Course Objectives (Minimum 3)	1. Use suitable software to examine geology, soil, geologic hazard, and NEHRP data to characterize a geologic site. 2. Calculate the bulk properties of rocks and unconsolidated sediments such as density, void ratio, water contents, and unit weights. 3. Evaluate rock-mass quality and perform a kinematic analysis.								
CO1	1. Discuss the importance of Geology in making engineering decisions specially site selection of engineering projects.								
CO2	2. Analyze the concepts of how minerals form and their uses for identifying the rock forming.								
CO3	3. Analyze graphs and models used in structural geology for demonstrating stress, strain and tectonics.								
CO4	4. Generalize rocks using basic geological systems for selective construction material								
CO5	5. Apply quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.								

Unit -No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction- Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, Rock forming minerals, megascopic identification of common primary & secondary minerals.	**5**	Geological studies are crucial for site selection, foundation design, and material sourcing. They prevent hazards like landslides and sinkholes and aid in environmental assessments and resource management for sustainable construction.	1, 2
II	Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology-Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. IUGS Classification of phaneritic and volcanic rock.. Field Classification chart. Structures. Classification of Igneous rocks on the basis of	**5**	Geology provides essential knowledge to civil engineering through structural geology, hydrogeology, and engineering geology. Structural geology helps understand rock behavior under stress, while hydrogeology deals with groundwater flow. Engineering geology assesses geological factors affecting construction sites.	1, 2, 3, 4

	Chemical composition. Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, Hornfels. Metamorphic Aureole, Kaolinization. Landform as Tors. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, and Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration.			
III	Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits.	**5**	Geological studies are crucial for site selection, foundation design, and material sourcing. They prevent hazards like landslides and sinkholes and aid in environmental assessments and resource management for sustainable construction.	1, 2, 3, 4, 5
IV	Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence.	**5**	Physical geology examines weathering (mechanical, chemical), erosion, and denudation processes influencing rock properties. Superficial deposits like alluvium and glacial deposits impact construction and groundwater management. Geological structures such as folds, faults, and joints affect rock strength and stability. Understanding these structures is vital for engineering operations, preventing hazards like landslides and earthquakes	2, 3, 4

	Strength of Igneous rock structures.			
V	Geological Hazards-Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India.	**10**	Geological hazards include slope instability, groundwater dynamics, and seismic activities. Prevention measures like drainage systems, slope reinforcement, and seismic design mitigate risks in civil engineering projects. This structured approach covers essential topics in geology relevant to civil engineering, ensuring a comprehensive understanding of geological principles and their practical applications.	2, 3, 4, 5

Text Books:

1. P.C. Varghese, Engineering Geology for Civil Engineers, PHI Learning private limited.
2. Parbin Singh, Engineering & General Geology, S.K. Kataria and Sons- Delhi.

Reference Books:

1.Dr. D.V. Reddy, Engineering Geology, Vikas Publishing House.
2.Chadha S. K., Elements of Geological Maps for Geology, Geography & Civil Engineering, CBS Publishers & Distributors- New Delhi.
3.Gautam Mahajan, Evaluation and Development of Ground Water, APH Publishers.
4.Jerome V. Degraff Robert B. Johnson, Principles of Engineering Geology, Wiley India Pvt Ltd.
5.Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Discuss the importance of Geology in making engineering decisions specially site selection of engineering projects.	1,2
2	Analyze the concepts of how minerals form and their uses for identifying the rock forming.	3,5,6
3	Analyze graphs and models used in structural geology for demonstrating stress, strain and tectonics.	7,2
4	Generalize rocks using basic geological systems for selective construction material	1,9
5	Apply quantitative skills and frame work for solving basic engineering geology problems related to	4,7

	geological features and geological hazards and remedial measures thereof.	

SEMESTER – III									
Course Title	**Computer-aided Civil Engineering Drawing**								
Course code	**22BTCE214R**	**Total credits: 2** **Total hours: 30T**	**L** **0**	**T** **0**	**P** **4**	**S** **0**	**R** **0**	**O/F** **0**	**C** **2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of seond year of the programme**								
Course Objectives (Minimum 3)	1. To develop parametric design and the conventions of formal engineering drawing 2. Produce and interpret 2D & 3D drawings 3. To communicate a design idea/concept graphically/ visually 4. To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs								
CO1	**CO1-** Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.								
CO2	**CO2-** Get a Detailed study of an engineering artifacts.								
CO3	**CO3-** Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D								
CO4	**CO4-** Construct accurate 2D geometry as per the dimensions following standard drawing practices with proper dimensioning using Computer Aided drafting software								
CO5	**CO5-** Create 2D representations of 3D objects as plan view, elevations, side views and sections / auxiliary views using Computer Aided drafting software								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT-I: INTRODUCTION; Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.	**5**	This unit introduces the concept of engineering drawings, emphasizing their interpretation and planning for concise and comprehensive information presentation. It covers optimal layout techniques, scales, and the basics of computer-aided drawing (CAD), including coordinate systems and essential commands like drawing entities, modifications, layers, text, dimensioning, and blocks. Standards and norms for drawing presentation are also discussed to ensure clarity and consistency in technical documentation.	1, 2

II	UNIT-II: SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards	**5**	Symbols and sign conventions play a crucial role in engineering drawings across various disciplines such as materials, architecture, structural engineering, electrical systems, and plumbing. This unit explores standard symbols used in rebar drawings, structural steel fabrication, and welding, alongside dimensioning standards. Understanding these conventions is essential for accurate communication and interpretation of technical details in construction and engineering projects.	1, 2, 3, 4
III	UNIT-III: MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall	**10**	Building drawing essentials are covered in this unit, including terms, planning elements, and methods for creating line drawings and detailed architectural drawings. It includes the depiction of site plans, floor plans, elevations, sections, foundation plans, and roof drainage plans for small residential buildings. Detailing of joinery, fittings, fixtures, and finishes, along with the use of notes for clarity, enhances the communicative value of architectural drawings.	1, 2, 3, 4, 5
IV	UNIT-IV: BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity	**5**	Building drawing essentials are covered in this unit, including terms, planning elements, and methods for creating line drawings and detailed architectural drawings. It includes the depiction of site plans, floor plans, elevations, sections, foundation plans, and roof drainage plans for small residential buildings. Detailing of joinery, fittings, fixtures, and finishes, along with the use of notes for clarity, enhances the communicative value of architectural drawings.	2, 3, 4
V	UNIT-V: PICTORIAL VIEW: Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modelling (BIM)	**5**	Principles of isometric and perspective drawing techniques are explored in this unit, emphasizing their application in architectural representation. It includes creating perspective views of buildings and introduces fundamentals of Building Information Modelling (BIM), highlighting its role in digital representation, collaboration, and	2, 3, 4, 5

			project management in contemporary architectural and construction practices.	

Text Books:

1. Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education,

Reference Books:

1. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age
2. International Pvt. Ltd.,
3. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing
4. KDR building, Calicut,
5. (Corresponding set of) CAD Software Theory and User Manuals.
6. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd
7. New Asian.
8. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.	1,2,3
2	Get a Detailed study of an engineering artifacts.	3,5,6
3	Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D	7,2,4
4	Construct accurate 2D geometry as per the dimensions following standard drawing practices with proper dimensioning using Computer Aided drafting software	8,1,9
5	Create 2D representations of 3D objects as plan view, elevations, side views and sections / auxiliary views using Computer Aided drafting software	10,4,7

SEMESTER – III									
Course Title	**Biology for Engineers**								
Course code	**22BTCE213R**	**Total credits: 3** **Total hours: 45T**	**L** **2**	**T** **1**	**P** **0**	**S** **0**	**R** **0**	**O/F** **0**	**C** **3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To make connections between the various branches of science. 2. To identify and define the basic life processes, the basic needs and the chemistry of living things. 3. Biology for Engineers is designed to introduce engineering students to fundamental concepts in biology and their applications in engineering disciplines.								
CO1	Discuss biological sciences, its scope and perspectives.								
CO2	Discuss regarding the ecological energetics, its working mechanism, identification of organisms.								
CO3	Analyse the mechanism of transfer of character from parent to next generation.								
CO4	Explain the genetic code and production of proteins.								
CO5	Interprets the relation between various physiological processes of our body								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT I Introduction Importance and scope of Biology as an important scientific discipline Branches of biological sciences Fundamental differences between science and engineering Comparison between the working mechanism of eye and camera, Bird flying and aircraft Biological observations of 18th century that lead to major discoveries in the world Steps in scientific research works Brownian motion in biological sciences	**10**	This unit introduces the importance and scope of biology, covering its branches and comparing fundamental differences between science and engineering. It explores biological systems such as the eye versus a camera and bird flight versus aircraft dynamics. Students also learn about key 18th-century biological observations and phenomena like Brownian motion.	1, 2
II	UNIT II Classification & Ecology Classification of organisms, Basis of classification: Morphological, biochemical or ecological, level of organization, symmetry, germ layer organization, segmentation, notochord Concept of unicellular and multicellular organisms; prokaryotes and eukaryotes; Habitat & Adaptations Concept of Ecosystem: Structure & Function Energy flow in an ecosystem: Lindemann ten percent law Types of excretion: Ammonotelism, Ureotelism and Uricotelism Animal Kingdom:	**10**	Students study organism classification based on morphology, biochemistry, and ecology. They learn about unicellular and multicellular organisms, prokaryotes versus eukaryotes, and habitats and adaptations. The unit covers ecosystem structures, functions, energy flow, and types of excretion (ammonotelism, ureotelism, uricotelism).	2, 3, 4

	Characters of phylum with examples Model organisms for the study of biology come from different groups. E. coli, S. cerevisiae, D. Melanogaster, C. elegans, A. thaliana, M. musculus			
III	UNIT III Genetics & Biomolecules Concept of Allele; Dominance & Recessive; Monohybrid, Dihybrid & Trihybrid cross; Mitosis & Meiosis Mendel's laws, Concept of Segregation and Independent assortment Concept of co-dominance and incomplete dominance with illustrations Sex determination in human Genetic disorders in human beings DNA & RNA as genetic material Enzymes: Classification; Mechanism of enzyme action	**10**	This unit covers basic genetics including alleles, dominance, and recessiveness. Students learn about monohybrid, dihybrid, and trihybrid crosses, mitosis, meiosis, Mendel's laws, and genetic disorders. Biomolecules like DNA, RNA, enzymes (classification and mechanism), and genetic material are also discussed.	1, 2, 3, 4
IV	UNIT IV Information Transfer & Metabolism Genetic code: Properties Structure of DNA Concept of recombination and crossing over Proteins: Primary secondary, tertiary and quaternary structure Concept of Central dogma ATP as an energy currency of cell Concept of docking: Protein Ligand interaction	**10**	Students delve into the genetic code, DNA structure, recombination, crossing over, and protein structures (primary, secondary, tertiary, quaternary). The unit covers the central dogma of biology, ATP as an energy carrier, and protein-ligand interactions.	1, 2
V	UNIT V Physiology Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosis fetalis Neuroendocrine system of human: Endocrine glands and their functions Human Excretory system: Structure of Kidney and Nephron Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse Human Respiratory System: Structure of lungs and exchange of gases Human digestive enzymes: Components and enzymes Mechanism of muscle contraction.	**5**	This unit focuses on human physiology, covering the circulatory system (heart function, blood groups), neuroendocrine system (endocrine glands and functions), excretory system (kidney structure, nephron), nervous system (neuron structure, nerve impulse), respiratory system (lung structure, gas exchange), digestive enzymes, and muscle contraction mechanisms.	2, 3, 4, 5

Text Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.

Reference Books:

1. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
2. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C.
3. Brown Publishers

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Discuss biological sciences, its scope and perspectives.	2,6,4
2	Discuss regarding the ecological energetics, its working mechanism, identification of organisms.	3,9,7
3	Analyse the mechanism of transfer of character from parent to next generation.	1,3,5
4	Explain the genetic code and production of proteins.	2,9
5	Interprets the relation between various physiological processes of our body	10,12

SEMESTER – III									
Course Title	**English for Employability for Engineers**								
Course code	**22UBPD213R**	**Total credits: 2** **Total hours: 30T**	**L** **0**	**T** **0**	**P** **4**	**S** **0**	**R** **0**	**O/F** **0**	**C** **2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be able to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	v. Parts of Speech i. Articles i. Auxiliary Verbs i. Affirmative and Negative Sentences	**5**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and meaningful sentences.	1, 2
II	i. Determiners i. Sentence Construction i. Types of Sentences (Assertive, Imperative, etc.) x. Degree of Comparison x. Comprehension Exercises	**5**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and exclamatory). The concept of the degree of comparison (positive, comparative, and superlative) will be explored. The module will also include comprehension exercises designed to enhance students' ability to understand and interpret	2, 3, 4

			written texts effectively	
III	i. What is listening? i. The Process of Listening x. Factors that adversely affect Listening x. Difference between Listening and Hearing, i. Purpose and Importance of Effective Listening i. How to Improve Listening Process.	**5**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	i. Introducing yourself i. Self-discovery i. Basics of Phonetics, pronunciation x. Extempore speech x. Video Recording for Self reflection	**10**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	x. Introduction to Communication, i. Importance of Communication Skills, i. Purpose of Communication, i. Types of Communication, v. Formal and informal communication v. Importance of Communication, i. Barriers to Communication, i. How to improve/ tips to improve Communication skills. i. Responding to different questions in various situations (formal/informal)	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	2, 3, 4, 5

Text Books:

1.Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.

2.Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & Company Ltd.: New Delhi.

Reference Books:

1.Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India

2.Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Klett

Other Learning Resources:

https://youtu.be/bEB8-SWMYhI

https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	2,6,3
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	3,9,8
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	1,3,9
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	2,9,4
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	10,12

SEMESTER – III									
Course Title	**Introduction to Civil Engineering**								
Course code	**22BTCE215R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering. 2. to motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness. 3. To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.								
CO1	Gaining practical and theoretical experience in conducting independent research on any Civil Engineering subject, as well as in oral and written presentations, in team work and in self-discipline								
CO2	Explore the scope of various disciplines of Civil Engineering.								
CO3	The student will learn about role of transportation as well as of water and its conservation								
CO4	Ability to define construction management, environmental issues and the sustainable development.								
CO5	Assess possible avenues of career and entrepreneurial opportunities in the Civil Engineering profession.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basic Understanding**: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. **History of Civil engineering**: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers. **Overview of National Planning for Construction and Infrastructure Development**; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works.	**5**	This unit covers basics of corrosion and other structural distress mechanisms, focusing on simple rehabilitation systems. It introduces non-destructive testing methods and discusses the use of carbon fibre wrapping and composites in structural repairs.	1, 2

II	**Fundamentals of Architecture & Town Planning**: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities **Fundamentals of Building Materials**: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes **Basics of Construction Management & Contracts Management**: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management.	**10**	This unit highlights typical software applications in civil engineering such as Finite Element Method, Computational Fluid Dynamics, and Computational Geotechnical Methods. It includes software for highway design (MX), Building Information Modelling (BIM), and various other tools like SAP, STAAD, ABAQUS, MATLAB, and AUTOCAD.	2, 3, 4
III	**Environmental Engineering & Sustainability**: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction. **Geotechnical Engineering**: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics &tunneling. **Hydraulics, Hydrology &Water Resources Engineering**: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects. **Ocean Engineering**: Basics of Wave and Current Systems; Sediment transport systems; Ports & Harbours and other marine structures	**5**	Industry professionals present case studies of large civil engineering projects, covering comprehensive planning through commissioning. Topics include project management strategies, challenges faced, and solutions implemented.	1, 2, 3, 4
IV	**Power Plant Structures**: Chimneys, Natural & Induced Draught Colling towers, coal	**5**	This unit explores professional ethics, entrepreneurial opportunities, and encourages creative and innovative	1, 2

	handling systems, ash handling systems; nuclear containment structures; hydro power projects **Structural Engineering**: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies; **Surveying & Geomatics**: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR; **Traffic &Transportation Engineering**: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and FreightTransportation; Road Safety under heterogeneous traffic; Sustainable and resilientpavement materials, design, construction and management; Case studies and examples.		approaches in civil engineering. It enhances technical writing skills and discusses facilities management, quality assurance, and health, safety, and environment (HSE) systems in construction.	
V	**Repairs & Rehabilitation of Structures:** Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non- Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs. **Computational Methods, IT, IoT in Civil Engineering:** Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD,…GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM, …)	**5**	This unit focuses on sustainability principles in civil engineering, addressing environmental, social, and economic aspects. It covers sustainable construction materials and practices, energy-efficient design, and green building certifications. Topics include lifecycle assessment, carbon footprint reduction strategies, and renewable energy integration in infrastructure projects. Case studies highlight successful sustainable initiatives and their impact on the built environment.	2, 3, 4, 5

	Industrial lectures: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning; **Basics of Professionalism**: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction			

Text Books:

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. Avtarsingh (2002), Law of Contract, Eastern Book Co.
3. Dutt (1994), Indian Contract Act, Eastern Law House.

Reference Books:

1. Anson W.R.(1979), Law of Contract, Oxford University Press
2. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on
3. UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
4. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
5. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
6. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency.
7. The National Building Code, BIS, (2017).
8. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Gaining practical and theoretical experience in conducting independent research on any Civil Engineering subject, as well as in oral and written presentations, in team work and in self-discipline	2,6,4
2	Explore the scope of various disciplines of Civil Engineering.	3,9,7
3	The student will learn about role of transportation as well as of water and its conservation	1,3,5
4	Ability to define construction management, environmental issues and the sustainable development.	2,9
5	Assess possible avenues of career and entrepreneurial opportunities in the Civil Engineering profession.	10,12

SEMESTER – III	
Course	**PDE and transform mathematics**

Title									
Course code	**22BTCE216R**	**Total credits: 3** **Total hours: 45T**	**L** **2**	**T** **1**	**P** **0**	**S** **0**	**R** **0**	**O/F** **0**	**C** **3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To familiarize the students with Laplace Transform, Fourier Transform, their application, logic group, sets, lattices, Boolean algebra and Karnaugh mapso make connections between the various branches of science. 2. It aims to present the students with standard concepts and tools. 3. This course delves into the theory and applications of Partial Differential Equations (PDEs) and Transform Mathematics, providing students with a strong foundation in these fundamental mathematical concepts.								
CO1	Understand the concept and application of transform calculus in solving various complex problems.								
CO2	Understand the basic principles of set theorem and apply them in solving different complex problems.								
CO3	Understand and apply the concepts of proposition logic.								
CO4	Understand the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems.								
CO5	Understand apply the concept of graphs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Transform Calculus -1 Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.	10	This unit covers polynomials, including orthogonal polynomials like Lagrange's and Chebyshev polynomials, as well as trigonometric polynomials. It introduces the Laplace Transform, its properties, and the Laplace transform of periodic functions. Methods for finding the inverse Laplace transform, the convolution theorem, and the evaluation of integrals using Laplace transforms are also discussed. Applications of the Laplace Transform in solving ordinary differential equations (ODEs) and partial differential equations (PDEs) are included.	1, 2
II	Transform Calculus-2 Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their	10	This unit focuses on Fourier transforms, Z-transforms, and Wavelet transforms, covering their properties, methods, inverses, and applications. It also delves into set theory, exploring basic operations on sets, Cartesian products,	2, 3, 4

	applications. Sets, relations and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.		disjoint unions (sums), and power sets. Different types of relations and functions, along with their compositions and inverses, are also examined.	
III	Partially ordered sets: Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	10	The propositional logic section addresses syntax, semantics, proof systems, satisfiability, validity, soundness, completeness, and the deduction theorem. Decision problems of propositional logic and an introduction to first-order logic and theory are also included. The unit then explores partially ordered sets, including concepts like complete partial ordering, chains, lattices, and Boolean lattices.	1, 2, 3, 4
IV	Algebraic Structures: Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operationsring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	5	This unit covers algebraic structures with one binary operation, such as semigroups, monoids, and groups. Topics include cosets, Lagrange's theorem, normal subgroups, homomorphic subgroups, congruence relations, and quotient structures. The unit also introduces error-correcting codes and algebraic structures with two binary operations, such as rings, integral domains, fields, Boolean algebra, and Boolean rings, with definitions and simple examples.	1, 2
V	Introduction to Counting: Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions. Introduction to Graphs: Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	10	This unit introduces basic counting techniques, including inclusion and exclusion, the pigeonhole principle, permutations, combinations, and summations. It also covers recurrence relations and generating functions. The introduction to graphs section explores basic properties of graphs, such as degrees, paths, cycles, subgraphs, isomorphism, Eulerian and Hamiltonian walks, and trees.	2, 3, 4, 5

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

3. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.

4. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

5. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.

Reference Books:

1. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
2. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
3. N. Deo, Graph Theory, Prentice Hall of India, 1974.
4. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
5. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concept and application of transform calculus in solving various complex problems.	2,6,3
2	Understand the basic principles of set theorem and apply them in solving different complex problems.	3,9,8
3	Understand and apply the concepts of proposition logic.	1,3,9
4	Understand the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems.	2,9,4
5	Understand apply the concept of graphs.	10,12

SEMESTER – III									
Course Title	**Techno Professional Skill 2**								
Course code	**22BTCE217R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with advanced AutoCAD skills necessary for civil engineering projects, enhancing their technical proficiency and professional competency. Develop students' ability to create precise engineering drawings and detailed designs, fostering attention to detail and accuracy in their work. Enhance problem-solving and critical thinking abilities through practical AutoCAD applications, preparing students for real-world engineering challenges.								
CO1	Demonstrate proficiency in using AutoCAD tools for creating complex civil engineering drawings.								
CO2	Apply advanced AutoCAD techniques to design detailed structural plans and layouts.								
CO3	Develop the ability to interpret and convert conceptual sketches into precise digital drawings.								
CO4	Integrate AutoCAD skills with other engineering tools and software for comprehensive project development.								
CO5	Exhibit improved problem-solving skills and technical knowledge through practical AutoCAD applications.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL**
I	**Introduction to Advanced AutoCAD Features:** Overview of advanced drawing tools, customization options, and productivity features.	4	Master advanced drawing tools and customization features in AutoCAD.	1, 2
II	**Creating Detailed Civil Engineering Drawings:** Techniques for creating detailed structural and architectural drawings, including layering, dimensioning, and annotation.	4	Create precise and detailed civil engineering drawings with advanced techniques.	2, 3
III	**3D Modeling and Visualization:** Introduction to 3D modeling, rendering, and visualization techniques in AutoCAD for civil engineering applications.	4	Develop 3D models and visualize civil engineering designs using AutoCAD.	3, 4
IV	**Integration with Other Tools:** Methods for integrating AutoCAD with other engineering software and tools, including importing/exporting files and collaborative project workflows.	4	Integrate AutoCAD skills with other tools for comprehensive engineering project development.	4, 5
V	**Practical Applications and Projects:** Hands-on projects and case studies to apply AutoCAD skills in real-world civil engineering scenarios, including project presentation and documentation.	4	Apply AutoCAD skills in practical projects, demonstrating problem-solving and technical proficiency.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Demonstrate proficiency in using AutoCAD tools for creating complex civil engineering drawings.	**5, 7**
2	Apply advanced AutoCAD techniques to design detailed structural plans and layouts.	**8**
3	Develop the ability to interpret and convert conceptual sketches into precise digital drawings.	**7.9,10**
4	Integrate AutoCAD skills with other engineering tools and software for comprehensive project development.	**11,12**
5	Exhibit improved problem-solving skills and technical knowledge through practical AutoCAD applications.	**10**

SEMESTER – III									
Course Title	**Material Testing and Evaluation**								
Course code	**22BTCE218R**	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**1**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Provide students with all information concerning principle, way of measurement, as well as practical application of mechanical characteristics. 2. Make measurements of behavior of various materials used in Civil Engineering. 3. Introduce experimental procedures and common measurement instruments, equipment, devices giving exposure to a variety of established material testing procedures and techniques. 4. Make measurements of behavior of various materials used in Civil Engineering								
CO1	Describe the various engineering materials, their qualities, and how they are made								
CO2	Identify the mechanical behavior and characteristics, the strength characteristics, and the history of fracture mechanics. Metals can deform in both elastic and plastic ways								
CO3	Perform mechanical testing on a range of metals, including iron, steel, and various non-ferrous metals. Additional mechanical testing includes impact testing, background fracture toughness research, creep, and fatigue research								
CO4	Discuss the methods used to evaluate soils, bitumen, bitumen blends, bricks, sand, concrete, and other materials								
CO5	Identify the mechanical characteristics and qualities of special materials, metals, cementitious materials, composites, and polymers								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT 1- Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete), Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geotextiles,	10	This unit provides an overview of various engineering materials essential in civil engineering. It covers different types of cements, M-Sand, and various forms of concrete such as plain, reinforced, steel fibre/glass fibre-reinforced, lightweight, high-performance, and polymer concrete. The unit also delves into ceramics, refractories, bitumen, asphaltic materials, timbers, glass, plastics, structural steel, and other metals. Additionally, it discusses paints, varnishes, acoustical materials, and geotextiles, highlighting their properties and applications in construction.	1, 2
II	UNIT 2- Introduction to Material Testing covering, What is the "Material Engineering"?; Mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material	10	This unit introduces material engineering and its significance, focusing on the mechanical behaviour and characteristics of materials. It explains elasticity and plastic deformation in metals, standards for tensile testing of different materials, and the interpretation of true stress-strain curves. The unit also covers hardness	2, 3, 4

	(brittle, quasi-brittle, elastic and so on), True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics;		tests, bending and torsion tests, the strength of ceramics, and the fundamentals of internal friction and creep.	
III	UNIT 3- Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.	5	This unit addresses the brittle fracture of steel, particularly focusing on the temperature transition approach. It provides background knowledge on fracture mechanics, discusses fracture toughness testing for various materials, and introduces the concept of material fatigue. The unit also covers structural integrity assessment procedures using fracture mechanics principles.	1, 2, 3, 4
IV	UNIT 4-Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures	10	This unit covers the standard procedures and laboratory practices for mechanical testing. It includes discussions on mechanical testing methods, naming systems for various irons, steels, and nonferrous metals. The unit explores elastic and plastic deformation, impact tests, and transition temperatures, emphasizing the importance of these tests in material evaluation	1, 2
V	UNIT 5-Testing of polymers and polymer-based materials, tests and testing of metals, special materials, composites and cementitious materials. Explanation of mechanical behaviour of these materials.	10	This unit focuses on the testing of polymers and polymer-based materials, as well as metals, special materials, composites, and cementitious materials. It explains the mechanical behaviour of these materials and the specific tests used to evaluate their properties, providing a comprehensive understanding of their performance in engineering applications.	2, 3, 4, 5

TextBooks:

1.S. Delhi. Peter Domone and J. M. Illston. (2018), Construction Materials: Their Nature and Behaviour", Taylor& Francis

2.SK Duggal, Building materials(2019), New Age Publishers

3.Materials Testing and Evaluation for Civil Engineering, by K. Subramanian, Oxford University Press (2019)

Reference Books:

1.Material Testing for Civil Engineering, by E.A. Avallone (McGraw-Hill, 2009)

2.Materials Testing for Civil and Construction Engineers, by A.G. Kulkarni and R.T. Johns (CRC Press, 2011)

3.Handbook of Material Testing for Construction and Industry, by B.J. Monahan and A.T. Murray (CRC Press, 2018)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe the various engineering materials, their qualities, and how they are made	2,6,8
2	Identify the mechanical behavior and characteristics, the strength characteristics, and the history of fracture mechanics. Metals can deform in both elastic and plastic ways	3,9,5
3	Perform mechanical testing on a range of metals, including iron, steel, and various non-ferrous metals. Additional mechanical testing includes impact testing, background fracture toughness research, creep, and fatigue research	1,7,9
4	Discuss the methods used to evaluate soils, bitumen, bitumen blends, bricks, sand, concrete, and other materials	9,1,8
5	Identify the mechanical characteristics and qualities of special materials, metals, cementitious materials, composites, and polymers	10,12,6

SEMESTER III									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Civil Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.	3

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

SEMESTER III									
Course Title	**EXTRA-CURRICULAR**								
Course code	**22UBEC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Civil Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 3. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree	**8**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of	2,3

	learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		learning experiences, fostering holistic development.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,9,11,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,9,11,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,9,11,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,9,11,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,9,11,12

SEMESTER – III									
Course Title	**Basic Life Saving Skills**								
Course code	**22UULS212R**	**Total credits: 1** **Total hours: 15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with essential knowledge and skills in basic life-saving techniques, including CPR and first aid. 2. Develop the ability to assess emergency situations and respond effectively to various types of injuries and medical conditions. 3. Foster an understanding of preventive measures and safety protocols to minimize the occurrence of emergencies and enhance overall community safety.								
CO1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).								
CO2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care								
CO3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.								
CO4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.								
CO5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit 1: Introduction to Life-Saving Skills** • Importance of life-saving skills • Basic principles of first aid • Legal and ethical aspects of providing first aid • Personal safety and use of protective equipment • Assessing the scene of an emergency	5	This unit covers the importance of life-saving skills and the basic principles of first aid. It discusses the legal and ethical aspects of providing first aid, emphasizing the importance of personal safety and the use of protective equipment. Students will learn how to assess the scene of an emergency to ensure safety and efficiency in providing aid.	1, 2
II	**Unit 2: Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillators (AED)** • Anatomy and physiology relevant to CPR • Steps for performing CPR on adults, children, and infants • Use of an AED: principles and procedures • Hands-on practice sessions for CPR and AED use • Recognizing and responding	5	Students will delve into the anatomy and physiology relevant to CPR, learning the steps for performing CPR on adults, children, and infants. This unit includes the principles and procedures for using an AED, with hands-on practice sessions to ensure proficiency. The unit also focuses on recognizing and responding to cardiac emergencies.	2, 3, 4

	to cardiac emergencies			
III	**Unit 3: First Aid Techniques** • Managing bleeding, wounds, burns, and fractures • Providing first aid for choking, poisoning, and shock • Practical sessions for bandaging, splinting, and other first aid procedures	5	This unit teaches essential first aid techniques for managing bleeding, wounds, burns, and fractures. Students will learn how to provide first aid for choking, poisoning, and shock. The unit includes practical sessions to practice bandaging, splinting, and other first aid procedures	1, 2, 3, 4
IV	**Unit 4: Emergency Medical Conditions** • Recognizing symptoms of heart attacks, strokes, asthma attacks, and diabetic emergencies • Immediate response actions for medical emergencies • Ongoing care until professional help arrives • Importance of staying calm and effective communication during emergencies	5	Students will explore common medical emergencies such as heart attacks, strokes, asthma attacks, and diabetic emergencies. This unit covers the recognition of symptoms, immediate response actions, and ongoing care until professional help arrives. Emphasis is placed on staying calm and effective communication during emergencies.	1, 2
V	**Unit 5: Safety and Prevention** • Home and workplace safety measures • Fire prevention and electrical safety • Accident prevention strategies • Community safety programs • Advocating for safety and preventive measures within the community	5	The final unit focuses on preventive measures to minimize the occurrence of emergencies. Students will learn about home and workplace safety, including fire prevention, electrical safety, and accident prevention. The unit also covers community safety programs and how to advocate for safety and preventive measures within the community.	2, 3, 4, 5

Textbooks:

1. **"First Aid Manual"** by British Red Cross, St John Ambulance, St Andrew's First Aid, 2016.
2. **"Emergency Care and Transportation of the Sick and Injured"** by American Academy of Orthopaedic Surgeons (AAOS), 2016.
3. **"Advanced First Aid, CPR, and AED"** by American Academy of Orthopaedic Surgeons (AAOS), 2011.

Reference Books:

1. **"Wilderness First Responder: How to Recognize, Treat, and Prevent Emergencies in the Backcountry"** by Buck Tilton, 2010.
2. **"Prehospital Trauma Life Support"** by National Association of Emergency Medical Technicians (NAEMT), 2014.
3. **"Fundamentals of Basic Emergency Care"** by Richard W. O. Beebe, Deborah L. Funk, 2013.
4. **"CPR and AED"** by Alton L. Thygerson, Steven M. Thygerson, 2011.
5. **"Basic Life Support (BLS) Provider Manual"** by American Heart Association, 2020.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).	2,3,4
2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care	1,2,4
3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.	3,5,6
4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.	3,2,5
5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.	2,3,7

SEMESTER – III									
Course Title	**Personal Financial Planning**								
Course code	**22UUFL213R**	**Total credits: 1** **Total hours: 15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-	**Nil**	**Co-requisite**	**Nil**						

requisite			
Programme	**Bachelor of Technology in Civil Engineering**		
Semester	**Fall: Winter/ III semester of second year of the programme**		
Course Objectives (Minimum 3)	1. Understand the fundamental principles and concepts of personal financial planning. 2. Develop skills in setting SMART financial goals and creating effective budget plans. 3. Gain knowledge of various investment vehicles, their risks, returns, and suitability for different financial goals. 4. Learn strategies for tax-efficient financial planning and retirement savings. 5. Acquire knowledge of estate planning essentials and legal considerations for asset distribution.		
CO1	Ability to create comprehensive personal financial plans aligned with individual goals and values.		
CO2	Proficiency in analyzing and selecting appropriate investment options based on risk tolerance and financial objectives.		
CO3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.		
CO4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.		
CO5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.		

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT 1- Fundamentals of Financial Planning • Principles of financial planning • Setting financial goals • Budgeting and cash flow management	5	This unit covers the foundational principles of financial planning, including setting financial goals, creating budgets, and managing cash flow effectively. It emphasizes the importance of understanding personal financial statements and the role of financial planning in achieving long-term financial security.	1, 2
II	UNIT 2- Investment Planning • Types of investments (stocks, bonds, mutual funds, etc.) • Risk and return analysis • Portfolio management strategies	5	This unit focuses on different types of investments such as stocks, bonds, mutual funds, and real estate. It explores risk and return analysis, asset allocation strategies, and portfolio management techniques to help individuals build and manage their investment portfolios effectively.	2, 3, 4
III	UNIT 3- Retirement Planning • Retirement savings vehicles (401(k), IRA, pension plans) • Estimating retirement needs • Social Security and Medicare considerations	5	TRetirement planning addresses the process of saving and investing for retirement. It covers retirement savings vehicles like 401(k) plans and IRAs, estimating retirement needs based on lifestyle expectations, and navigating Social Security and Medicare benefits to optimize retirement income.	1, 2, 3, 4
IV	UNIT 4- Tax Planning • Tax-efficient investment	5	Tax planning involves strategies to minimize tax liabilities and maximize after-tax income. This unit discusses tax-	1, 2

	strategies • Tax deductions and credits • Tax implications of retirement distributions		efficient investment strategies, deductions, credits, and tax implications related to retirement contributions, distributions, and estate planning.	
V	UNIT 5 -Estate Planning • Wills, trusts, and probate • Power of attorney and healthcare directives • Charitable giving and legacy planning	5	Estate planning encompasses the process of managing and distributing assets in accordance with an individual's wishes upon death. It covers essential topics such as wills, trusts, probate, power of attorney, healthcare directives, charitable giving, and strategies for minimizing estate taxes.	2, 3, 4, 5

Textbooks:

1. **"Personal Finance"** by Jeff Madura, 2016.
2. **"Personal Financial Planning"** by Lawrence J. Gitman, Michael D. Joehnk, and Randy Billingsley, 2013.
3. **"Fundamentals of Financial Planning"** by Michael A. Dalton, James F. Dalton, 2011.

Reference Books:

1. **"The Bogleheads' Guide to Retirement Planning"** by Taylor Larimore, Mel Lindauer, Richard A. Ferri, Laura F. Dogu, 2009.
2. **"The Financial Planning Workbook: A Practical Guide to Creating Your Own Financial Plan"** by Coventry House Publishing, 2018.
3. **"The Millionaire Next Door: The Surprising Secrets of America's Wealthy"** by Thomas J. Stanley, William D. Danko, 2010.
4. **"Your Money or Your Life: 9 Steps to Transforming Your Relationship with Money and Achieving Financial Independence"** by Vicki Robin, Joe Dominguez, 2008.
5. **"Smart Couples Finish Rich: 9 Steps to Creating a Rich Future for You and Your Partner"** by David Bach, 2009.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Ability to create comprehensive personal financial plans aligned with individual goals and values.	2,3,4

2	Proficiency in analyzing and selecting appropriate investment options based on risk tolerance and financial objectives.	1,2,4
3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.	3,5,6
4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.	3,2,5
5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.	2,3,7

SEMESTER – III									
Course Title	**MOOCS-III THE AGE OF SUSTAINABLE DEVELOPMENT**								
Course code	**22UBPD224R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								

Course Objectives (Minimum 3)	1. To provide students with a comprehensive understanding of the principles, theories, and frameworks of sustainable development and their application to global challenges. 2. To equip students with the knowledge and skills to address environmental, economic, and social sustainability issues through practical applications and case studies. 3. To enable students to critically evaluate integrated and interdisciplinary approaches to sustainable development and develop effective strategies for policy integration and governance.
CO1	Understand the definitions, principles, and historical context of sustainable development, as well as the global challenges addressed by the Sustainable Development Goals (SDGs).
CO2	Apply knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to address environmental sustainability challenges.
CO3	Analyze economic sustainability concepts, including sustainable economic growth, green economy, and corporate social responsibility, and evaluate case studies of sustainable economic practices.
CO4	Apply principles of social sustainability to promote social equity, community participation, education for sustainable development, and overall health and well-being.
CO5	Evaluate integrated approaches to sustainable development, including interdisciplinary and transdisciplinary methods, systems thinking, and sustainable urban planning, and assess the effectiveness of policy integration and governance.

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Sustainable Development** • Definition and Principles of Sustainable Development • Historical Context and Evolution of the Concept • Global Challenges and Sustainable Development Goals (SDGs) • Key Theories and Frameworks	**7**	Students will understand the definitions, principles, and historical context of sustainable development, and recognize the significance of global challenges addressed by the Sustainable Development Goals (SDGs), supported by relevant case studies.	1,2

	• Case Studies of Sustainable Development Initiatives			
II	**Environmental Sustainability** • Ecosystem Functions and Services • Biodiversity Conservation • Climate Change: Science, Impacts, and Mitigation • Renewable Energy Sources and Technologies • Environmental Policy and Legislation	7	Students will apply their knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to propose and implement solutions for environmental sustainability challenges.	1,2
III	**Economic Sustainability** • Sustainable Economic Growth • Green Economy and Circular Economy • Corporate Social Responsibility (CSR) and Ethical Business Practices • Economic Instruments for Environmental Management • Case Studies of Sustainable Economic Practices	7	Students will analyze concepts related to sustainable economic growth, green economy, corporate social responsibility, and economic instruments for environmental management, and evaluate case studies demonstrating sustainable economic practices.	1,2
IV	**Social Sustainability** • Social Equity and Justice • Community Development and Participation • Education for Sustainable Development • Health and Well-being • Cultural Dimensions of Sustainability	7	Students will apply principles of social sustainability to promote social equity and justice, enhance community participation, support education for sustainable development, and improve health and well-being.	1,2
V	**Integrated Approaches to Sustainable Development** • Interdisciplinary and Transdisciplinary Approaches • Systems Thinking and Resilience • Sustainable Urban Planning and Development • Policy Integration and Governance for Sustainability • Monitoring and Evaluation of Sustainable Development Projects	7	Students will evaluate integrated approaches to sustainable development, including interdisciplinary and transdisciplinary methods, systems thinking, sustainable urban planning, and the effectiveness of policy integration and governance for sustainability.	1,2

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

5. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
6. Fast track Objective mathematics for Competitive exam by Arihant
7. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the definitions, principles, and historical context of sustainable development, as well as the global challenges addressed by the Sustainable Development Goals (SDGs).	**5, 7**
2	Apply knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to address environmental sustainability challenges.	**8**
3	Analyze economic sustainability concepts, including sustainable economic growth, green economy, and corporate social responsibility, and evaluate case studies of sustainable economic practices.	**7.9,10**
4	Apply principles of social sustainability to promote social equity, community participation, education for sustainable development, and overall health and well-being.	**11,12**
5	Evaluate integrated approaches to sustainable development, including interdisciplinary and transdisciplinary methods, systems thinking, and sustainable urban planning, and assess the effectiveness	**10**

	of policy integration and governance.	

MAPPING TABLE (3RD SEM)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE211R	Engineering Mechanics	3	3	1	1	1		1					1
22BTCE212R	Engineering Geology	2	3	2	1	1	1	1					1
22BTCE213R	Biology for Engineers	3	3	1	1	1		1					1
22BTCE214R	Computer Aided Design (CAD)	3	2	2	3	2	1				1		
22BTCE215R	Introduction to Civil Engineering	3	3	1	1	1		1					1
22BTCE216R	PDE and transform mathematics	2	3	2	1	1	1	1					1
22BTCE217R	Techno-Professional Skills II	3	3	1	1	1		1					1
22BTCE218R	Material Testing and Evaluation	3	2	2	3	2	1				1		
22UBPD213R	English for Employability for Engineers	3	3	1	1	1		1					1
22UBCC211	Co-curricular	2	3	2	1	1	1	1					1
22UBEC211	Extra-curricular	3	3	1	1	1		1					1
22UULS212R	Basic Life Saving Skills	3	2	2	3	2	1				1		
22UUFL213R	Personal Financial Planning	3	3	1	1	1		1					1

SEMESTER – IV									
Course Title	**Basic Electronics for Civil Engineering Application**								
Course code	**22BTCE225R**	**Total credits: 3** **Total hours: 30T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						

Programme	B.Tech Civil Emgineering			
Semester	**Fall/ IV semester of second year of the programme**			
Course Objectives (Minimum 3)	5. Understand the principles of electronic components, circuits, and semiconductor devices relevant to civil engineering applications. 6. Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 7. Acquire proficiency in digital electronics, including the understanding and application of logic gates for civil engineering applications. 8. Improve problem-solving skills through hands-on exercises and practical application of electronic principles in civil engineering projects. 9. Apply acquired knowledge in projects, designing and implementing electronic systems tailored for specific civil engineering applications.			
CO1	Attain foundational knowledge in electronic components, circuits, and semiconductor devices.			
CO2	Analyze electronic applications in civil engineering for infrastructure design and maintenance			
CO3	Attain digital electronics expertise, including logic gates, for civil engineering applications.			
CO4	Enhance problem-solving with hands-on application of electronic principles in civil projects			
CO5	Apply knowledge in projects, design tailored electronic systems, fostering practical skills.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	***Introduction to Electronics and Circuit Fundamentals*** ● Overview of electronics and its relevance to civil engineering ● Basic electronic components: resistors, capacitors, inductors ● Ohm's Law, Kirchhoff's Laws, and circuit analysis Series and parallel circuits	**7**	Understand basic electronic components and fundamental circuit analysis techniques using Ohm's Law and Kirchhoff's Laws in the context of civil engineering applications.	1,2
II	***Semiconductor Devices and Diodes*** ● Introduction to semiconductor materials ● Diodes and their applications in civil engineering ● Zener diodes and voltage regulation Rectifiers and power supply basics	**7**	Comprehend the properties and applications of semiconductor materials and diodes, including rectification and voltage regulation in civil engineering.	1,2
III	***Transistors and Amplifiers*** ● Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs) ● Transistor amplifiers and amplifier	**7**	Learn the operation and applications of BJTs, FETs, and operational amplifiers, and their use in designing transistor amplifiers and amplifier	1,2

	configurations Operational amplifiers (Op-amps) and their applications		configurations.	
IV	***Sensors and Instrumentation in Civil Engineering*** ● Overview of sensors and transducers ● Types of sensors relevant to civil engineering Data acquisition systems and instrumentation	**7**	Gain knowledge of various sensors and transducers, their applications in civil engineering, and the principles of data acquisition systems and instrumentation.	1,2
V	***Digital Electronics and Control Systems*** ● Basics of digital electronics ● Logic gates and digital circuits Introduction to control systems in civil engineering applications	**7**	Understand the basics of digital electronics, logic gates, digital circuits, and the introduction of control systems for civil engineering applications.	1,2
Practical	1. To study about the components used in electronics laboratory 2. To Study the V-I characteristics of Forward Biased PN junction diode. 3. To Study the Reverse characteristics of Zener diode. 4. To Study the working of a diode as half wave rectifier with and without filter 5. To Study the working of a diode as full wave rectifier with and without filter. 6. To study the input and output characteristic of in CE configuration. 7. To study and verify the truth table of logic gates. 8. Practical Implementation of Electronic circuit based 35 projects in real world	**30**	Describe, illustrate and explain and apply the concepts of electronics engineering in engineering prospect.	1,2, 3,4

TEXT BOOKS:

1. **Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky**
2. **Introduction to Control System Technology" by Robert N. Bateson**

REFERENCE BOOKS:

1. **Basic Electronics, Santiram Kal, Prentice Hall**
2. **Basic Electronics, BL Thareja, S.Chand Publishing**
3. **All-in-One Electronics Simplified, A.K. Maini, Khanna Book Publishing**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Attain foundational knowledge in electronic components, circuits, and semiconductor devices	**1,3 & 4**
2	Analyze electronic applications in civil engineering for infrastructure design and maintenance	**1,2**
3	Attain digital electronics expertise, including logic gates, for civil engineering applications.	**7.9,10**
4	Enhance problem-solving with hands-on application of electronic principles in civil projects	**5,7**
5	Apply knowledge in projects, design tailored electronic systems, fostering practical skills.	**5,8**

SEMESTER – IV									
Course Title	**Environmental Science**								
Course code	**22UBPD226R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. This course provides students with a comprehensive overview of fundamental ecological principles, environmental chemistry, biodiversity conservation, and the impacts of human activities on the environment. 2. Through a blend of theoretical knowledge and practical applications, students delve into the complexities of pollution, resource management, and sustainable development. The course emphasizes the interconnectedness of ecological systems, aiming to cultivate an understanding of the delicate balance required for environmental harmony. 3. By studying environmental chemistry, biodiversity, and pollution, students develop the skills needed to critically analyze and propose solutions to contemporary								

	environmental challenges.
CO1	Understand the relationships between natural and man-made systems.
CO2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.
CO4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment
CO5	Analyse various aspects of human population, and the impact of the population growth on the environment.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	To Develop a comprehensive understanding of the components of the environment, including the atmosphere, hydrosphere, lithosphere, and biosphere. Gain knowledge of the structure and composition of these systems, as well as the principles governing life systems, metabolic processes, and the diversity of plant and animal life.	**6**	Develop a holistic understanding of the environment's components and principles governing life systems, metabolic processes, and biodiversity.	1,2
II	To Acquire proficiency in ecological concepts, including terminology, ecosystem structure and function, mineral cycling, energy flow, trophic chains, and the development and evolution of ecosystems. Understand the relationships between different components of ecosystems and their ecological roles.	**6**	Acquire proficiency in ecological terminology, ecosystem structure, energy flow, trophic chains, and understand the relationships between ecosystem components and their ecological roles.	1,2
III	To Develop the ability to analyze environmental pollution by examining its sources, causes, assessment, effects, and methods of prevention and control. Explore strategies for managing different types of pollution, emphasizing the concept of sustainability and the relationships between energy, environment, and human activities.	**6**	Develop the ability to analyze environmental pollution sources, causes, effects, and prevention methods, emphasizing sustainability and the interplay between energy, environment, and human activities.	1,2
IV	To Gain knowledge of the utilization and sustainable management of water and forest resources. Understand the role of human activities in shaping the environment, including the management of rivers, lakes, forests, and wildlife. Explore concepts related to urbanization, green cities, global warming, and carbon sequestration.	**6**	Gain knowledge of sustainable water and forest resource management, understand human impacts on the environment, and explore concepts related to urbanization, global warming, and carbon sequestration.	1,2
V	To Develop awareness of international agreements and protocols addressing global environmental issues. Understand the role of society, non-governmental organizations (NGOs), and government agencies in addressing environmental challenges. Familiarize yourself with national forest	**6**	Develop awareness of international agreements and protocols addressing global environmental challenges, understand the roles of society, NGOs, and government agencies, and familiarize oneself with	1,2

	policies, environmental laws, acts, and Environmental Impact Assessment (EIA) processes.		national environmental policies and laws, including Environmental Impact Assessment processes.	

Text Books:

1 H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International.

2 J. G. Henry and G.H. Heinke, Environmental Science and Engineering, Prentice Hall International.

Reference Books:

1 G.M. Masters, Introduction to Environmental Engineering and Science, Pearson Education.

2 R.T. Wright and D.F. Boorse, Environmetal Science Towards a Sustainable Future, PHI Learing.

3 P.A. Vesilind and S.M. Morgan, Introduction to Environmental Engineering, Thomson Books.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the relationships between natural and man-made systems.	**1,3 & 4**
2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.	**1,2**
3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.	**7.9,10**
4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment	**5,7**
5	Analyse various aspects of human population, and the impact of the population growth on the	**5,8**

	environment.	

SEMESTER – IV									
Course Title	**Geotechnical Engineering**								
Course code	**22BTCE224R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To focus on the study of soil behaviour and properties to design secure foundations, assess slope stability, and conduct geotechnical investigations for construction and environmental projects. 2. To impart knowledge on the various factors governing the Engineering behaviour of soils and the suitability of soils for various Geotechnical Engineering applications. 3. To characterize the failure criteria and to evaluate the shear strength and compressibility parameters of soils.								
CO1	Distinguish various soil type based on their properties and behaviour.								
CO2	Calculate soil parameters of soils at different site condition.								
CO3	Predict the occurrence of failure of sub-soil beneath any foundation.								
CO4	Determine the bearing capacity of soil and possible settlement of the foundation.								
CO5	Test various direct and indirect soil exploration.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	***Introduction***–Origin and types of soils, Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weights voids ratio- moisture content, unit weight- percent air voids, saturation-moisture content, moisture content-specific gravity etc. Determination of various parameters (such as: Moisture content, Specific gravity, Unit weight of soil), Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and Consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit, Classification of Soils.	**11**	Understand the origin, types, and basic properties of soils, and establish relationships between key parameters such as moisture content, unit weights, and void ratios.	1,2

II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method, Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table, Stresses in soils.	**10**	Learn and apply Darcy's law to determine soil permeability using laboratory methods and perform seepage analysis through the construction of flow nets.	1,2
III	***Compression of soil:***Compaction of Soil- Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. *Consolidation of Soil* - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation,.	**10**	Grasp the concept of effective stress, analyze the impact of the water table on soil stress, and differentiate between soil compaction and consolidation processes.	1,2
IV	***Shear Strength***- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, unconfined compression test, vane shear test, Types of slopes and their failure mechanisms, factor of safety, Introduction to of finite and infinite slopes.	**7**	Analyze soil shear strength using Mohr-Coulomb theory and various shear tests, and understand the mechanisms of slope failures and the factor of safety in slope stability.	1,2
V	***Soil Exploration***- Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trail pits, borings, penetrometer tests, analysis of borehole logs, geophysical methods.	**7**	Acquire knowledge of site exploration methods, soil sampling techniques, and the interpretation of borehole data for geotechnical investigations.	1,2
Practical	1. Moisture content by oven dry method 2. Field density by core cutter method 3. Sieve analysis 4. Liquid limit test by Casagrande Apparatus 5. Plastic limit test 6. Standard compaction test (OMC& MDD) 7. Consolidation test 8. Direct shear test	**30**	Describe, illustrate and explain and apply the concepts of geotechnical engineering in engineering prospect.	1,2, 3,4

	9. Unconfined compression test			

Text Books:

1. Ranjan G., Rao A.S.R (2011), Basic and Applied Soil Mechanics
2. Saran S. (2015) Analysis and Design of Substructures
3. Punmia B.C. (2005), Soil Mechanics And Foundation Engineering

Reference Books:

1. Soil Mechanics by Craig R.F., Chapman & Hall
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Distinguish various soil type based on their properties and behabior.	**1,3 & 4**
2	Calculate soil parameters of soils at different site condition.	**1,2**
3	Predict the occuarance of failure of sub-soil beneath any foundation.	**7.9,10**
4	Determine the bearing capacity of soil and possible settlement of the foundation.	**5,7**
5	Test various direct and indirect soil exploration.	**5,8**

SEMESTER – IV									
Course Title	**Introduction to Fluid mechanics**								
Course code	**22BTCE222R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	4. The course introduces fundamental fluid mechanics principles, including fluid statics, fluid dynamics, and flow measurement, emphasizing their application across various engineering fields such as mechanical, civil, and aerospace engineering. 5. Students engage in theoretical lectures, laboratory experiments, and computational exercises to gain a deep understanding of fluid behavior, enhancing their problem-solving skills and critical analysis of fluid flow phenomena. 6. The course equips students with the knowledge and skills necessary to apply fluid mechanics principles to real-world engineering problems, preparing them for advanced study and professional practice in the field.								
CO1	Determine the various fluid characteristics that affect fluid behaviour.								
CO2	Explain the fluid pressure and about its measurements.								
CO3	Summarize the various fluid flow.								
CO4	Apply the conservation laws for fluids in fluid dynamics.								
CO5	Discuss various non dimensional parameters of fluid flow.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.	**11**	Comprehend fundamental fluid properties such as viscosity, density, surface tension, and compressibility, and understand the distinction between fluids and solids.	1,2
II	Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, UTube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	**10**	Analyze fluid pressure variations and measure pressure using various manometers and gauges, while understanding hydrostatic forces and buoyancy on submerged and floating bodies.	1,2
III	Fluid Kinematics-Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates	**10**	Classify different types of fluid flow, understand flow patterns and visualization methods, and apply the continuity equation in one, two, and three dimensions.	1,2

IV	Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced	**7**	Apply Euler's and Bernoulli's equations to solve fluid flow problems and analyze forces in practical applications like venturimeters, orifice meters, and pipe bends.	1,2
V	Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	**7**	Utilize dimensional analysis and understand dimensionless numbers like Reynolds, Froude, Mach, Weber, and Euler for modeling and analyzing fluid flow similarity.	1,2
Practical	1. Bernoulli's Theorem 2. Discharge Over Notches ● Triangular ● Rectangular 3. Impact Of Jet On Vanes ● Flat ● Hemispherical 4. Flow Through Orifice And Mouthpiece 5. Reynolds's Number Determination 6. Losses Due To Pipe Friction 7. Determination of metacentric height of a given ship model	**30**	Describe, illustrate and explain and apply the properties of fluid in engineering prospect.	1,2, 3,4

Text Books:

1. Dr. D.S. Kumar , "Fluid Mechanics and Fluid Power Engineering".

2. Dr. R.K.Bansal, " A textbook on Fluid Mechanics and Hydraulic Machines", Laxmi Publication ltd

3. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.

Reference Books:

1. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House.
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Determine the various fluid characteristics that affect fluid behaviour.	**1,3 & 4**
2	Explain the fluid pressure and about its measurements.	**1,2**
3	Summarize the various fluid flow.	**7.9,10**
4	Apply the conservation laws for fluids in fluid dynamics.	**5,7**
5	Discuss various non dimensional parameters of fluid flow.	**5,8**

SEMESTER – IV									
Course Title	**SOLID MECHANICS**								
Course code	**22BSBT221R**	**Total credits: 3** **Total hours: 35T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Introduce to continuum mechanics and material modelling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design 2. To understand analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system. 3. Understanding, modelling and design of a large range of engineering materials								
CO1	Relate and describe the strain and strain produced by engineering materials when they are subjected to various forms of stress.								
CO2	Summarize the equations of equilibrium for constructing the shear force and bending moment diagrams for different types of loads on cantilever and simply supported beams.								
CO3	Identify the principal stresses, maximum shearing stresses and angles acting on any arbitrary plane within a structural element using Mohr's circle method.								
CO4	Apply the knowledge of theories of failure, shear force and bending moment relations for analyzing the flexural stress, shear stress distributions and failure of beam sections.								
CO5	Understand the concept of torsion and buckling of thin shells, spheres, etc. to determine the stresses at various points of geometry.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**KL**

I	Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications. :Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.	**7**	Understand the fundamental concepts of stress and strain, including their types, relationships, and applications in various loading conditions.	1,2
II	Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.	**7**	Analyze and construct bending moment and shear force diagrams for various beam configurations and loading conditions to determine critical values and points of contraflexure.	1,2
III	Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections. Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.	**7**	Apply the theory of simple bending and shear stress distribution to calculate stresses in different beam sections and design simple beam sections.	1,2
IV	Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.	**7**	Utilize moment-area and Macaulay's methods to determine the slope and deflection in determinate beams.	1,2
V	Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum	**7**	Derive and apply torsion equations for circular shafts, analyze combined torsion and bending stresses, and calculate stresses in thin-walled cylinders and spheres under internal pressure.	1,2

	shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs, Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.			

Text Books: Example

1 Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2 Solid Mechanics by Dr. Utasv Chandra Kalita

Reference Books: Example

1 Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.

2 Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979

3 Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Relate and describe the strain and strain produced by engineering materials when they are subjected to various forms of stress.	**1,3 & 4**
2	Summarize the equations of equilibrium for constructing the shear force and bending moment diagrams for different types of loads on cantilever and simply supported beams.	**1,2**
3	Identify the principal stresses, maximum shearing stresses and angles acting on any arbitrary plane within a structural element using Mohr's circle method.	**7.9,10**
4	Apply the knowledge of theories of failure, shear force and bending moment relations for analyzing the flexural stress, shear stress distributions and	**5,7**

	failure of beam sections.	
5	Understand the concept of torsion and buckling of thin shells, spheres, etc. to determine the stresses at various points of geometry.	**5,8**

SEMESTER – IV									
Course Title	**Surveying and Geomatics**								
Course code	**22BTCE223R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. The course equips students with essential theoretical knowledge and practical skills required for surveying and geomatics, preparing them for careers in engineering and land management industries. 2. Students gain hands-on experience in modern surveying techniques, enhancing their ability to apply these skills in real-world geospatial data analysis and mapping. 3. The curriculum is designed to prepare students for professional success, enabling them to excel in various applications of surveying and geomatics within engineering and land management sectors.								
CO1	Use of various surveying instruments and mapping								
CO2	Explain Methods of Leveling and setting Levels with different instruments								
CO3	Explain the principle and working of theodolitefor measuring angles in vertical and horizontal planes.								
CO4	Apply the methods of radiation and intersectionfor obtaining an area enclosed with in the traverse								
CO5	Discuss the concept and principle of modern surveying.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. **Measurement of Distances and Directions** **Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections. **Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination and dip.	**11**	Understand the fundamental principles, classifications, and objectives of surveying, including the use of scales, conventional symbols, and various surveying accessories.	1,2
II	**Leveling-** Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction. **Contouring-** Characteristics and uses of Contours, methods of contour surveying. **Areas -**Determination of areas consisting of irregular boundary and regular boundary. **Volumes -**Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.	**10**	Acquire skills in measuring linear distances and directions using chains, tapes, and prismatic compasses, and comprehend corrections for tape measurements and the impact of magnetic declination.	1,2
III	**Theodolite Surveying:** Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible. **Traversing:** Methods of traversing, traverse computations and adjustments, Omitted measurements.	**10**	Master different leveling techniques, including the use of various types of levels and levelling staves, and understand the methods and applications of contour surveying.	1,2
IV	**Curves:** Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves. **Tachometric Surveying:** Principles of Tacheometry, stadia and tangential methods of Tacheometry, **Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station	**7**	Learn to calculate areas with irregular and regular boundaries and determine the volumes of earthwork in different contexts, such as cutting, embankments, borrow pits, and reservoir capacities.	1,2

	Survey, Global Positioning System- Principle and Applications.			
V	**Photogrammetry Surveying:**Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	**7**	Apply advanced surveying methods using theodolites, traverse computations, curves, tacheometry, and modern instruments like EDM, total stations, and GPS, along with understanding the principles and applications of photogrammetry.	1,2
Practical	1. To range a line more than one chain length and recording the details in a field book. 2. Profile leveling and cross section leveling with Dumpy level. 3. Trigonometric Constant 4. Close Compass Traversing to plot the existing layout or built up area 5. Measurement of horizontal and angles with Theodolite 6. Measurement of vertical angles with Theodolite 7. Contouring of a given area by method of grid and prepare the contour map of that area.	**30**	Describe, illustrate and explain and apply the concepts of surveying in engineering prospect.	1,2, 3,4

Text Books:

1.Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.

2.Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Reference Books:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Use of various surveying instruments and mapping	1,3 & 4
2	Explain Methods of Leveling and setting Levels with different instruments	1,2
3	Explain the principle and working of theodolitefor measuring angles in vertical and horizontal planes.	7.9,10
4	Apply the methods of radiation and intersectionfor obtaining an area enclosed with in the traverse	5,7
5	Discuss the concept and principle of modern surveying.	5,8

SEMESTER – IV									
Course Title	**Basic Acclimatizing Skills (BAS)**								
Course code	**22UULS201R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 20P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career								

	goals, addressing both technical and behavioral questions confidently.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Unit 1- Introduction to Accommodation Management • Telephone handling technique • Organizing of Rooms. • Cleaning equipments and uses. • Bed making Process.	**4**	Develop skills in telephone handling, room organization, cleaning equipment usage, and bed-making processes.	1,2
II	Unit-2- Fundamental of Cooking • Uses of basic cooking equipments • Uses of fire & Fuel • Different cuts of vegetables • Uses of herbs & spices • Regional Food Habits	**4**	Gain proficiency in using basic cooking equipment, fire, and fuel, as well as preparing different cuts of vegetables, utilizing herbs, spices, and understanding regional food habits.	1,2
III	Unit 3- Food and Beverage skills • Introduction to catering industry • Types menus and beverages • Identifications of Cutlery, crockery & glassware • Table etiquettes or manners • Customer handling skills or Situation Handling	**4**	Understand catering industry basics, menu types, beverage identification, table etiquette, and customer handling skills.	1,2
IV	Unit 4- Travel management • Travel Documentation (Types) • Application of passport & Visa • Tourism products (UNESCO sites) • Types of logistics in travel and tourism management	**4**	Learn about travel documentation, passport and visa applications, tourism products like UNESCO sites, and various logistics in travel and tourism management.	1,2
V	Unit 5- Basic Hospitality Skills • Various Egg Preparations • Canapés preparations • Mocktail & Shakes Preparations • Butter Rice / Lemon Rice • Various Lentils Preparations • 1 non-veg preparation/ 1 veg preparation	**4**	Master various egg preparations, canapés, mocktails, shakes, rice dishes, lentil preparations, and both vegetarian and non-vegetarian dishes.	1,2

Text Books:

- 1. Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt ltd-New Delhi.
- 2. Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restauranteur, Guides.
- 3. Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.
- 4. Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – IV									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 2** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate								

	3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**30**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**

3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7.9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – IV									
Course Title	**ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD224R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing	**7**	Develop proficiency in various forms of writing, including paragraph and narrative	1,2

	iii. Technical Writing **Pipe and cistern** i. Introduction of pipes and cistern iii.Solving different types of questions iv. Worksheet1 and Worksheet 2		construction, letter writing, and technical documentation.	
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Worksheet1 and Worksheet 2	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement Iv. Worksheet1 and Worksheet 2	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Worksheet1	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables	**7**	Master interview techniques for various formats, understand dress code ethics, and improve	1,2

	Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Worksheet1 and Worksheet 2		performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	

Text Books:

1.Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.

2.McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)

3.A Modern Approach to Logical Reasoning All Exams

4.General Mental Ability & Logical Reasoning Compendium

Reference Books:

1.Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*

2. Fast track Objective mathematics for Competitive exam by Arihant

3.General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active	**11,12**

	listening, conflict resolution, and clear communication within engineering contexts.	
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – IV									
Course Title	**Extra-curricular Activities**								
Course code	**22UBEC221**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops,	**30**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

	competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

SEMESTER – IV									
Course Title	**Techno Professional Skills-III**								
Course code	**22BTCE227R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**

Pre-requisite	**Nil**	**Co-requisite**	**Nil**
Programme	**B.Tech Civil Emgineering**		
Semester	**Fall/ IV semester of first year of the programme**		
Course Objectives (Minimum 3)	Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.		
CO1	Understand the basic principles and standards of engineering graphics.		
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.		
CO3	Create accurate and detailed 2D engineering drawings of civil structures.		
CO4	Interpret and visualize engineering designs through graphical representation.		
CO5	Apply engineering graphics skills in practical civil engineering projects.		

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of orthographic projection, multi-view drawing, and sectional views.	6	Create accurate orthographic projections and sectional views of civil structures.	3, 4
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and perspective drawings. Visualization of 3D objects on 2D planes.	6	Interpret and visualize engineering designs through isometric and perspective drawings.	4, 5
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Understand the basic principles and standards of engineering graphics.	**5, 7**
2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

SEMESTER – IV									
Course Title	**MOOCS IV-Excel Skills for Business: Essentials**								
Course code	**22MOCE221R**	**Total credits: 1** **Total hours: 15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Summer/ V semester of second year of the programme**								
Course Objectives (Minimum 3)	Introduce the fundamental concepts and interface of Excel. Teach data manipulation and analysis techniques in Excel. Develop skills for creating and customizing data visualizations. Equip students with advanced Excel functions and macro automation. Apply Excel skills to real-world business scenarios.								
CO1	Navigate and utilize the Excel interface for basic data management tasks.								
CO2	Manipulate and analyze complex datasets using advanced Excel functions.								
CO3	Create clear and impactful data visualizations.								
CO4	Automate repetitive tasks with macros and advanced functions.								
CO5	Apply Excel skills to financial modeling, budgeting, forecasting, and other business applications.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit 1: Introduction to Excel** This unit introduces the basics of Excel, including the user interface, navigation, and essential functions. Students will learn how to create, save, and open workbooks, enter and edit data, and use basic formulas. This unit lays the foundation for more advanced	**3**	Upon completing this unit, students will be able to confidently navigate the Excel interface, understanding the structure of workbooks and worksheets. They will acquire basic data entry skills and learn essential formatting techniques to manage data effectively.	1, 2

	Excel skills, ensuring students are comfortable with the fundamental operations and tools available in Excel.			
II	**Unit 2: Data Management and Analysis** Students will delve into data management techniques, including sorting, filtering, and using Excel tables. This unit covers data validation, conditional formatting, and the use of functions for data analysis such as SUM, AVERAGE, COUNT, and IF statements. The focus is on organizing and analyzing data efficiently to extract meaningful insights.	**3**	This unit will enable students to manipulate and analyze data efficiently within Excel. They will learn to sort and filter data, use advanced functions such as VLOOKUP and HLOOKUP, and apply data validation techniques to ensure data accuracy.	1, 2, 3, 4
III	**Unit 3: Advanced Formulas and Functions** Building on the basics, this unit introduces more advanced formulas and functions. Students will learn about VLOOKUP, HLOOKUP, INDEX, MATCH, and complex nested formulas. This unit also covers text functions, date and time functions, and logical operators, enabling students to perform sophisticated data manipulations and analyses.	**3**	Students will gain the ability to create and customize various types of charts and graphs, essential for effective data visualization. They will learn to use pivot tables and pivot charts to summarize large datasets and generate meaningful visual representations. The unit will also emphasize best practices for designing clear and impactful visualizations, which are crucial for business reports and presentations. By the end of this unit, students will be proficient in visually communicating data insights and findings.	1, 2, 3, 4, 5
IV	**Unit 4: Data Visualization with Charts and Graphs** Effective data visualization is crucial for business reporting and decision-making. This unit teaches students how to create and customize various types of charts and graphs in Excel, including bar charts, line charts, pie charts, and scatter plots. Students will learn how to use chart elements, formatting options, and design principles to present data clearly and effectively.	**3**	In this unit, students will be introduced to advanced Excel functions and the use of macros to automate repetitive tasks. They will learn complex functions such as INDEX and MATCH, array formulas, and logical functions like IF, AND, and OR.	2, 3, 4
V	**Unit 5: PivotTables and PivotCharts** PivotTables and PivotCharts are powerful tools for summarizing and analyzing large datasets. In this unit, students will learn how to create, format, and manipulate PivotTables and PivotCharts to explore data from different perspectives. The unit covers	**3**	The final unit will focus on applying Excel skills to real-world business scenarios. Students will learn to create financial models, perform budgeting and forecasting, and conduct what-if analysis using tools like Scenario Manager and Goal Seek.	2, 3, 4, 5

	grouping, filtering, and using calculated fields to enhance data analysis.			

Textbooks:

1. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, 2018.
2. "Microsoft Excel 2019 Step by Step" by Curtis Frye, 2018.
3. "Excel 2016 in Depth" by Bill Jelen, 2015.

Reference Books:

1. "Excel Data Analysis: Modeling and Simulation" by Hector Guerrero, 2018.
2. "Excel Formulas and Functions for Dummies" by Ken Bluttman and Peter G. Aitken, 2018.
3. "Pivot Table Data Crunching" by Bill Jelen and Michael Alexander, 2016.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Navigate and utilize the Excel interface for basic data management tasks.	1,4,7
2	Manipulate and analyze complex datasets using advanced Excel functions.	2,3,5
3	Create clear and impactful data visualizations.	3,7,9
4	Automate repetitive tasks with macros and advanced functions.	6,8,10
5	Apply Excel skills to financial modeling, budgeting, forecasting, and other business applications.	10,12,4

MAPPING TABLE (4TH Semester)

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE221R	Solid Mechanics	3	2	3	1	1	1	1					1
22BTCE222R	Introduction to Fluid mechanics	3	3	3	2					1		1	1
22BTCE223R	Surveying and Geomatics	3	3	2	2	2				1			3
22BTCE224R	Geotechnical Engineering	2	2	1	1	1	1	1					
22BTCE225R	Basic Electronics for Civil Engineering Application	2	2	1	1	3	1	1	1				
22BTCE226R	Environmental Science	3	2	2	3	2	2	2					
22UBPD223R	English Language	2	2	2	3	2	3	3		1	1		1

	Proficiency for Engineers												
22UBCC221	Co-curricular	3	3	2	2	2				1			3
22UBEC221	Extra-curricular	2	2	1	1	1	1	1					
22BTCE227R	Techno-Professional Skills III	2	2	1	1	3	1	1	1				
22MOCE221R	MOOCS III	3	2	2	3	2	2	2					
22UULS221R	Basic Acclimatizing Skills (BAS)	2	2	2	3	2	3	3		1	1		1

SEMESTER – V									
Course Title	**Environmental Engineering**								
Course code	**22BTCE311R**	**Total credits: 3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	0	2	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of third year of the programme**								
Course Objectives (Minimum 3)	1. To understand the basic principles and concepts and processes involved in water and waste water treatment. 2. To develop a student's skill in the basic design of unit operations and processes involved in water and wastewater treatment. 3. To learn the basics of water treatment plant composition and its characteristics 4. To design the structures involved in an water treatment plant								
CO1	Analyze characteristics of water and wastewater								
CO2	Estimate the quantity of drinking water and domestic wastewater generated								
CO3	Identify the components of water supply systems								
CO4	Design sewerage system								
CO5	Plan strategies to control, reduce and monitor pollution.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	1.Water: -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processe	**9**	Understand the implications of water quality parameters on public health and environmental sustainability.	1,2
II	Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water-Quantification and design of Storm water;	**9**	Understand the factors influencing water demand and wastewater generation.	1,2

	Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.			
III	Air - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations, Noise- Basic concept, measurement and various control methods.	**9**	To be able to explain the role of infrastructure in ensuring reliable and safe water supply.	1,2
IV	Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities, Government authorities and their roles in water supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.	**9**	Understand the principles of gravity flow and hydraulic design in sewerage systems.	1,2
V	Building Plumbing-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.	**9**	To be able to design and implement monitoring programs to track pollution levels in water bodies.	1,2

TEXT BOOKS:

1. Droste R.L., (1997)., Theory and Practice of water wastewater treatment, John Wiley & sons.
2. Garg S.K., (2001), Environmental Engineering, Vols. I and II, 12th Edition, Khanna Publishers, New Delhi.

Reference Books

1. PeavyH.S.,.Rowe D.R and George Tchobanoglous (2001), Environmental Engineering, McGraw-Hill Company, New Delhi.
2. Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition.
3. Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES (PO)

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze characteristics of water and wastewater	**1,2,7&10**
2	Estimate the quantity of drinking water and domestic wastewater generated	**1,3,6&7**
3	Identify the components of water supply systems	**1,2,3,5,6 &7**
4	Design sewerage system	**1,2,3,5&6**
5	Plan strategies to control, reduce and monitor pollution.	**1,2,3,7**

SEMESTER –V									
Course Title	Mechanics of Materials								
Course code	22BTCE312R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Mechanics of Materials gives the student basic tools for stress, strain and deformation analysis. 2. Methods for determining the stresses, strains and deformations produced by applied loads are presented. 3. Engineering design concepts are integrated throughout the course								
CO1	Learn fundamental concepts of Stress, Strain and deformation of solids with applications to								

	bars, beams and thin cylinders.
CO2	Infer the mechanism of load transfer in beams, the induced stress resultants and deformations.
CO3	Estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.
CO4	Explain the effect of torsion on shafts and springs.
CO5	Analyze plane trusses using method of joint and the method of section.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	***Deformation and Strain covering description of finite deformation, Infinitesimal deformation:*** *Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder;* ***Generalized state of stress and strain:*** *Stress and strain tensor, Yield criteria and theories of failure; Tresca, Von-Mises, Hill criteria, Heigh-Westerguard's stress space.*	**9**	To be able to describe and differentiate between finite and infinitesimal deformation in materials.	1,2
II	*Momentum Balance and Stresses covering Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States / Failure Criterion* *Mechanics of Deformable Bodies covering Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate Trusses*	**9**	Understand the principles of momentum balance in the context of mechanical structures.	1,2
III	***Force-Stress-Equilibrium covering Multiaxial Stress and Strain*** ***Displacement*** *– Strain covering Multiaxial Strain and Multiaxial Stress-strain Relationships Elasticity and Elasticity Bounds covering Stress-strain-temperature*	**9**	Analyze stress-strain-temperature relationships and their implications in thin-walled pressure vessels.	1,2

	Relationships and Thin-walled Pressure Vessels, Stress and strain Transformations and Principal Stress, Failure of Materials			
IV	*Stress and Strains; Deflections and Torsion covering Pure Bending, Moment-curvature Relationship, Beam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams, Shear and Torsion, Torsion and Twisting, Thermo elasticity, Energy methods, Variational Methods; Strain energy, elastic, complementary and total strain energy, Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems, Castigliano's theorem, Maxwell Bettie's reciprocal theorem; Virtual work and unit load method for deflection, Application to problems of beams and frames*	**9**	Analyze pure bending in beams and derive the moment-curvature relationship.	1,2
V	***Structural stability:*** *Stability of columns, Euler's formula, end conditions and effective length factor, Columns with eccentric and lateral load; Plasticity and Yield Design covering 1D-Plasticity – An Energy Approach, Plasticity Models, Limit Analysis and Yield Design*	**9**	Apply limit analysis and yield design principles to ensure the structural integrity and safety of materials and structures.	1,2

Text Books:

1. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455
2. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979. ISBN: 9780070662308

Reference Books:

1. Gere, J. M. Mechanics Of Materials. 2Ed (Pb 2004)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.	**1,3 & 4**
2	Infer the mechanism of load transfer in beams, the induced stress resultants and deformations.	**1,2**
3	Estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.	**7,9,10**
4	Explain the effect of torsion on shafts and springs.	**5,7**
5	Analyze plane trusses using method of joint and the method of section.	**5,8**

SEMESTER – V									
Course Title	Structural Analysis I								
Course code	22BTCE313R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	4. This course aims at providing students with a solid background on principles of structural engineering design. 5. Students will be exposed to the theories and concepts of both concrete and steel design and analysis both at the element and system levels. 6. Hands-on design and skills will be gained and learned through problem sets and a comprehensive design project.								
CO1	Demonstrate their knowledge of structural mechanics in addressing design problems of structural engineering.								
CO2	Distinguish the varying materials and different loading systems in a structure.								
CO3	Classify structures and explain their behaviour by drawing its components and forces acting on it.								
CO4	Apply the design concepts to develop a R.C.C. members.								
CO5	Explain the basic concepts of special structures.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**KL**

I	Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design	**9**	Understand the basic concepts of energy principles, safety, and sustainable development in structural performance.	1,2
II	Planning and Design Process; Materials, Loads, and Design Safety; Behaviour and Properties of Concrete and Steel; Wind and Earthquake Loads	**9**	Comprehend the behavior and properties of concrete and steel, and understand the impact of wind and earthquake loads on structures.	1,2
III	Materials and Structural Design Criteria: Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures;	**9**	To be introduced to the analysis and design of structural systems, focusing on determinate and indeterminate trusses, beams, and frames.	1,2
IV	Design of Structural Elements; Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of Reinforced Concrete Beams for Flexure; Design of Reinforced Concrete Beams for Shear; Bond, Anchorage, and Serviceability; Reinforced Concrete Columns; Reinforced Concrete Slabs; Introduction to Steel Design; Tension Members and Connections; Bending Members; Structural Systems	**9**	Apply design principles to reinforced concrete beams and columns, and gain an introduction to steel design, focusing on tension members, connections, and bending members.	1,2
V	System Design Concepts; Special Topics that may be Covered as Part of the Design Project Discussions; Cable Structures; Prestressed Concrete Bridges; Constructability and Structural Control; Fire Protection	**9**	Explore system design concepts, including cable structures, prestressed concrete bridges, and structural control.	1,2

Text Books:

1. Design Of Structures - S. Ramamrutham., DhanpatRai Publishing Co Pvt Ltd
2. Design Of Steel Structures - N. Subramanian

Reference Books:

1. Analysis of Indeterminate Structures by C.K. Wang.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate their knowledge of structural mechanics in addressing design problems of structural engineering.	**1,3 & 4**
2	Distinguish the varying materials and different loading systems in a structure.	**1,2**
3	Classify structures and explain their behaviour by drawing its components and forces acting on it.	**7.9,10**
4	Apply the design concepts to develop a R.C.C. members.	**5,7**
5	Explain the basic concepts of special structures.	**5,8**

SEMESTER – V									
Course Title	Transportation Engineering								
Course code	22BTCE314R	**Total credits:3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	0	2	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. To introduce the students about different classifications/types of roads 2. To explain the students about different geometric features of highways 3. To describe about traffic characteristics and traffic control devices 4. To describe about different pavement materials, their properties and laboratory experiments. 5. To describe about different design phenomenon of pavement design								
CO1	Describe different types of roads, its administration and highway survey techniques								
CO2	Determine ideal road alignment in different topographies and design different geometric features of flexible and rigid pavement.								
CO3	Perform traffic survey to collect data required for traffic regulations and control								
CO4	Discuss about different materials and their suitability to be used in construction of road.								

CO5	Design various components of flexible and rigid pavements as per the latest code of practice.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	***Highway development and planning*** *Classification of roads, road development inIndia, Current Road projects in India; highway alignment, Highway Survey, and project preparation*	**9**	Understand the classification of roads and the historical and current road development projects in India.	1,2
II	***Geometric design of highways*** *Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of* *intersections, problems*	**9**	Learn the principles of geometric design, including the cross-section elements of highways and sight distance requirements.	1,2
III	***Traffic engineering & control*** *Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems*	**9**	Design road intersections, parking facilities, and highway lighting, and learn traffic regulation and control techniques.	1,2
IV	***Highway Materials and Construction*** *Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification – Concrete Mix Design,* *construction of bituminous and rigid pavements, Highway Maintenance – Material recycling*	**9**	Understand the components, functions, and design principles of rigid pavements, and solve design problems as per IRC standards.	1,2
V	***Design of pavements-*** *Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements-components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC;*	**9**	To be introduced to the factors affecting the design and performance of flexible pavements, including stress analysis and IRC design standards	1,2

	problems.			

Text Books:

1. S.K.Khanna, C.E.G.Justo, (2001) " Highway Engineering", Nem Chand & Bros, Roorkee.
2. Rao.G.V., (2005) "Principles of Transportation and Highway Engineering", Tata McGraw Hill Co.

Reference Books:

1.L.R.Kadiyali, (2003) "Principles and Practice of Highway Engineering", Khanna Publishers.

2. ParthaChakroborthy, Animesh Das, (2005) "Principles of Transportation Engineering", Prentice-Hall of India.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe different types of roads, its administration and highway survey techniques	**1,3 & 4**
2	Determine ideal road alignment in different topographies and design different geometric features of flexible and rigid pavement.	**1,2**
3	Perform traffic survey to collect data required for traffic regulations and control	**7.9,10**
4	Discuss about different materials and their suitability to be used in construction of road.	**5,7**
5	Design various components of flexible and rigid pavements as per the latest code of practice.	**5,8**

SEMESTER – V									
Course Title	**Hydrology and Water Resource Engineering**								
Course code	22BTCE315R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3

Pre-requisite	**Nil**	**Co-requisite**	**Nil**
Programme	**B.Tech Civil Emgineering**		
Semester	**Fall/ V semester of Third year of the programme**		
Course Objectives (Minimum 3)	• To study occurrence movement and distribution of water that is a prime resource for development of a civilization. • To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology. • To know the basic principles and movement of ground water and properties of ground water flow.		
CO1	Remember the key drivers on water resources, hydrological processes and their integrated behavior in catchments.		
CO2	Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph		
CO3	Explain the concept of hydrological extremes such as flood and drought and its management strategies		
CO4	Apply the concepts of groundwater for water resources management		
CO5	Understand the importance of spatial analysis of rainfall and design water storagereservoirs		

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data	**9**	Understand the components and processes of the hydrologic cycle and apply the water-budget equation to various scenarios.	1,2
II	**Precipitation:** forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, deptharea-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India, evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of	**9**	Apply depth-area-duration relationships, analyze maximum intensity/depth-duration-frequency relationships, and estimate probable maximum precipitation (PMP).	1,2

	infiltration capacities, infiltration indices			
III	**Runoff:** runoff volume, SCS-CN method of estimating runoff volume, flowduration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.	**9**	Estimate runoff volume using methods like the SCS-CN method and analyze flow-duration and flow-mass curves.	1,2
IV	**Ground water:** forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.	**9**	Analyze well hydraulics, including steady-state flow in wells, equilibrium equations for confined and unconfined aquifers, and conduct aquifer tests.	1,2
V	**Dam and Spillway:** embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site	**9**	Analyze forces on gravity dams, causes of failure, and stress analysis, and understand the design of arch and buttress dams, components of spillways, and reservoir management, including sedimentation and economic considerations.	1,2

Text Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.

Reference Books:

1.K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.

2. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill
3. G L Asawa, Irrigation Engineering, Wiley Eastern

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Remember the key drivers on water resources, hydrological processes and their integrated behavior in catchments.	**1,3 & 4**
2	Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph	**1,2**
3	Explain the concept of hydrological extremes such as flood and drought and its management strategies	**7.9,10**
4	Apply the concepts of groundwater for water resources management	**5,7**
5	Understand the importance of spatial analysis of rainfall and design water storagereservoirs	**5,8**

SEMESTER – V									
Course Title	**Construction Engineering& Management**								
Course code	22BTCE316R	**Total credits:3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. To train the students with the latest and the best in the rapidly changing fields of Construction Engineering, Technology and Management. **2.** To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry. **3.** To continually work with industry to enhance the program's effectiveness and the opportunities for innovation in the construction industry. **4.** To conduct research to develop advanced technologies and management approaches								
CO1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.								
CO2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.								
CO3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.								
CO4	Analyze and manage construction contracts, encompassing a comprehensive understanding								

	of construction costs considerations.
CO5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	INTRODUCTION**;** Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.	**9**	Learn to define work tasks, precedence relationships among activities, estimate activity durations, resource requirements, and use coding systems effectively.	1,2
II	PLANNING AND ORGANIZING CONSTRUCTION SITE AND RESOURCES: Resource allocation, resource aggregation and resources levelling	**9**	Apply resource leveling methods to optimize the use of resources on construction sites.	1,2
III	PERT CPM AND GERT NETWORKS: concepts of PERT, CPM and GERT, analysis of network and determining the critical path and duration of the network.	**9**	Understand the concepts of PERT, CPM, and GERT for project scheduling and management.	1,2
IV	CONTRACTS MANAGEMENT BASICS AND CONSTRUCTION COSTS: Make up of construction costs including capital costs operational costs and life cycle cost	**9**	Comprehend the components of construction costs, including capital, operational, and life cycle costs.	1,2
V	COST ANALYSIS TECHNIQUES: Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety.	**9**	Apply statistical quality control methods, including sampling by attributes and variables, and learn total quality control techniques to ensure high standards in construction projects.	1,2

Text Books:

1. Saurabh Kumar Soni (2013), “Building construction and management”, S.K Kataria and Sons.
2. Denis Lock (2010), “Project management in construction”, Pearson Education,
3. Sidney M. Levy (2009), “project control and Practice”, Pearson Education,

Reference Books:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.

2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.

4. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.

5. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.	**1,3 & 4**
2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.	**1,2**
3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.	**7.9,10**
4	Analyze and manage construction contracts, encompassing a comprehensive understanding of construction costs considerations.	**5,7**
5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.	**5,8**

SEMESTER – V									
Course Title	**Hydraulics Engineering**								
Course code	**22BTCE317R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	0	0	0	0	0	2
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	• 1. To introduce the importance of study of open channel flow, to give brief description on different types of flows and channels and hydraulic design principles of channels. • To learn the fundamentals of Uniform and Non-Uniform flow in open channels. • To understand about the concepts of specific energy, critical flow and their applications. • To give an idea about the gradually varied flow and rapidly varied flow and their equations and computations.								

CO1	Summarize the boundary layer analysis and their separation.
CO2	Illustrate the flow occurring in open channel and velocity distribution.
CO3	Assess energy equation and momentum equation with respect to uniform flow.
CO4	Summarize characteristics of surface profile by graphical and numerical approach in non-uniform flow.
CO5	Compile models related to hydraulic jump and web basedmodeling in water resource engineering

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Laminar Flow**- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. **Turbulent Flow**- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. **Boundary Layer Analysis**-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.	**6**	Comprehend the transition from laminar to turbulent flow, define turbulence, and analyze its effects using Prandtl's mixing length theory, Reynolds stresses, and Moody's diagram.	1,2
II	**Dimensional Analysis and Hydraulic Similitude:** Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem.	**6**	Analysis of laminar and turbulent boundary layers on a flat plate, understand local and average friction coefficients, and learn about boundary layer separation and control.	1,2

	Introduction to Open Channel Flow- Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.			
III	**Uniform Flow-**Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient "n" Most economical section of *ch*annel. Computation of Uniform flow, Normal depth. **Non-Uniform Flow-** Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Direct integration method	**6**	Application of dimensional homogeneity using Rayleigh and Buckingham's Pi methods, and understand the formation and application of dimensionless groups.	1,2
IV	**Hydraulic Jump-** Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,	**6**	Comparison of open channel flow with pipe flow, understand geometrical parameters and classification of open channels.	1,2
V	**Flow through Pipes:** Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic	**6**	Application the continuity, energy, and momentum equations to characterize uniform	1,2

	gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.		flow using Chezy's and Manning's formulas, and compute normal depth.	

Text Books:

1.Open channel Flow, K. Subramanya, Tata McGraw Hill.

2.Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House

Reference Books:

1.Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.

2.Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Summarize the boundary layer analysis and their separation.	**5, 7**
2	Illustrate the flow occurring in open channel and velocity distribution.	**8**
3	Assess energy equation and momentum equation with respect to uniform flow.	**7.9,10**
4	Summarize characteristics of surface profile by graphical and numerical approach in non-uniform flow.	**11,12**
5	Compile models related to hydraulic jump and web basedmodeling in water	**10**

	resource engineering	

SEMESTER – V									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC311	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**15**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

SEMESTER –V									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate								

	3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	AdtUhas included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**15**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**

3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7,9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – V									
Course Title	**Competent English for Engineers**								
Course code	**22UBPD314R**	**Total credits: 2** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	4	0	0	0	2
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern**	**6**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2

	ii. Introduction of pipes and cistern iii.Solving different types of questions iv. Worksheet1 and Worksheet 2			
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Worksheet1 and Worksheet 2	**6**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement Iv. Worksheet1 and Worksheet 2	**6**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Worksheet1	**6**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount**	**6**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and	1,2

	i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Worksheet1 and Worksheet 2		matrix arrangements.	

Text Books:

1.Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.

2.McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)

3.A Modern Approach to Logical Reasoning All Exams

4.General Mental Ability & Logical Reasoning Compendium

Reference Books:

1.Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*

2. Fast track Objective mathematics for Competitive exam by Arihant

3.General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse	**7, 9&10**

	audiences.	
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – V									
Course Title	**Techno Professional Skills-IV**								
Course code	**22BTCE317R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								
Semester	**Fall/ V semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. 2. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. 3. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.								
CO1	Understand the basic principles and standards of engineering graphics.								
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.								
CO3	Create accurate and detailed 2D engineering drawings of civil structures.								
CO4	Interpret and visualize engineering designs through graphical representation.								
CO5	Apply engineering graphics skills in practical civil engineering projects.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of	6	Create accurate orthographic	3, 4

	orthographic projection, multi-view drawing, and sectional views.		projections and sectional views of civil structures.	
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and perspective drawings. Visualization of 3D objects on 2D planes.	6	Interpret and visualize engineering designs through isometric and perspective drawings.	4, 5
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic principles and standards of engineering graphics.	**5, 7**
2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

MAPPING TABLE (5TH SEM)

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE311R	Environmental Engineering	3	3	2	2	2	2	3					
22BTCE312R	Mechanics of Materials	3	2	2	2	2	2	1					2
22BTCE313R	Structural Analysis I	3	2	3	1	1	1	1					3
22BTCE314R	Transportation Engineering	3	3	3	1	2	2	2					2
22BTCE315R	Hydrology and Water Resource Engineering	3	2	3	2	2		1					2
22BTCE316R	Construction Engineering& Management	3	3	2		2	2						3
22BTCE317R	Hydraulics Engineering	3	2	2	2	3	3	2					2
22UBPD314R	Competent English for Engineers	3	2	3	2	2		1					2
22UBCC311	Co-curricular	3	3	2		2	2						3
22UBEC311	Extra-curricular	3	2	2	2	3	3	2					2
22MOCE221R	MOOCS IV-Excel Skills for Business: Essentials	3	2	3	2	2		1					2
22BTCE317R	Techno-Professional Skills IV												

SEMESTER – VI										
Course Title	**Design of RC Structure**									
Course code	**22BTCE321R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 45T	**2**	**1**	**0**	**0**	**0**	**0**	**3**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ VI semester of third year of the programme**									
Course Objectives (Minimum 3)	The objective of the teacher is to impart knowledge and abilities to the students to: 1. Develop an understanding and appreciation for basic concepts in the behavior and design of reinforced concrete systems and elements. 2. Differentiate between working stress design and limit state design. 3.Understand the basic concepts for reinforced concrete sectional design mainly in accordance with ultimate strength. 4.Assess the structural and material behavior for the design of reinforced concrete systems and elements.									
CO1	Understand the general mechanical behavior of reinforced concrete in accordance with IS456:2000.									
CO2	Identify and apply the applicable industry design codes relevant to the design of reinforced concrete members.									
CO3	Analyze and design reinforced concrete flexural members with detailing.									
CO4	Design and check for serviceability (crack and deflection) and ultimate limit state conditions.									
CO5	Assess the stresses and design vertical and horizontal shear reinforcements in reinforced concrete members with detailing.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Concepts of RC. Design – Working Stress Method - Limit State method – Material StressStrain Curves – Safety factors – Characteristic values. Stress Block parameters – IS – 456 –2000. Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections	**10**	Upon completion of the course, students will demonstrate proficiency in applying both the Working Stress Method and the Limit State Method in the design of reinforced concrete structures, including beams, columns, slabs, and footings.	1, 2
II	Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in	**10**	Students will be able to analyze and design reinforced concrete beams for both flexural and shear capacities using appropriate IS code provisions. They will also be competent in designing various	1, 2, 3, 4

	simply supported and continuous beams, detailing; Design of canopy.		types of columns under axial loads, uniaxial bending, and biaxial bending scenarios.	
III	Short and Long columns – under axial loads, uniaxial bending and biaxial bending – I S Code provisions.	**8**	By the end of the course, students will have acquired skills in detailing reinforced concrete elements such as beams and footings, ensuring compliance with design specifications and structural integrity requirements.	1, 2, 3, 4, 5
IV	Footings: Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.	**7**	Students will be capable of designing different types of footings (isolated, square, rectangular, circular, and combined footings) to support varying loads and soil conditions. They will also be proficient in designing one-way slabs, two-way slabs, and continuous slabs, considering IS coefficients and limit state design principles.	2, 3, 4
V	Design of one-way slab, Two-way slabs and continuous slab Using I S Coefficients Limit state design for serviceability for deflection, cracking and codal provision. Design of doglegged staircase.	**10**	Upon completion of the course, students will be able to assess and design reinforced concrete structures while ensuring compliance with safety factors, characteristic values, and codal provisions related to serviceability criteria such as deflection, cracking, and durability.	2, 3, 4, 5

Text Books:

1 Reinforced concrete design by by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.

2. Limit state designed of reinforced concrete – P. C. Varghese, Prentice Hall of India,New Delhi.

3. Limit state designed of reinforced concrete – P. C. Varghese, Prentice Hall of India, New Delhi

Reference Books:

1. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand &

company.

2. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers

3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W.

Dolar, Tata McGraw-Hill, 3rd Edition, 2005.

OTHER LEARNING RESOURCES:

Design Of Reinforced Concrete Structures - Course (nptel.ac.in)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the general mechanical behavior of reinforced concrete in accordance with IS456:2000.	**1,3 & 4**
2	Identify and apply the applicable industry design codes relevant to the design of reinforced concrete members.	**1,2**
3	Analyze and design reinforced concrete flexural members with detailing.	**7.9,10**
4	Design and check for serviceability (crack and deflection) and ultimate limit state conditions.	**5,7**
5	Assess the stresses and design vertical and horizontal shear reinforcements in reinforced concrete members with detailing.	**5,8**

SEMESTER – VI									
Course Title	**Engineering Economics, Estimation and Costing**								
Course code	**22BTCE322R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Summarize the basic principal and standard methods for working out quantities in estimating. 2. Demonstrate the detailed estimate of buildings and workout rate analysis of the various items ofwork. 3. Understand the material requirements as per specified norms and standards 4. Assess the valuation of buildings and provide practical knowledge of standard specifications of items of buildings construction.								
CO1	Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses								
CO2	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure								
CO3	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.								
CO4	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.								
CO5	Detailed estimate of minor structure and deriving an approximate estimate for a multi-storeyed building by approximate methodsand preparation of valuation report in standard Government form								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including	**5**	Demonstrate proficiency in estimating quantities for various construction materials and activities using industry-standard methods.	1, 2

	GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve			
II	Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control – Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial.Case Study Method. Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment– Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.	**5**	Understand the importance and application of specifications in different types of construction projects.	1, 2, 3, 4
III	*Estimation* / Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete	**10**	Be capable of conducting rate analysis for accurate cost estimation and budgeting.	1, 2, 3, 4, 5

	and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying			
IV	Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures. Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity	**5**	Gain practical skills in preparing tender documents, including bid price formulation and contract management.	2, 3, 4
V	Tender- Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management. Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights	**5**	Acquire knowledge of relevant legal aspects and Acts related to construction contracts and labor rights in the industry.	2, 3, 4, 5

Text Books:

1. Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), *Indian Economy*, Himalaya
4. Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers

Reference Books:

1. M Chakravarty, Estimating, Costing Specifications & Valuation
2. Joy P K, Handbook of Construction Management, Macmillan
3. B.S. Patil, Building & Engineering Contracts
4. Relevant Indian Standard Specifications.

OTHER LEARNING RESOURCES:

Engineering Economic Analysis - Course (nptel.ac.in)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses	**1,3 & 4**
2	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure	**1,4**
3	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	**7.9,10**
4	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	**5,7**
5	Detailed estimate of minor structure and deriving an approximate estimate for a multi-storeyed building by approximate methodsand preparation of valuation report in standard Government form	**5,8**

SEMESTER – VI									
Course Title	**Structural Analysis II**								
Course code	22BTCE324R	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Students will develop the ability to analyze statically determinate beams and frames using influence lines and design these structures to withstand specified loads by calculating critical stress resultants. 2. Students will gain proficiency in using Muller Breslau's principle to analyze indeterminate beams and frames, with a focus on understanding the distribution of shear force, bending moment, and support reactions. 3. Students will be equipped to analyze different types of arches and suspension systems, taking into account settlement, temperature effects, and the behavior of cables under various loading conditions, and apply plastic theory to determine plastic moments, plastic moduli, and load factors for statically indeterminate structures.								
CO1	Students will be able to analyze statically determinate beams and frames using influence lines, and design them to withstand specified loads by calculating critical stress resultants.								
CO2	Students will gain proficiency in analyzing indeterminate beams and frames using Muller Breslau's principle, understanding the distribution of shear force, bending moment, and support reactions.								
CO3	Students will be capable of analyzing different types of arches and suspension systems, considering factors such as settlement, temperature effects, and the behavior of cables under various loading conditions.								

CO4	Students will develop a thorough understanding of plastic theory and its application to statically indeterminate structures, including the determination of plastic moments, plastic moduli, and load factors.
CO5	Students will be able to apply the knowledge gained to analyze and design structural systems under realistic conditions, incorporating factors such as dynamic loads, environmental effects, and safety considerations.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.	**5**	Upon completing the course, students will demonstrate proficiency in deriving and interpreting influence lines for reactions, shear force, bending moment, and member forces in determinate and indeterminate beams and pin-jointed plane frames.	1, 2
II	Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams	**10**	Students will be able to analyze various types of arch structures, including three-hinged, two-hinged, and fixed arches, considering settlement and temperature effects, and applying equilibrium principles specific to arch geometry.	1, 2, 3, 4
III	Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening gird	**5**	By the end of the course, students will understand the principles governing cables and suspension bridges, including the equilibrium of cables, determination of cable length, and the role of stiffening girders in suspension bridge design.	1, 2, 3, 4, 5
IV	Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders	**5**	Students will gain proficiency in plastic analysis techniques for statically indeterminate structures, including determining plastic moment of resistance, plastic modulus, and understanding the behavior of plastic hinges and mechanisms under loading conditions.	2, 3, 4
V	Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.	**5**	Upon completion, students will be able to apply theoretical concepts such as Muller Breslau's principle, plastic theory, and influence line analysis to solve practical engineering problems related to structural analysis, including beams, arches, cables, and suspension bridges.	2, 3, 4, 5

Text Books:

1.Structural Analysis, S.S. Bhabikatti

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - Structural Analysis II

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will be able to analyze statically	**1,2**

	determinate beams and frames using influence lines, and design them to withstand specified loads by calculating critical stress resultants.	
2	Students will gain proficiency in analyzing indeterminate beams and frames using Muller Breslau's principle, understanding the distribution of shear force, bending moment, and support reactions.	**1,2, 3, 4**
3	Students will be capable of analyzing different types of arches and suspension systems, considering factors such as settlement, temperature effects, and the behavior of cables under various loading conditions.	**7.9,10**
4	Students will develop a thorough understanding of plastic theory and its application to statically indeterminate structures, including the determination of plastic moments, plastic moduli, and load factors.	**5,7**
5	Students will be able to apply the knowledge gained to analyze and design structural systems under realistic conditions, incorporating factors such as dynamic loads, environmental effects, and safety considerations.	**5,8**

SEMESTER – VI										
Course Title	**Pavement Materials**									
Course code	22BTCE324E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Understanding different types of pavement materials and their characteristics 2. To have knowledge about the various tests which need to be carried out on soils, aggregate and bitumen for the design of bituminous mixes and pavements. 3. To understand and enable students to carry out design of bituminous mixes and superpave design									
CO1	Classify different types of soil and different laboratory test to estimate soil strength									
CO2	Explain different tests related to characterization of aggregates									
CO3	Describe different types of bituminous material and their characterization									
CO4	Explain different characteristics of bituminous mixes and design bituminous mixes for various condition									
CO5	Explain different composition of super pave									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Soil: Classification, characterization, evaluation of soil strength-shear test, CBR Test, Plate load test, Triaxial test	**5**	Students will gain proficiency in classifying soils and characterizing aggregates, utilizing a range of testing methods to evaluate their mechanical properties.	1, 2
II	Aggregate: Source, Characterization, Tests on aggregate-Crushing strength test, Abrasion Test, Impact Test, Soundness test, Shape Test, Specific gravity and water absorption test, Stripping value test, Aggregate gradation, voids in aggregates, Cement Concrete	**10**	By completing this lesson, students will be able to identify different types of bitumen, understand their properties, and conduct various tests to assess their suitability for construction applications.	1, 2, 3, 4

III	Bitumen: Source, Characterization, Cutback bitumen, Bitumen emulsion, Tests on bituminous binder-viscosity, ductility, specific gravity, durability, purity, safety	**8**	Upon completion, students will demonstrate competence in designing bituminous mixes, applying rheological models, and optimizing bitumen content to meet specified performance criteria.	1, 2, 3, 4, 5
IV	Bituminous mixes: Mix volumetric, Rheological models for asphalt mix- Two component models, Maxwell model, Kelvin model **,**Three component models **,** Generalized models, Linear viscoelasticity **,** Time-temperature superposition,Selection of Optimum bitumen content, Marshall method, Numerical examples, Mix Specification, Stiffness modulus and fatigue performance of bituminous mix	**10**	Students will learn to apply Superpave concepts in asphalt mix design, including binder and aggregate selection, volumetric analysis, compaction methods, and performance evaluation.	2, 3, 4
V	Concept of Superpave: Components, Binder Selection, Aggregate selection, Superpave volumetrics, Compaction, Evaluation of mix performance	**7**	This lesson aims to integrate theoretical knowledge with practical applications, preparing students for effective utilization of soil, aggregate, bitumen, and bituminous mixes in civil engineering projects.	2, 3, 4, 5

Text Books:

1. Principles of Transportation Engineering- Partha Chakroborty, Animesh Das

2. Pavement Analysis and Design-Yang H Huang

3. Analysis of Pavement Structures- Animesh Das

Reference Books:

1. Principles of Pavement design- Yoder and Witezak

2. IRC: 37-2012 and IRC: 58-2011

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - NOC:Pavement Materials (Under Pavement Engineering)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Classify different types of soil and different laboratory test to estimate soil strength	**1, 4**
2	Explain different tests related to characterization of aggregates	**2, 3**
3	Describe different types of bituminous material and their characterization	**7.9,10**
4	Explain different characteristics of bituminous mixes and design bituminous mixes for various condition	**5,7**
5	Explain different composition of super pave	**5,8**

SEMESTER – VI										
Course Title	**BUILDING CONSTRUCTION PRACTICE**									
Course code	22BTCE324E	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ VI semester of third year of the programme**									
Course Objectives (Minimum 3)	The course should enable the students to: I. Develop knowledge of material science and behavior of various building materials used in construction. II. Identify the construction materials required for the assigned work. III. Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc. IV. List the requirements and different types of stairs									
CO1	Recognize the various phases associated with simple residential and commercial construction.									
CO2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.									
CO3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.									
CO4	Understand construction procedure of different components									
CO5	Understand the property, use, advantage and disadvantage of different material used in construction.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction- Objectives, Requirements Of Foundation, Aim Of Superstructure, Types Of Construction, Aim Of Site Inspection, Laying Out The Building Plan At Site For Foundation	**5**	Understanding the objectives and requirements of foundation construction.	1, 2
II	UNIT II CONSTRUCTION PRACTICES Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.	**10**	Describing the aims and types of superstructure construction	1, 2, 3, 4
III	UNIT III SUB STRUCTURE CONSTRUCTION Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.	**5**	Implementing effective site inspection techniques	1, 2, 3, 4, 5
IV	UNIT IV SUPER STRUCTURE CONSTRUCTION Launching girders, bridge decks, off shore	**5**	Planning and executing the layout of building plans for foundations at a construction site.	2, 3, 4

	platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.			
V	UNIT V CONSTRUCTION EQUIPMENT Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunnelling.	**5**	Applying specifications and coordinating activities for efficient construction practices	2, 3, 4, 5

Text Books:

1 Building construction: metric volume 1 by WR McKay.

2 Fundamentals of building construction: materials and methods by Edward Allen and Joseph Iano.

Reference Books:

1 Building materials and construction book with reference to B.C.Rangawala, Sushil Kumar, B.P.Bindra, A.Kamala.

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - Civil Engineering - Building materials and Construction

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Recognize the various phases associated with simple residential and commercial construction.	**1,3 & 4**
2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.	**1,2**
3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.	**7.9,10**
4	Understand construction procedure of different components	**5,7**

5	Understand the property, use, advantage and disadvantage of different material used in construction.	**5,8**

SEMESTER – VI									
Course Title	**CORPORATE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD324R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** iii. Introduction of pipes and cistern iii.Solving different types of questions iv. Worksheet1 and Worksheet 2	**7**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Worksheet1 and Worksheet 2	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2

	iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement Iv. Worksheet1 and Worksheet 2			
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Worksheet1	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Worksheet1 and Worksheet 2	**7**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

Text Books:

1.Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking,* Zephyros Press.

2.McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)

3.A Modern Approach to Logical Reasoning All Exams

4.General Mental Ability & Logical Reasoning Compendium

Reference Books:

1.Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*

2. Fast track Objective mathematics for Competitive exam by Arihant

3.General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – VI									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	22UBCC321	**Total credits: 1** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/ F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								

Semester	Fall/ VI semester of third year of the programme
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**30**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1, 2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7.9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – VI									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC321	**Total credits: 1** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**30**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**

5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

MAPPING TABLE

Subject Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCE321 R	Design of RC Structure	3	2	3	1	1	1	1					1
22BTCE322 R	Engineering Economics, Estimation and Costing	3	3	3	2					1		1	1
22BTCE324 R	Structural Analysis II	3	3	2	2	2				1			3
22BTCE324E	Pavement Materials	2	2	1	1	1	1	1					
22BTCE325E	Building Construction Practice	2	2	1	1	3	1	1	1				1
22UBPD324 R	Corporate Proficiency for Engineers								1	1	1	1	
22UBCC321	Co-curricular									1	1		1
22UBEC321	Extra-curricular									1	1		1

SEMESTER – VII									
Course Title	**Design of Steel Structure**								
Course code	**22BTCE411E**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								

Semester	Fall/ VII semester of fourth year of the programme
Course Objectives **(Minimum 3)**	1. This course provides students with learning about different types of steel structures, their formations, characteristics, and practical applications in various industries. 2. The course covers the design of welded and bolted connections, focusing on efficiency and reliability in structural design. 3. By studying Students gain insights into designing tension and compression members, as well as justifying the selection and design of steel beams and plate girders, ensuring robust and efficient steel structures.
CO1	Explain the steel structures, their types and formations.
CO2	Analize and design welded and bolted connections
CO3	Elustrate tension members and compression members
CO4	Justify steel beams and industrial beams
CO5	Design and justify plate girders

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**General principles of design:** Types of structural steel, Mechanical properties, codes and specifications, Basis of structural design. Welded connections, advantage, types and properties, Design of weld, Simple joints, moment resistant connections.	**6**	Understand the types, properties, and specifications of structural steel and the basics of structural design, including welded and bolted connections.	1,2
II	**Bolted joints and Bolted connections in frames:** Bolted connections, Centrally and eccentrically loaded connection **Welded joints and Welded connection in frames:** Types of welded joints, various types of butt and fillet joints, strength and efficiency of welded joints. Welded brackets, moment resistant welded connections.	**6**	Learn the design principles and applications of centrally and eccentrically loaded bolted connections.	1,2
III	**Design of tension members:** Design of tension members, splicing of tension members. Factors effecting the strength of tension member, angle under tension, other sections, modes of failure. **Design of compression member and Design of beams:** Classification of cross section, Elastic buckling of slender compression member, effective length, compression member composed with two components back to back. Simple laterally restrained and un-restrained beams. **Design of Industrial Building:** Structural layout of industrial building, Various types of trusses andtheirelection, effect of wind loads on purlin and trusses, bracing systems, columns, foundations, gantry girder – static and moving loads, selection & design of section.	**6**	Gain proficiency in designing various types of welded joints, focusing on strength, efficiency, and moment-resistant connections.	1,2
IV	**Design of plate girders:** Modes of failure: Elastic buckling, bending in the plane of web, Local buckling, buckling in the plane of web, Vertical	**6**	Develop skills to design tension and compression members, classify cross-sections, and understand the behavior	1,2

	buckling of the compression flange, Shear buckling.		of slender compression members and beams.	
V	**Introduction to Plastic Analysis:** Introduction to plastic method of analysis, Design of continuous beams and portal frame using plastic design approach.	**6**	Acquire knowledge on the structural layout and design of industrial buildings, including trusses, wind load effects, bracing systems, columns, foundations, and gantry girders.	1,2

Text Books:

1. Design Of Steel Structures - S. Ramamrutham,Dhanpat Rai Publishing Co Pvt Ltd,
2. Design Of Steel Structures - N. Subramanian, OUP India,2016
3. Design Of Steel Structures - S K Duggal

Reference Books:

1. Design Of Steel Structures - Dr. N. R. Chandak

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the steel structures, their types and formations.	**1,3 & 4**
2	Analize and design welded and bolted connections	**1,2**
3	Elustrate tension members and compression members	**7.9,10**
4	Justify steel beams and industrial beams	**5,7**
5	Design and justify plate girders	**5,8**

SEMESTER – VII

Course Title	Professional Elective-IV Concrete Technology								
Course code	22BTCE415E	Total credits: 3	L	T	P	S	R	O/F	C
		Total hours: 40T	3	0	0	0	0	0	3
Pre-requisite	Nil	Co-requisite	Nil						
Programme	B.Tech Civil Emgineering								
Semester	Fall/ VII semester of fourth year of the programme								

Course Objectives (Minimum 3)	1. Understand the essential properties of concrete and its key constituents, focusing on how these impact concrete performance. 2. Learn the principles of concrete mix design, production techniques, and quality control measures to ensure the durability and strength of concrete structures. 3. Explore various types of concrete, such as normal strength, high strength, lightweight, and special concretes, and their specific applications in different construction projects.
CO1	Learn the constituents and their roles in concrete, including cement, aggregates, water, and admixtures.
CO2	Develop proficiency in proportioning concrete ingredients for desired properties like strength, workability, and durability.
CO3	Develop practical skills in conducting tests to assess fresh and hardened concrete properties.
CO4	Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.
CO5	Learn to conduct tests to maintain industry standards and ensure safe construction practices.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Basics: Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends.	**8**	Gain an understanding of the historical background, composition, strength mechanisms, recent practices, and future trends in concrete technology.	1,2
II	Constituent of Concrete: 1. Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, testing of cement as per Indian standard. 2. Aggregates - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements, sampling & testing as per Indian Standards. 3. Water - General Requirements & limiting values of impurities. 4. Admixtures - Additives and admixtures, types, necessity and benefit Mineral admixture - Fly ash, silica fume, blast furnace slag, and other pozzolanic materials. Chemical admixtures - Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and usage	**8**	Learn about the properties, testing, and roles of cement, aggregates, water, and admixtures in concrete production.	1,2
III	Fresh concrete: Methods of mixing, transporting and placing of concrete. Workability – Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, re-tempering. Curing:	**7**	Understand the methods of mixing, transporting, placing, and curing concrete, along with the factors affecting workability and methods to measure it.	1,2

	necessity and various methods, micro-cracking.			
IV	Hardened concrete: Compressive and tensile strength and their relationship, various tests as per IS and ASTM. Factors affecting strength – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage and creep. Tests for strength of concrete: Destructive, semi destructive and non-destructive tests with their limitations, test methods as per IS and ASTM. 5 Durability and permeability of concrete: Definitions, causes, carbonation, cracking.	**9**	Develop knowledge of the strength properties of hardened concrete, factors affecting its strength, and various destructive and non-destructive testing methods.	1,2
V	Concrete in aggressive environment: Alkali – aggregate reaction, sulphate attack, chloride attack, acid attack, effect of sea water, special coating for water proofing, sulphate chloride and acid attack, concrete for hot liquids.	**8**	Explore the definitions, causes, and impacts of durability and permeability, including the effects of aggressive environments on concrete structures.	1,2

Text Books:

1. M S Shetty; Concrete Technology, S.Chand Publication New Delhi 2. P Kumar Mehta, Monteiro;
2. Concrete Technology, Indian Concrete Institute

Reference Books:

1. A.M.Neville ; Properties of Concrete , Pearson Education
2. M L Gambhir; Concrete Technology , Tata McGraw Hill
3. IS 456-2000 7.
4. IS 269-1989
5. IS 516-1959 9
6. IS 1786-1985 10
7. IS 1893-2002
8. IS 12269-1987
9. IS 9103-1999
10. IS 8112-1989

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn the constituents and their roles in concrete, including cement, aggregates, water, and admixtures.	**1,3 & 4**

2	Develop proficiency in proportioning concrete ingredients for desired properties like strength, workability, and durability.	**1,2**
3	Develop practical skills in conducting tests to assess fresh and hardened concrete properties.	**7.9,10**
4	Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.	**5,7**
5	Learn to conduct tests to maintain industry standards and ensure safe construction practices.	**5,8**

SEMESTER – VII										
Course Title	**Professional Elective IV Surface Hydrology**									
Course code	**22BTCE414E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	4. Understand Hydrological Processes and Modeling: Gain knowledge in hydrology, including precipitation, stream flow measurement, hydrograph analysis, storm runoff, flood estimation, and modeling techniques. 5. Explore the Hydrologic Cycle: Examine how components like precipitation and runoff affect water availability across different regions over time. 6. Apply Hydrological Principles in Decision Support: Learn to use hydrological data and models for effective water and environmental management decisions, such as watershed management and flood control.									
CO1	Explain the different concepts in hydro-metrology.									
CO2	Discuss the key aspects of hydrology, along with a more applied appreciation of monitoring and modelling hydrological processes.									
CO3	Generalize knowledge on topics ranging from climatology, atmospheric circulation and meteorological measurements, as well as more detailed investigations into precipitation, stream flow measurement, hydrograph analysis, storm runoff and concepts in flood estimation and routing.									
CO4	Explain the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal distribution of water availability in any region.									
CO5	Develop students' in-depth understanding on how hydrologic principles can be applied to supplement decision support system for water and environmental management.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	**Hydrometeorology:** Hydrologic cycle – Global water budget – Practical applications – Hydrometeorology – Constituents of atmosphere – Vertical structure of the atmosphere – general circulation,– Air mass – Air front – cyclones – Formation of precipitation – Types and forms of precipitation – Climate and Weather – Meteorological Observations.	**10**	Students will demonstrate a comprehensive understanding of the hydrologic cycle and global water budget, including its practical applications in various contexts. They will be able to analyze the constituents and vertical structure of the atmosphere, interpret general circulation patterns, and differentiate between air masses, air fronts, and cyclones. Additionally, students will identify the processes involved in the formation of precipitation, recognize different types and forms of precipitation, and comprehend the relationships between climate and weather. They will also be proficient in conducting and interpreting meteorological observations essential for understanding and predicting weather patterns and phenomena.	1, 2
II	**Precipitation:** Measurement of rainfall – Rain gauges – Radar Measurement of rainfall - Rainfall Hyetograph – Intensity Duration and Frequency analysis – Consistency – Missing data – Rain gauge network – Average depth of rainfall analysis.	**10**	By the end of this unit on precipitation, students will be able to effectively measure rainfall using both traditional rain gauges and radar technology. They will learn to analyze rainfall data using techniques such as creating rainfall hyetographs, conducting Intensity Duration Frequency (IDF) analysis, assessing data consistency, and handling missing data. Students will also gain proficiency in designing and managing rain gauge networks to collect accurate precipitation data and perform analysis to determine average depths of rainfall over specified periods.	2, 3, 4
III	**Abstractions:** Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrometers – Infiltration Equations - Infiltration Indices.	**10**	Upon completion of this unit, students will demonstrate proficiency in understanding and applying concepts related to water losses and abstractions in hydrology. They will be able to analyze initial losses including interception and depression storage, evaluate methods of measuring evaporation using evaporimeters, and estimate evapotranspiration through empirical equations and field measurement techniques. Additionally, students will gain practical skills in assessing infiltration using infiltrometers and interpreting infiltration equations and indices, thereby developing a comprehensive understanding of the factors influencing water movement and losses in natural	1, 2, 3, 4

			and engineered environments.	
IV	**Streamflow Measurement:** Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site. .	**10**	Upon completion of this unit on Streamflow Measurement, students will be able to demonstrate a comprehensive understanding of various methods and technologies used in the measurement of streamflow. They will proficiently describe and apply principles related to stage and velocity measurement using gauges, current meters, and Doppler flow velocity meters. Additionally, students will be able to calculate discharge using both the Area Velocity method and the Area Slope method, and identify appropriate Discharge Measuring Structures for different scenarios. They will also gain competence in applying the Dilution Technique and establishing Stage Discharge relationships. Furthermore, students will be capable of evaluating and selecting suitable stream gauging sites based on specific criteria and considerations relevant to hydrological studies and water resource management.	1, 2
V	**Runoff and Water Conservation:** Concept of catchment – Linear, Areal and Relief Aspects – Detailed study of Runoff process – Factors affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation - Strange and SCS methods – Water Conservation – Rain water and Runoff Harvesting in Rural and Urban Areas - Reservoir Sedimentation.	**5**	By the end of this unit on Runoff and Water Conservation, students will be able to comprehensively understand the concept of catchment areas, including their linear, areal, and relief aspects. They will have detailed knowledge of the runoff process and the factors influencing it, as well as the ability to analyze hydrographs and apply methods such as Unit Hydrograph and Synthetic Hydrograph for runoff estimation. Furthermore, students will gain practical insights into water conservation strategies, including rainwater and runoff harvesting techniques applicable to both rural and urban environments, and grasp the challenges and methods related to reservoir sedimentation management.	2, 3, 4, 5

Text Books:

1 Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, New York, 1995.

2 Subramanya K., "Hydrology,Tata McGraw Hill Co., New Delhi, 1994.

3 Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2nd Edition, New Delhi.

Reference Books:

1 Jeya Rami Reddy.P, "Hydrology, Laxmi Publications, New Delhi, 2004".

2 Larry W. Mays, "Water Resources Engineering", Wiley Publication"

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the different concepts in hydro-metrology.	3,2
2	Discuss the key aspects of hydrology, along with a more applied appreciation of monitoring and modelling hydrological processes.	1,2
3	Generalize knowledge on topics ranging from climatology, atmospheric circulation and meteorological measurements, as well as more detailed investigations into precipitation, stream flow measurement, hydrograph analysis, storm runoff and concepts in flood estimation and routing.	1,4
4	Explain the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal distribution of water availability in any region.	7.9,10
5	Develop students' in-depth understanding on how hydrologic principles can be applied to supplement decision support system for water and environmental management.	5,7

SEMESTER – VII									
Course Title	**Generic Elective II Nano-science & Technology**								
Course code	**22BTCE414E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Gain understanding of the core principles and concepts behind manipulating matter at the nanoscale. 2. Learn about the unique and unexpected properties that emerge when materials are engineered at the nanoscale level. 3. Dive into the methods for creating nanomaterials and explore their diverse applications across various fields								
CO1	Learn about the basics of Nanotechnology.								
CO2	Understand the concepts of extraordinary properties exhibit at nanoscale.								
CO3	Learn different synthesis/ fabrication techniques of nanomaterials.								
CO4	Learn about different characterization methods of nanomaterials.								
CO5	Learn the software used for analysis of characterized data.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Basics of Nanotechnology: Importance of Nano-technology, History of Nano-Technology, Properties of Nano materials,Difference between Bulk and Nanomaterial, Molecular building blocks for nanostructure systems, Forces between atoms and molecules - Particles and grain boundaries – strong Intermolecular forces – Electrostatic and Vander Waals forces between surfaces.	**8**	Gain foundational knowledge of nanotechnology, including its history, significance, unique properties of nanomaterials, and the distinction between bulk and nanoscale materials.	1,2
II	Physics of nanomaterials: Atomic scale structure of nanoparticles, nanotubes, nanowires, nanodots etc.; electronic and optical characteristic properties of quantum dots, quantum wires and quantum wells; concept of quantum confinement: 0D, 1D and 2D nanostructures; Size effects – Fraction of Surface Atoms – specific Surface Energy and Surface Stress. Nanofluidics, Nanophotonics, Nanothermodynamics, Plasmonics – plasmons and surface plasmons, SPR, Core-shell quantum dots and quantum-dot-quantum wells.	**8**	Understand the atomic structure of various nanomaterials like nanoparticles, nanotubes, and quantum dots. Explore their electronic and optical properties, grasp the concept of quantum confinement, and analyze size effects on nanostructures.	1,2
III	Synthesis/fabrication techniques of nanomaterials: Top down approach, Lithography – electron beam and ion beam techniques, Etching – wet and dry etching, Bottom up approach - Solvent based and	**7**	Learn about the top-down and bottom-up approaches for nanomaterial synthesis/fabrication. Explore techniques like lithography,	1,2

	template based synthesis, other important synthesis methods like CVD, PVD etc.; Doping, Nucleation, Growth and Stability of colloidal nanoparticles, concept of self assembly.		etching, self-assembly, and methods like CVD and PVD.	
IV	Characterization methods: Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), Atomic force microscopy (AFM) and X-ray diffraction Spectroscopy (XRD).	**9**	Master characterization methods for nanomaterials such as TEM, SEM, AFM, and XRD.	1,2
V	Applications: Nanosensors and nanoelectronics, Micro & Nano electromechanical systems, Photonic crystals, Nano pizotronics, Nanomedicine.	**8**	Discover applications of nanotechnology in various fields like sensors, electronics, MEMS/NEMS, photonics, pieztronics, and nanomedicine.	1,2

Text Books:

1. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanoscience, CRC Press.
2. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanotechnology, CRC Press.

Reference Books:

1. T. Pradeep, Nano: The essentials, McGraw Hill.
2. D. Maclurcan& N. Radywyl (Eds.), Nanotechnology and global sustainability, CRC Press.
3. E. Lichtfouse, J. Shwarzbauer, D. Robert, Environmental chemistry for sustainable world, vol.2, Springer verlag.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn about the basics of Nanotechnology.	1,3 & 4
2	Understand the concepts of extraordinary properties exhibit at nanoscale.	1,2
3	Learn different synthesis/ fabrication techniques of nanomaterials.	7.9,10
4	Learn about different characterization methods of nanomaterials.	5,7
5	Learn the software used for analysis of characterized data.	5,8

MAPPING TABLE (7th Semester)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE411E	Design of Steel Structure	3	2	2	2	1		2					1
22BTCE415E	Concrete Technology	2	2	2	2	2		2					3
22BTCE415E	Surface Hydrology	3	2	2	2	1		2					1
22BTCE414E	Nano-science & Technology	2	2	2	3	2							1

SEMESTER – VIII	
Course Title	**Professional Elective V- Soil Mechanics**

Course code	22BTCE421R	Total credits: 2 Total hours: 30T	L	T	P	S	R	O/F	C
			2	0	0	0	0	0	2
Pre-requisite	Nil	Co-requisite	Nil						
Programme	Bachelor of Technology in Civil Engineering								
Semester	Fall: Winter/ VIII semester of fourth year of the programme								
Course Objectives (Minimum 3)	1. To Develop an advanced understanding of soil behavior, encompassing exploration methods, laboratory testing, and hydraulic characteristics, with a focus on stress distribution, consolidation theory, and shear strength analysis. 2. Attain proficiency in geotechnical design, including foundations, slopes, and retaining structures, applying principles such as bearing capacity, settlement analysis, and limit equilibrium methods. 3. Apply advanced geotechnical concepts by integrating geosynthetics in reinforced structures, exploring ground improvement techniques, and addressing environmental challenges through the application of soil mechanics principles.								
CO1	To Conduct advanced soil exploration and characterization, employing laboratory-testing techniques to determine soil properties accurately.								
CO2	To Analyze stress distribution in soils in three dimensions, predicting settlements through consolidation theory and assessing shear strength using critical state soil mechanics.								
CO3	To Design shallow and deep foundations, applying principles of bearing capacity and settlement analysis, while also demonstrating competence in slope stability analysis and design.								
CO4	To Apply earth pressure theories to design effective retaining walls and bulkheads, incorporating reinforced soil structures into geotechnical solutions.								
CO5	To Demonstrate proficiency in incorporating geosynthetics into soil engineering practices, utilizing them in the design and construction of reinforced structures, and applying ground improvement techniques effectively								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**UNIT 1: INTRODCUTION Overview of Geotechnical Engineering:** • Definition, scope, and importance of geotechnical engineering. • Historical developments and key contributors in the field. • Interrelation between geology and geotechnical engineering. **Basic Soil Mechanics Concepts:** • Fundamental properties of soils (particle size, soil classification, moisture content). • Soil phases: solids, water, and air. • Basic soil behavior and stress-strain relationships. **Role of Geotechnical Engineer:** • Professional responsibilities and ethical considerations. • Case studies highlighting the significance of geotechnical engineering in civil projects.	5	Students will have a comprehensive understanding of geotechnical engineering, including its definition, scope, and significance. They will be familiar with the historical context and key contributors to the field, as well as the essential relationship between geology and geotechnical engineering. Students will grasp fundamental soil mechanics concepts, such as soil properties, classification, moisture content, and the composition of soil phases (solids, water, and air). Additionally, they will understand basic soil behavior and stress-strain relationships. The unit will also cover the role and responsibilities of a geotechnical engineer, emphasizing professional ethics through case studies that demonstrate the critical impact of geotechnical engineering on civil engineering projects.	1, 2
II	**UNIT 2: SHALLOW FOUNDATION AND BEARING CAPACITY** **Types of Shallow Foundations:** • Overview of different types of shallow foundations	10	Upon completing this unit, students will have a comprehensive understanding of shallow foundations, including an overview of various types such as spread footings and mat foundations, along with criteria for selecting appropriate	1, 2, 3, 4

	(spread footings, mat foundations). • Selection criteria based on soil conditions and structural requirements. **Bearing Capacity Basics:** • Definition of bearing capacity. • Factors influencing bearing capacity: soil strength, foundation geometry, and loading conditions. • Ultimate and allowable bearing capacity. **Terzaghi's Bearing Capacity Equation:** • Derivation and application of Terzaghi's bearing capacity equation. • Practical considerations and limitations of the equation.		foundation types based on soil conditions and structural requirements. They will grasp the concept of bearing capacity, factors influencing it, and the differentiation between ultimate and allowable bearing capacity. Additionally, students will learn the derivation and application of Terzaghi's bearing capacity equation, recognizing its practical considerations and limitations, thus equipping them with essential knowledge for assessing and designing shallow foundations in civil engineering projects.	
III	**UNIT 3: BEARING CAPACITY THEORIES AND APPLICATION** **Other Bearing Capacity Theories:** • Introduction to other bearing capacity theories (Meyerhof, Hansen). • Comparative analysis of different bearing capacity theories. **Influence of Water Table:** • Effect of the water table on bearing capacity. • Application of correction factors in bearing capacity analysis. **Foundation Settlement:** • Causes and types of foundation settlement. • Methods for predicting and mitigating settlement.	**5**	Upon completing Unit 3: Bearing Capacity Theories and Application, students will gain a comprehensive understanding of various bearing capacity theories, including those proposed by Meyerhof and Hansen, and will be able to conduct comparative analyses of these theories. They will learn how the presence of a water table influences bearing capacity and how to apply correction factors in such scenarios. Additionally, students will explore the causes and types of foundation settlement, and develop skills in predicting and mitigating settlement issues, enabling them to make informed decisions in geotechnical engineering practice.	1, 2, 3, 4, 5
IV	**UNIT 4: SETTLEMENT OF FOOTING** **Immediate and Consolidation Settlement:** • Distinction between immediate and consolidation settlement. • Calculation methods for each type of settlement. **Time-Settlement Behavior:** • Time-rate of settlement and its implications. • Settlement prediction using empirical and analytical methods. **Practical Applications and Case Studies:** • Real-world examples of footing settlement in various	**5**	Upon completing Unit 4: Settlement of Footing, students will be able to distinguish between immediate and consolidation settlement, understanding the respective calculation methods for each. They will grasp the time-rate of settlement and its implications, predicting settlement behavior using both empirical and analytical methods. Through practical applications and case studies, students will analyze real-world examples of footing settlement in various construction projects, extracting valuable lessons from these case studies to enhance their understanding and application of settlement principles in geotechnical engineering.	2, 3, 4

	construction projects. • Analysis of lessons learned from case studies.			
V	**UNIT 5: SOIL EXPLORATION AND STABILITY ANALYSIS** **Methods of Soil Exploration:** • Overview of geotechnical site investigation techniques (boring, sampling, in-situ tests). • Selection of exploration methods based on site conditions. **Stability Analysis of Slopes:** • Slope stability analysis methods (infinite slope, circular failure). • Factors affecting slope stability. **Case Studies in Soil Exploration and Stability:** • Application of soil exploration data in slope stability analysis. • Review of case studies demonstrating the importance of thorough soil investigation in stability assessments.	**5**	Upon completing Unit 5: Soil Exploration and Stability Analysis, students will be able to proficiently conduct geotechnical site investigations using various methods such as boring, sampling, and in-situ tests, selecting appropriate techniques based on specific site conditions. They will gain a comprehensive understanding of slope stability analysis methods, including infinite slope and circular failure, and will be able to identify and evaluate the factors affecting slope stability. Additionally, students will apply soil exploration data to practical slope stability assessments and critically review case studies that highlight the critical role of detailed soil investigation in ensuring stability and safety.	2, 3, 4, 5

Text Books:

1 "Principles of Geotechnical Engineering" by Braja M. Das,1994

2 "Foundation Design: Principles and Practices" by Donald P. Coduto, William A. Kitch, and Man-chu Ronald Yeung, 2001

Reference Books:

1 "Soil Mechanics and Foundations" by Muni Budhu: 1999

2 "Geotechnical Engineering: Principles and Practices" by Donald P. Coduto, Man-chu Ronald Yeung, and William A. Kitch: 2005

3 "Introduction to Geotechnical Engineering" by Robert D. Holtz, William D. Kovacs, and Thomas C. Sheahan, 1981

OTHER LEARNING RESOURCES:

https://archive.nptel.ac.in/courses/105/101/105101084/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	To Conduct advanced soil exploration and characterization,	1,3 & 4

	employing laboratory-testing techniques to determine soil properties accurately.	
2	To Analyze stress distribution in soils in three dimensions, predicting settlements through consolidation theory and assessing shear strength using critical state soil mechanics.	1,2
3	To Design shallow and deep foundations, applying principles of bearing capacity and settlement analysis, while also demonstrating competence in slope stability analysis and design.	7.9,10
4	To Apply earth pressure theories to design effective retaining walls and bulkheads, incorporating reinforced soil structures into geotechnical solutions.	5,7
5	To Demonstrate proficiency in incorporating geosynthetics into soil engineering practices, utilizing them in the design and construction of reinforced structures, and applying ground improvement techniques effectively	5,8

SEMESTER – VIII									
Course Title	**Professional Elective V - Earthquake Engineering**								
Course code	**22BTCE422R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VIII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. This course explores the behavior of structures under seismic loads. 2. Students analyze SDOF and MDOF systems' response to vibration and earthquakes, study stiffness, damping, and lateral forces generated during seismic events. 3. They also learn ductile detailing for RC structures and earthquake-resistant design principles, essential for creating resilient structures in seismic regions.								
CO1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.								
CO2	Discuss the concept of stiffness and damping.								
CO3	Determine the lateral forces generated in the structure due to earthquake.								
CO4	Apply the concept of ductile detailing in RC structures.								
CO5	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction:** Scope of seismology; Interior of Earth, plate tectonics, faults, consequences of earthquake, Basic parameters of earthquake, magnitude & intensity, scales, Seismic zones of India, damages caused during past earthquakes (worldwide).	**5**	By the end of this unit, students will have a comprehensive understanding of seismology, including its scope and significance in studying the Earth's interior and tectonic activities. They will be able to explain the concept of plate tectonics, the nature and types of faults, and the consequences of earthquakes. Students will learn to distinguish between the basic parameters of earthquakes, such as magnitude and intensity, and understand the various scales used to measure them. Additionally, they will gain knowledge about the seismic zones in India and analyze the damages caused by past earthquakes worldwide, enhancing their ability to assess and mitigate earthquake-related risks.	1, 2
II	**Fundamentals of Earthquake Vibrations of buildings** Static load v/s Dynamic load (force control and displacement control), simplified single degree of freedom system, mathematical modelling of buildings, natural frequency, resonance v/s increased response, responses of buildings to different types of vibrations like free and forced, damped and un-damped vibration, response of building to earthquake ground motion, Response to multi degree (maximum three) of freedom systems up to mode shapes.	**10**	Upon completing the unit on Fundamentals of Earthquake Vibrations of Buildings, students will be able to understand and distinguish between static and dynamic loads, including force and displacement control mechanisms. They will gain proficiency in simplifying complex structures into single degree of freedom (SDOF) systems and mathematically modeling buildings to analyze their vibrational characteristics. Students will be able to determine natural frequencies and recognize the phenomena of resonance and increased response. They will learn to evaluate the responses of buildings to various types of vibrations, including free, forced, damped, and undamped vibrations. Additionally, they will be capable of analyzing the response of buildings to earthquake ground motions and understand the behavior of multi-degree (up to three degrees) of freedom systems, including determining mode shapes.	1, 2, 3, 4

III	**Design Philosophy:** Philosophy of earthquake resistant design, earthquake proof v/s earthquake resistant design, four virtues of earthquake resistant structures (strength, stiffness, ductility and configuration), seismic structural configuration, Introduction to IS: 1893 (Part I), IS: 875(Part V). Seismic load: **Seismic Coefficient Method** – base shear and its distribution along height. Introduction to Response spectrum, IS code provisions.	**5**	By the end of this unit, students will have a comprehensive understanding of the philosophy behind earthquake-resistant design, distinguishing it from earthquake-proof design. They will learn the critical attributes of earthquake-resistant structures, namely strength, stiffness, ductility, and configuration, and how these contribute to a building's resilience. The unit will cover the principles of seismic structural configuration and introduce key Indian Standards (IS: 1893 Part I and IS: 875 Part V) relevant to seismic design. Students will gain practical knowledge of calculating seismic loads using the Seismic Coefficient Method, including determining base shear and its vertical distribution. Additionally, they will be introduced to the concept of the response spectrum and the associated IS code provisions, equipping them with the necessary skills to design structures that can withstand seismic forces effectively.	1, 2, 3, 4, 5
IV	**Lateral Loads on Buildings:** **Lateral Load Distribution (SDOF):** Rigid diaphragm effect, centers of mass and stiffness, torsionally coupled and uncoupled system. **Lateral Load Analysis:** Analysis of frames using approximate methods like portal & cantilever methodsdrawing of small residential buildings.	**5**	By the end of this unit on "Lateral Loads on Buildings," students will be able to analyze the behavior of buildings under lateral loads. They will understand the principles of lateral load distribution in structures with rigid diaphragms, including the effects of centers of mass and stiffness. Students will be proficient in distinguishing between torsionally coupled and uncoupled systems and will be capable of conducting lateral load analysis of frames using approximate methods such as portal and cantilever methods. Additionally, they will be able to apply these concepts to draw preliminary designs for small residential buildings.	2, 3, 4
V	**Ductile Detailing:** Concepts of Detailing of various structural components as per IS: 13920 provisions.	**5**	By the end of this unit on Ductile Detailing, students will demonstrate a proficient understanding of detailing principles for structural components based on IS: 13920 specifications. They will be able to apply these concepts effectively to ensure ductile behavior and enhance the structural integrity of reinforced concrete elements. Students will be capable of interpreting and implementing the guidelines for detailing reinforcement in beams, columns, slabs, and other structural elements, thereby contributing to safer and more resilient structural designs in accordance with established standards.	2, 3, 4, 5

Text Books:

1. Manish Shrikhande & Pankaj Agrawal; Earthquake resistant design of structures, PHI Publication, New Delhi.

Reference Books:

1. A.K.Chopra; Dynamics of structures , Pearson, New Delhi
2. Clough & Penzin; Dynamics of structures
3. C V R Murthy - Earthquake Tips, NICEE

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.	1,2 & 4
2	Discuss the concept of stiffness and damping.	1,3
3	Determine the lateral forces generated in the structure due to earthquake.	7.9,10
4	Apply the concept of ductile detailing in RC structures.	5,6
5	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.	5,7

SEMESTER – VIII										
Course Title	**Railway and Airport Engineering**									
Course code	**22BTCE423R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ VIII semester of fourth year of the programme**									
Course Objectives (Minimum 3)	5. The course "Railway and Airport Engineering" aims to provide students with a comprehensive understanding of the design, construction, and maintenance of railway and airport infrastructure. 6. It focuses on equipping students with the technical skills and knowledge needed to address the challenges and innovations in transportation engineering.									
CO1	Describe different components of the rail track, their functions and its operation system with respect to construction and engineering applications.									
CO2	Identify different failures of rails and explain different wheel and axis arrangements.									
CO3	Design different geometric features of railway track									
CO4	Design different types of Railway Point and Crossing									
CO5	Explain essential features and requirements of different types of signaling and interlocking system.									

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	RAILWAY ENGINEEIRNG: General: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, Functions of various Components - Rails, Sleepers and Ballast, Rails - types of rails, rail sections, defects in rails, creep of rails, rail fixtures and fastenings, rail joints and welding of rails, sleepers – types, spacing and density, Ballast – types, advantages and disadvantages, Subgrade – Requirement, embankment.	**10**	By the end of this unit, students will demonstrate a comprehensive understanding of the development of railways in India, including the evolution of permanent way and railway track components. They will be able to explain the significance of different gauges used in India and the process of conning wheels. Students will identify and describe the functions and characteristics of key components such as rails, sleepers, and ballast, detailing their types, spacing, and densities. They will analyze the advantages and disadvantages of various types of ballast and understand the requirements for subgrade and embankment construction. Additionally, students will be able to identify common rail defects, understand rail creep, and explain the principles behind rail joints and welding techniques.	1, 2
II	Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. Track layouts, Switches, Tongue Rails, Crossings, Layout of Turnout – Double Turnout, Diamond crossing, Scissors crossing. Railway station and Yard: Railway traction and track resistance, stresses in railway track – rails, sleepers, ballast. Points and crossings – turnouts, switches, crossings. Track junctions – types, splits, diamond, gauntlet, scissor crossovers. Railway stations - requirements, facilities, classifications, platforms, loops, sidings. Railway yards – types, required equipment in yards. Signaling and control system – objectives, classification, Interlocking of signals and points.	**10**	Upon completing this unit on the geometric design of railway tracks, students will be able to analyze and design railway track layouts incorporating gradients, grade compensation, speed considerations for curves, and principles of super elevation to enhance safety and efficiency. They will understand the concepts of cant deficiency and negative super elevation, applying them appropriately to track design. Furthermore, students will gain proficiency in designing and implementing various track layouts including switches, crossings (such as diamond and scissors crossings), and turnouts (including double turnouts). They will comprehend the operational requirements and design considerations for railway stations and yards, including traction and track resistance, stress analysis on track components (rails, sleepers, ballast), and the equipment necessary in yards. Additionally, students will grasp the	1, 2, 3, 4

			fundamentals of signaling and control systems, their objectives, classifications, and the principles of interlocking signals and points to ensure safe railway operations.	
III	AIRPORT ENGINEERING: General: History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, airport classifications as per ICAO. Airport Planning: Regional planning-concepts and advantages, location and planning of airport as per ICAO and FAA. Airport Master plan, Airport site selection, Zoning laws, Airport Elements - airfield, terminal area, zoning laws, classification of obstructions, approach zone, turning zone, airport capacity, runway capacity, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	**10**	The learning outcome of the unit on air transport and airport planning encompasses a comprehensive understanding of the historical evolution, regulatory frameworks, and operational aspects of air transport systems worldwide. Students will gain knowledge of aircraft types and their characteristics, aerodrome classifications, and the roles of air transport authorities. They will develop proficiency in airport planning principles according to international standards (ICAO and FAA), covering regional planning concepts, airport master planning, site selection criteria, zoning laws, and the design and classification of airport elements such as airfields and terminals. Additionally, students will learn to assess airport and runway capacities, estimate future air traffic demands, and apply principles for developing new airports, culminating in the ability to conceptualize ideal airport layouts.	1, 2, 3, 4, 5
IV	Run Way Design: Wind rose and orientation of runway, wind coverage and crosswind component, factors affecting runway length, basic runway length and corrections to runway length, runway geometrics and runway patterns (configurations), Runway marking, threshold limits cross section of runway. Taxiway Design: Controlling factors, taxiway geometric elements, layout, exit taxiway, location and geometrics, holding apron, turnaround facility. Aprons - locations, size, gate positions, aircraft parking configurations and parking systems, hanger-site selection, planning and design considerations, Fuel storage area, blast pads. Wind direction indicator. LCN system of Pavement Design, Airfield Pavement – Failures, Maintenance and Rehabilitation	**10**	Upon completion of this unit on Airfield Design and Planning, students will be able to demonstrate comprehensive knowledge and skills in various critical aspects of airfield infrastructure. They will understand the principles of runway design, including the influence of wind orientation and coverage on runway orientation and length requirements, as well as factors affecting runway length determination and geometric configurations. Students will be proficient in designing taxiways, considering geometric elements, layout, and exit strategies, as well as planning apron locations, sizes, and configurations for efficient aircraft parking and turnaround operations. Additionally, they will grasp the essentials of pavement design using the LCN system, comprehend common airfield pavement failures, and formulate strategies for maintenance and rehabilitation. This unit will equip students with the necessary expertise to contribute effectively to the planning, design, and operational efficiency of airfield facilities.	2, 3, 4
V	Terminal Area: Elements and requirements, terminal building functions, space requirements, location planning concepts, vehicular parking area and circulation network, Grading and Drainage: Airport grading-importance, operations, airport drainage aims, functions, special characteristics, basic requirements, Deign of drainage - surface and subsurface drainage systems, Air Traffic Control and Visual Aids: Need of Air traffic control, Air traffic	**5**	By the end of this unit, learners will demonstrate a comprehensive understanding of terminal area planning and design within an airport context. They will be able to analyze and apply the fundamental elements and requirements of terminal buildings, including functional spaces and spatial requirements. Students will also grasp essential concepts in vehicular parking area design and circulation networks, incorporating considerations for efficient operations and user experience.	2, 3, 4, 5

	control network, Air traffic control aids - landing information system, airport markings and lighting.		Furthermore, they will comprehend the significance of airport grading and drainage systems, understanding their roles in ensuring operational safety and efficiency.	

Books:

1. A text book of railway engineering , By S.C.Saxena and M.G.Arora

2. Railway Engineering by Satish Chandra & MM Agrawal, Oxford University Press.

3. Transportation Engineering, Volume-II- Railways, Airports, Docks and Harbours, Bridges and Tunnels by C. venkatramaih, Universities Press

4. Air-port Engineering by S.K.Khanna and M.G.Arora

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe different components of the rail track, their functions and its operation system with respect to construction and engineering applications.	1,3 & 5
2	Identify different failures of rails and explain different wheel and axis arrangements.	1,4
3	Design different geometric features of railway track	7.9,10
4	Design different types of Railway Point and Crossing	5,8
5	Explain essential features and requirements of different types of signaling and interlocking system.	5,7

SEMESTER – VIII									
Course Title	**Economics for Engineers**								
Course code	**22BTCE424E**	**Total credits: 3** **Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**VII**								
Course Objectives (Minimum 3)	1. To understand the basics of Economics 2. To Apply the concepts of Economics in Engineering 3. To understand the Industrial Laws								
CO1	Understand the principles of economics								
CO2	Apply the concepts of Economics in Engineering problems								
CO3	Explain the rights to comprehend the working hour and over duty								
CO4	Illustrate the ways to mitigate the hurdles to Indian Economy								
CO5	Appraise the financial aspects of projects								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**
I	**Introductory Macroeconomics**: What is Macroeconomics, Basic concepts in macroeconomics: significance of economics, LPG meaning, demand and supply. Law of demand, law of supply. Difference of macroeconomics and microeconomics	**5**	Understand the principles of economics
II	**Economic Indexes**: Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross Domestic Product (GDP) and Net Domestic Product (NDP). Fixed, Variable, Marginal & Average Costs, Recurring and Nonrecurring Costs, Break Even Analysis, ROI, Payback period	**5**	Apply the concepts of Economics in Engineering problems
III	**Industrial Statistics**: Measures of central tendency, Relation between mean, median and mode, Measure of dispersion, moments, skewness, Kurtosis, Probability distribution, Binomial distribution, Poisson distribution, Test of hypothesis, Chi-square distribution, application of chi square test, ANOVA test, Level of confidence, Regression model, Simple linear regression analysis, coefficient of correlation, correlation coefficient, Mean absolute deviation (MAD), Mean squared error(MSE)	**10**	Explain the rights to comprehend the working hour and over duty
IV	**Industrial laws:** Laws related to Industrial Relations and Industrial Disputes: Industrial disputes act, 1947: definition and authorities, awards, settlement, strike lockouts, lay off, retrenchment and closure. **The Trade Union Act, 1926, Laws related to health, safety and welfare:** The Workmen's Compensation Act, 1923 Provisions, and Social Legislation: Employee State Insurance Act 1948: Definition, employees' provident fund. Miscellaneous Provision Act 1948: Schemes, Administration and determination of	**8**	Illustrate the ways to mitigate the hurdles to Indian Economy

	dues, Laws related to compensation management: The payment of Wages Act 1948: Objectives, Definition, and Authorised Deductions.		
V	**Challenges in Indian Economy:** Poverty- Main programmes for poverty alleviation, Human Capital Formation: How people become resource; Role of human capital in economic development; alternative farming - organic farming Employment: Growth and changes in work force participation rate in formal and informal sectors; Energy and Health: Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming.	**8**	Appraise the financial aspects of projects

TEXT BOOKS:

1 Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia

2 V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill

REFERENCE BOOKS:

1: M Chakravarty, Estimating, Costing Specifications & Valuation

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the principles of economics	1,3
2	Apply the concepts of Economics in Engineering problems	1,2
3	Explain the rights to comprehend the working hour and over duty	7,9
4	Illustrate the ways to mitigate the hurdles to Indian Economy	6,7
5	Appraise the financial aspects of projects	8.10

SEMESTER – VIII									
Course Title	**History of Science and Engineering**								
Course code	**22BTCE425E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**VIII**								
Course Objectives (Minimum 3)	1. Develop a culture of critical reflection, intellectual curiosity, tolerance of ambiguity, scholarly engagement, and learning together 2. Identify and understand tools to inquire into the history and philosophy of engineering education, and develop skills for using these tools 3. Make use of these tools to problematize different perspectives as well as synthesize perspectives to form arguments for both oneself and others about the nature of engineering, education, and engineering education								
CO1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period								
CO2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.								
CO3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.								
CO4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)								
CO5	It explores how science and technology have been used to make sense of the world, and to control it.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Historical Perspective: The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.	**5**	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	1,2
II	Science and Technology- The Beginning: Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine 2. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. 3. Development of Geography: Geography in Ancient Indian Literature	**5**	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	1,2
III	Developments in Science and Technology in Medieval India: 1. Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up. 2. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. 3. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.	**10**	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	1,2
IV	Developments in Science and Technology in Colonial India: 1. Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company‘s Service. 2. Indian Response to new Scientific Knowledge, Science and Technology in Modern India 3. Development of research organizations like	**8**	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	1,2

	CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.			
V	Prominent scientist of India since beginning and their achievement: 1. Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna 2. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali 3. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha and Dr. Vikram Sarabhai.	**8**	It explores how science and technology have been used to make sense of the world, and to control it.	1,2

TEXT BOOKS:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58

2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.

REFERENCE BOOKS:

1. Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Developlemnt, K., Nayudamma Memorial Science Foundation, Chennai – 8

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	1,3 & 4
2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	1,2
3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	7.9,10
4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	5,7
5	It explores how science and technology have been used to make sense of the world, and to control it.	5,8

MAPPING TABLE (8th Semester)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCE421E	Soil Mechanics-II	3	3	1	1	1		1					1
22BTCE422E	Earthquake Engineering	2	3	2	1	1	1	1					1
22BTCE423R	Railway and Airport Engineering	3	3	1	1	1		1					1
22BTCE424E	Economics for Engineers											2	1
22BTCE425E	History of Science and Engineering		1										2

Assam down town University

Curriculum and Syllabus

Bachelor of Technology
in
Civil Engineering - Construction Management

OUTCOME BASED EDUCATION FRAMEWORK
CHOICE BASED CREDIT SYSTEM
Version: 2.0

FACULTY OF ENGINEERING AND TECHNOLOGY

July, 2022

Preamble

Assam down town University is a premier higher educational institution which offers Bachelor, Master, and Ph.D. degree programmes across various faculties. These programmes, collectively embodies the vision and mission of the university. In keeping with the vision of evolutionary changes taking place in the educational landscape of the country, the university has restructured the course curriculum as per the guidelines of National Education Policy 2020. This document contains outline of teaching and learning framework and complete detailing of the courses. This document is a guidebook for the students to choose desired courses for completing the programme and to be eligible for the degree. This volume also includes the prescribed literature, study materials, texts, and reference books under different courses as guidance for the students to follow.

Recommended by the 13th Board of Studies (BoS) meeting of the Faculty of Engineering and Technology held on dated 17/06/2022 and approved by the Emergent Academic Council (AC) meeting held on dated 30/07/2022

Chairperson
Board of Studies

Assam down town University
Guwahati-26
Panikhaiti

Member Secretary
Academic Council

Vision

To become a Globally Recognized University from North Eastern Region of India, dedicated to the Holistic Development of Students and Making Society Better

Missions

1. Creation of curricula that address the local, regional, national, and international needs of graduates, providing them with diverse and well-rounded education.

2. Build a diverse student body from various socio-economic backgrounds, provide exceptional value-based education, and foster holistic personal development, strong academic careers, and confidence.

3. Achieve high placement success by offering students skill-based, innovative education and strong industry connections.

4. Become the premier destination of young people, desirous of becoming future professional leaders through multidisciplinary learning and serving society better.

5. Create a highly inspiring intellectual environment for exceptional learners, empowering them to aspire to join internationally acclaimed institutions and contribute to global efforts in addressing critical issues, such as sustainable development, Climate mitigation and fostering a conflict-free global society.

6. To be renowned for creating new knowledge through high quality interdisciplinary research for betterment of society.

7. Become a key hub for the growth and excellence of AdtU's stakeholders including educators, researchers and innovators

8. Adapt to the evolving needs and changing realities of our students and community by incorporating national and global perspectives, while ensuring our actions are in harmony with our foundational values and objectives of serving the community.

Programme Details

The professional practise of designing and developing infrastructure projects is known as civil engineering. This can be done on a large scale, such as the construction of national transportation systems or water supply networks, or on a smaller scale, such as the construction of individual roads or buildings**.**

I. Specific Features of the Curriculum

The Program Specific Outcomes (PSOs) for Civil Engineering in Construction Management graduates focus on three main areas. First, graduates should excel in research and reasoning, capable of identifying, formulating, reviewing literature, and analysing complex Civil Engineering in Construction Management problems using logical and critical thinking and scientific principles. Second, they should demonstrate techno-professional efficiency by applying multidisciplinary concepts and interdisciplinary approaches to serve mankind. Lastly, graduates should exhibit global competency by addressing interdisciplinary Civil Engineering in Construction Management issues and enhancing their expertise through international certification courses.

II. Eligibility Criteria: Minimum 45% in 10+2 with Physics, Chemistry & Mathematics. 5% relaxation for SC/ST, EWS, and Especially able candidates.

III. Program Educational Objectives (PEOs):

PEO-1: To understand and incorporate the ability to apply, update, extend, and build deep knowledge through a flexible, research-intensive programme tailored to suit current academic and industry demands.

PEO-2: Establish professional integrity and an ethical attitude while being aware of global and national competencies, and consider the social implications of their job, particularly its impact on safety, health, and the environment for long-term growth.

PEO-3: Participate in individual and team-oriented, open-ended activities promoting productive thinking to provide opportunities for students to manage and work on multidisciplinary projects through interaction with their peers in the industry

IV. Program Specific Outcomes (PSOs):

PSO1: Research and Reasoning: Identify, formulate, review literature, and analyze complex Civil Engineering in Construction Management problems reaching substantial conclusions using logical and critical thinking, and scientific principles.

PSO2: Techno-Professional Efficiency: Apply the understanding of multidisciplinary concepts of Civil Engineering in Construction Management with interdisciplinary approaches in the service of mankind.

PSO3: Global Competency: Demonstrate global competency in addressing interdisciplinary Civil Engineering in Construction Management issues through international certification courses.

V. Program Outcome:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VI. Total Credits to be Earned:185

VII. Career Prospects:

When it comes to graduate programmes in India, Civil Engineering in Construction Management remains at the top of the list because of its flexibility and capacity to adapt to changing requirements, as well as providing students with the required information and skills for a successful career.

Some of the opportunities for Civil Engineering in Construction Management graduates are:

- Construction manager
- Geotechnical engineer
- Environmental engineer
- Public Health engineer
- Transportation engineer
- Urban planning engineer.

EVALUATION METHODS

The student performance shall be evaluated through In-semester (Sessional) and semester-end examinations. A weightage of 40% or as prescribed by the programme shall be added to the score of the end-semester examination.

1. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting in-semester (Sessional) examination and evaluating the performance of the students pursuing that course. The components for internal assessment are illustrated in the table given below.

SN	Components/ Examinations	Marks Allotted
1.	In-Sem Exam – I (ISE-I) (Written Examination) *	30
2.	In-Sem Exam – II (ISE-II) (Written Examination) *	30
3.	Assignment	10
4.	Presentation (SP)	10
5.	Quiz	5
6.	Class Performance based score*	5

are compulsory

Note: *Total Internal assessment should be out of 40*

INSTRUCTION

1. If a student fails to appear in the any of the component without any valid reason, he/she shall be marked zero in that component. However, the course teacher at his discretion may arrange for the missed test on an alternate date for the absentee students after determining ground with genuine/valid reasons for the absent.

2. The report of evaluation of an activity towards the in-semester (Sessional) component of a course shall be duly notified by the concerned course teacher within a week of completion.

3. The program coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the program to the Controller of Examinations before the start of the End-semester examination.

2. SEMESTER END EXAMINATION:

Time table for end semester examination is published at least 25 days prior to the start of Examination.

I. Pre-Examination:

Eligibility Criteria for a student to appear in University Examinations:

The student shall only be allowed to appear in a University Examination, if:

i) He/ She is a registered student of the University;

ii) He/ She is of good conduct and character;

iii) He/ She has completed the prescribed Programme of study with minimum percentage of attendance as laid down in the Regulations of the Programme concerned.

Under special cases, a student may be allowed to appear for an examination without being registered in the University but the result of the said student will be kept on hold till the registration of the concerned student is completed.

II. Admit Card:

Admit card for the examination may be downloaded through ERP where the system will generate a Unique ID Cards through online.

The University shall have the right to cancel admission for examination of any candidate on valid grounds.

III. Pattern of Question Papers:

The question paper shall follow the principles of Bloom's Taxonomy.

Table

S. N.	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when, where, etc.
2	Understand	Describe, explain, contrast, summarize, differentiate, discuss, etc.
3	Apply	Predict, apply, solve, illustrate, determine, examine, modify
4	Analyze	Classify, outline, categorize, analyze, diagrams, illustrate, infer, etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare etc.
6	Create	Design, Formulate, Modify, Develop, integrate, etc.

Note: No course is to be evaluated on basis of **all 6 knowledge levels.**

The format of the question paper across all the program follows a unique pattern and the total marks is 60

Table 1: Question paper pattern for End semester examination

Sl no	Question pattern	Total marks
1	MCQs (10 Questions)	10
2	2 Marks questions (10 Questions)	20
3	4 Marks questions (5 Questions)	20
4	10 Marks questions (1 Question)	10

IV. Examination Duration:

Each paper of 60 marks shall ordinarily be of two hours duration.

V. Practical Examinations, Viva-Voce etc.:

i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.

ii) Viva-Voce, Oral examinations of the Project report, Dissertation etc. shall be undertaken by a Board of Examiners constituted by the respective Dean of Program with the advice of Supervisor(s).

VI. Procedure of Expulsion:

If any candidate is found to be using any unfair-means during the examination, the invigilator may cease his/her answer sheet and report it directly to the Officer-in-Charge. The Office-in-Charge of the center may take appropriate decisions as per the rules and procedure of the examination. The Officer-in-Charge may allow the students to write the exam with new answer sheet or may expel the student from appearing the paper depending on the nature of unfair-means. In case of Computer based test, the students may be directed to write an apology letter and sign in the prescribe expulsion form. The student may not be allowed to write that examination.

VII. Instruction to the Students:

(i) The students shall not bring to the Examination Hall, any electronic gadget used as a means of communication or record except electronic calculator, if required.

(ii) The students shall not receive any book or printed or hand written or photo copy (Xerox) or blank-paper from any other person while he/she is in the examination-room or in laboratory or in any other place to which he/she is allowed to have access during course of examination.

(iii) The students shall not communicate with any other candidate in the examination room or with any other person in and outside the examination-room.

(iv) The students shall not see, read or copy anything written by any other candidate, nor shall he/she knowingly or negligently permit any other candidate to see, read or copy anything written by him/her or conveyed by him/her.

(v) The students shall not write anything on the Question Paper or in other paper or materials during the examination, or pass any kind of paper to any other candidate in the examination-room, or to any person outside the room.

(vi) The students shall not disclose his/her identity to the examiner by writing his/her name or putting any sign / symbol in any part of his answer-script.

(vii) The students shall not use any abusive language or write any objectionable remark or make any appeal to examiner by writing in any part of his answer-script.

(viii) The students shall not detach any page from the answer-script or insert any authorized or unauthorized loose sheet into it. He /she shall also not insert any other answer-script / loose sheet by removing the pins of the origin answer-scripts and re-fixing it.

(ix) The students shall not resort to any disorderly conduct inside the examination-room or misbehave with the invigilator or any other examination official.

VIII. Provision for an Amanuensis (writer):

(i) A candidate may be provided with an Amanuensis (writer) to write down on dictation on his / her behalf on ground of his / her physical disability to write down by himself / herself due to accident or any other reason. The amanuensis may be provided till he / she recovers from the physical disability. The physical disability to write down by himself / herself must be supported by Medical Certificate from a competent Medical Officer.

(ii) The qualifications of the amanuensis so provided must not be equal or higher than that of the candidate. This is also to be supported by Certificate from the Faculty of Study where the Amanuensis is provided.

(iii) Such candidates are to be accommodated in a separate room under the supervision of an invigilator so that the fellow candidates are not disturbed in the process.

3. Credit Point:

It is the product of grade point and number of credits for a course, thus, CP = GP x CR

i. Credit:

A unit by which the course work is measured. It determines the number of hours of instructions required per week. 'Credit' refers to the weightage given to a course, usually in terms of the number of instructional hours per week assigned to it. Credits assigned for a single course always pay attention to how many hours it would take for an average learner to complete a single course successfully.

ii. Grade Point:

Grade Point is a numerical weight allotted to each Grade Letter on a 10-point scale.

iii. Letter Grade:

Letter Grade is an index of the performance of students in a said paper of a particular course. Grades are denoted by letters O, A+, A, B+, B, C, P, F and Abs. Student obtaining Grade F / Grade Abs shall be considered failed/ absent and, will be required to appear in the subsequent ESE. The UGC recommends a 10-point grading system with the following (Table: 1) Letter Grades:

(i) A Letter Grade shall signify the level of qualitative/quantitative academic achievement of a student in a Course, while the Grade Point shall indicate the numerical weight of the Letter Grade on a 10-point scale.

(ii) There shall be 08 (eight) Letter Grades bearing specific Grade Points as listed in Table 1, where the Letter Grades ‘O’ to ‘P’ shall indicate successful completion of a course.

(iii) Apart from the 08 (eight) regular Letter Grades listed in Table 1, there shall be 03 (three) additional Letter Grades, which shall be awarded if a Course is withdrawn or spanned over the next Semester or remains incomplete as stated in Table 2.

Table 2: Letter Grades and Grade Points

Letter Grade	Grade Points	Description
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	4	Pass
F	0	Fail
Abs	0	Absent
UFM	0	Unfair Means

iv. Grade Point Average:

a. SGPA (Semester Grade Point Average)

The SGPA of a student in a Semester shall be the weighted average of the Grade Points secured by the student in all the Credit Courses (both Core and Elective Courses) he/she registered in that Semester, irrespective of whether he/she could or could not complete the Courses. More specifically, the calculation of SGPA shall take into account the Courses graded with Letter Grades 'O' to 'F' as given in Table 1.

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad (1.1)$$

The SGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.1) up to two decimal places, where n is the total number of Credit Courses registered by the student in that Semester, Gi is the Grade Point secured in the i^{th} registered Course and Ci is the Credit (weight) of that Course.

b. CGPA (Cumulative Grade Point Average)

(i) The CGPA of a student in a Semester of a Programme shall be the accumulated weighted average of the Grade Points secured by the student in all the Credit

Courses (both Core and Elective Courses) he/she registered and successfully completed so far starting from the enrollment in the Programme. In other words, taking into account all the Courses graded with 'O' to 'P' as given in Table 1.1, generally the CGPA of a student shall be calculated starting from the first Semester of his/her enrolled Programme, while the CGPA of a lateral-entry student shall be calculated starting from the Semester of his/her enrollment.

(ii) The CGPA of a student in a Semester shall be calculated on a 10-point scale using Equation (1.2) up to two decimal places, where N is the total number of Credit Courses registered and successfully completed so far by the student, Gi is the Grade Point secured in the ith completed Course and Ci is the Credit (weight)of that Course.

$$\text{CGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \qquad (1.2)$$

(iii) The CGPA shall be convertible into equivalent percentage of marks using Equation Conversion of CGPA to percentage marks: = CGPA*10

4. Post-Examination

i. Transcript or Grade Card or Certificate:

A marking certificate shall be issued to all the registered students after every Semester. The Semester mark sheet will display the course details (code, title, number of credits, grade secured) along with total credit earned in that Semester.

ii. Grievance Readdress Mechanism:

Students with any dissatisfaction or grievance regarding the marks awarded in any of the Papers / Courses may appeal to the Controller of Examinations for remedial action such as Re-evaluation within 10 days of the declaration of result.

(i) A student has options to appeal for re-evaluation of his /her answer script to the Controller of Examination.

(ii) Application for re-evaluation / re-scrutiny of answer scripts shall be made in the definite proforma available with the Examination Office through the head of the respective departments within 10 days of declaration of the results of the respective examinations.

(iii) The Controller of Examination may appoint an examiner for re-evaluation and will consider and recognize the evaluation done by a university appointed examiner.

(iv) There shall be no provision for re-evaluation of the Practical Papers, Project Work, and Dissertation etc. However, the students fail in practical examination or viva voce and wish to appear again may apply to be evaluated can do so with the next schedule.

(v) After screening the application for re-evaluation, the CoE may send the answer scripts of the student to the examiners appointed by the CoE with the approval of Vice Chancellor.

(vi) The marks/grades achieved by the students after the re-evaluation shall be final and binding.

(vii) Fresh Marks – sheets / Grade Card shall be issued only if the candidate secures pass marks / passing grade in the re-evaluated paper.

(viii) Revaluation of answer scripts shall be deemed to be an additional facility provided to the students with a view to improving upon their results at the preceding examination result for any reason whatsoever shall not confer any right upon them for admission to next higher class which matters always be regulated in accordance with the relevant rules or regulations framed by the University.

(ix) If as a result of revaluation of the candidate attracts the provision of condonation of deficiency, the same may be applied to his/her only for fresh attempt.

INSTRUCTION TO TEACHERS AND STUDENTS

(Teaching and Learning Methods)

In all the courses the teacher has to select topics for teacher-method which should not be less than 20 percent. The approach will be direct classroom teaching through a series of lectures delivering concepts using ITC facilities, white or blackboard. Notes may also be circulated to the students; however, the students are to be involved in the preparation of the notes. The teacher will be responsible for selecting the best note for circulation. The teacher-centric methodology has recently fallen out of favour because this strategy for teaching is seen to favour passive students.

1. Student- centric / Constructivist Approach:

The topics of the courses may be selected at the start of the class and assigned one topic to each of the students for studying by themselves, prepare presentations, notes, etc., and present at respective class time after consultation and discussion with the course teachers. The teacher facilitates the learning of the students by guiding and providing input and explaining concepts. 60 percent of the course contents may be selected for this purpose. To avoid behaviour problems, teachers must lay a lot of groundwork in student-centric classrooms. Typically, it involves instilling a sense of responsibility in students. In addition, students must learn internal motivation.

a. Project-Based Learning: The teacher may select 5 percent of topics for the purpose and may conduct visits to the laboratory for experiments or field surveys. The selection of the topic may be done considering the available facility for the purpose. However, in the final semester of each of the programme the student has to undergo project-based learning at least 4 months duration. This approach will help the student to think critically, evaluate, analyse, make decisions, collaborate and more.

b. Inquiry-Based Learning: The teacher/students are supposed to list at least five questions in each contact hour and student solve these question or search for answer which becomes the home work for the students "question-driven" learning approach. The teacher may look for the correctness of the solution or the best possible answer and discuss in the successive class. This will help in the preparation for various competitive examinations and develop a habit for search for solutions.

c. Flipped Classroom: About 10 percent of the course content has to be completed by this method. In this approach the students are asked to watch video or lecture prepared by the teacher or any video available (relevant to the course). A set of questions may be given to the students for searching answers by the students. The idea is that students should have more time in-classroom focusing on achieving these higher levels of thinking and learning. The Flipped classroom is also an acronym. The letters FLIP represent the four pillars included in this type of learning: Flexible environment, Learning culture shift, Intentional content, and Professional educator. As you can see, the second pillar refers to a culture shift from the traditional approach where students are more passive to an approach where students are active participants. As a result, this approach is also a student-centric teaching method.

d. Cooperative Learning: The remaining five percent has to be completed by cooperative learning approach. In this approach, the students are allotted problems. During library hours the students along with the teacher visit the library and search for probable solutions for the assigned problem. The same has to be done in groups so that the students discuss among themselves for the appropriate answers. Essentially, cooperative learning believes that social interactions can improve learning. In addition, the approach recreates real-world work situations in which collaboration and cooperation are required.

The percentage categorization for the completion of a theory course

Teacher-centric or Direct Classroom Teaching: Delivery by series of lectures	20%
Student-centric Approach, Students present and deliver lectures in the presence of teacher and supervised by teacher	60%
Students visit fields or perform experiments or teachers perform demonstration	05%
Flipped Classroom approach	10%
Cooperative learning approach	05%

Inquiry-based approach has to be followed in all of the classes

Teacher has to distribute the topics to be considered for teaching by the above-mentioned approaches and prepare a lesson plan for execution and maintain a file.

Curriculum Framework: Breakdown of Credits (for 2022-23 Syllabus)

Sl. No	Category	Total number of Credits
1	University Core (UC)	47
2	University Elective (UE)	21
3	Program Core (PC)	68
4	Program Elective (PE)	42
5	Faculty Elective (FE)	07
Total number of credits		**185**

Breakdown by category of courses (for 2022-23 Syllabus)

Sl. No	Category	Credits	Percentage %
1	Engineering	150	81.08%
2	Science	22	11.98%
3	Computer Technology	4	2.1%
4	Humanities	8	4.3%
5	Commerce and Management	1	0.54%
Total number of credits		**185**	**100%**

SEMESTER WISE COURSE DISTRIBUTION

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester I	1	22BTCM111R	Engineering Mathematics I	UC	3	1	0	0	0	0	4	40	60	0	100
	2	22BTCM112R	Introduction to Basic Mathematics, Logic and Coding	UC	2	1	2	0	0	0	4	40	60	100	200
	3	22BTCM113R	Engineering Physics	UC	2	1	2	0	0	0	4	40	60	100	200
	4	22BTCM114R	Basic Electrical Engineering	PE	2	1	2	0	0	0	4	40	60	100	200
	5	22BTCM115R	Workshop/Manufacturing Practices	PE	1	0	4	0	0	0	3	40	60	100	200
	6	22UBPD114R	Introductory English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	7	22UBEC111	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	Total				10	4	14	4	0	0	22	200	300	600	1100

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester II	1	22BTCM121R	Engineering Mathematics II	UC	3	1	0	0	0	0	4	40	60	0	100
	2	22BTCM122R	Engineering Chemistry	UC	2	1	2	0	0	0	4	40	60	100	200
	3	22BTCM123R	Programming for Problem Solving	PE	3	0	2	0	0	0	4	40	60	100	200
	4	22BTCM124R	Engineering Graphics and Design	PC	1	0	4	0	0	0	3	40	60	100	200
	5	22UBPD12R	Effective English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	6	MOOCSCECE1	MOOCS I	FE	0	0	0	0	0	0	2	0	0	100	100
	7	22UBCC121	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	8	22UBEC121	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22BTCM125R	Techno-Professional Skills I	PC	0	0	2	0	0	0	1	0	0	100	100
	10	22UUHV102R	Universal Human Values (UHV) + Professional Ethics	UC	1	0	2	0	0	0	2	40	60	100	200
	11	22UUDL103R	Computational Systems and Digital World	UC	0	0	2	0	0	0	1	0	0	100	100
	Total				10	2	18	8	0	0	25	200	300	1000	1500

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester III	1	22BTCM211R	Engineering Mechanics	PC	2	1	0	0	0	0	3	40	60	0	100
	2	22BTCM212R	Engineering Geology	PC	1	0	2	0	0	0	2	40	60	100	200
	3	22BTCM213R	Biology for Engineers	FC	2	1	0	0	0	0	3	40	60	0	100
	4	22BTCM214R	Computer Aided Design (CAD)	PC	0	0	4	0	0	0	2	0	0	100	100
	5	22BTCM215R	Introduction to Civil Engineering	PC	2	0	0	0	0	0	2	40	60	0	100
	6	22BTCM216R	PDE and transform mathematics	PC	2	1	0	0	0	0	3	40	60	0	100
	7	22BTCM217R	Techno-Professional Skills II	PC	0	0	2	0	0	0	1	0	0	100	100
	8	22BTCM218R	Material Testing and Evaluation	PC	1	1	2	0	0	0	3	40	60	100	200
	9	22UBPD213R	English for Employabilityfor Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	10	22UBCC211	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	11	22UBEC211	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	12	22UULS212R	Basic Life Saving Skills	UC	0	0	2	0	0	0	1	0	0	100	100
	13	22UUFL213R	Personal Financial Planning	UC	0	0	2	0	0	0	1	0	0	100	100
	14	22MOCE211R	MOOCS II	FE	0	0	0	0	0	0	2	0	0	0	100
	Total				10	4	18	8	0	0	27	240	360	900	1600

	S. N.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester IV	1	22BTCM221R	Solid Mechanics	PC	3	0	0	0	0	0	3	40	60	0	100
	2	22BTCM222R	Introduction to Fluid mechanics	PC	2	0	2	0	0	0	4	40	60	100	200
	3	22BTCM223R	Surveying and Geomatics	PC	3	0	2	0	0	0	4	40	60	100	200
	4	22BTCM224R	Geotechnical Engineering	PC	3	0	2	0	0	0	4	40	60	100	200
	5	22BTCM225R	Basic Electronics for Civil Engineering Application	PC	2	0	2	0	0	0	3	40	60	100	200
	6	22BTCM226R	Environmental Science	UC	2	0	0	0	0	0	2	40	60	0	100
	7	22UBPD223R	English Language Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	8	22UBCC221	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22UBEC221	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22BTCM227R	Techno-Professional Skills III	PC	0	0	2	0	0	0	1	0	0	100	100
	12	22MOCE221R	MOOCS III	FE	0	0	0	0	0	0	1	0	0	100	100
	14	22UULS221R	Basic Acclimatizing Skills (BAS)	UC	0	0	2	0	0	0	1	0	0	100	100
	Total				15	0	16	8	0	0	27	240	360	1100	1600

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester V	1	22BTCM311R	Environmental Engineering	PC	2	0	2	0	0	0	3	40	60	100	200
	2	22BTCM312R	Mechanics of Materials	PC	3	0	0	0	0	0	3	40	60	0	100
	3	22BTCM313R	Construction Engineering & Management	PC	2	1	0	0	0	0	3	40	60	0	100
	4	22BTCM314R	Transportation Engineering	PC	2	0	2	0	0	0	3	40	60	100	200
	5	22BTCM315R	Hydrology and Water Resource Engineering	PC	2	1	0	0	0	0	3	40	60	0	100
	6	22BTCM316R	Construction Engineering& Management	PC	3	0	0	0	0	0	3	40	60	0	100
	7	22BTCM317R	Hydraulics Engineering	PC	2	0	0	0	0	0	2	40	60	0	100
	8	22UBPD314R	Competent English for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	9	22UBCC311	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22UBEC311	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	11	22BTCM317R	Techno-Professional Skills IV	PC	0	0	2	0	0	0	1	0	0	100	100
		MOOCSCECE4	MOOCS IV	FE	0	0	0	0	0	0	1	0	0	0	100
	Total				16	2	10	8	0	0	26	280	420	600	1400

	S. No.	Course Code	Course Title	Course Category	Engagement							Maximum Marks for			
					L	T	P	S	R	O	C	IA*	SEE*	PE*	Total
Semester VI	1	22BTCM321R	Design of RC Structure	PC	2	1	0	0	0	0	3	40	60	0	100
	2	22BTCM322R	Estimation and Costing	PC	2	0	2	0	0	0	3	40	60	100	200
	3	22BTCM323R	Structural Engineering	PC	3	0	0	0	0	0	3	40	60	0	100
	4	22BTCM324R	Professional Elective I	PE	3	0	0	0	0	0	3	40	60	0	100
	5	22BTCM326R	Professional Elective II	PE	3	0	0	0	0	0	3	40	60	0	100
		22BTCM328R	Professional Elective III	PE	3	0	0	0	0	0	3	40	60	0	100
	6	22OE321	Generic (Open) Elective I	UE	2	0	0	0	0	0	2	40	60	0	100
	7	22UBPD324R	Corporate Proficiency for Engineers	UE	0	0	4	0	0	0	2	0	0	100	100
	8	22UBCC321	Co-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	9	22UBEC321	Extra-curricular	UC	0	0	0	4	0	0	1	0	0	100	100
	10	22BTCM323R	Techno-Professional Skills V	PC	0	0	2	0	0	0	1	0	0	100	100
	11	MOOCSCECE5	MOOCS V	FE	0	0	0	0	0	0	1	0	0	100	100
	Total				15	1	8	8	0	0	26	240	360	600	1200

	S. N.	Course Code	Course Title	Course Category	Engagement						C	Maximum Marks for			
					L	T	P	S	R	O		IA*	SEE*	PE*	Total
Semester VII	1	22BTCM411R	Construction Safety and Risk Management	PC	2	0	0	0	0	0	2	40	60	0	100
	2	22BTCM415R	Professional Elective IV	PE	3	0	0	0	3	3	3	40	60	0	100
	3	22BTCM414E	Generic Elective II	UE	3	0	0	0	3	3	3	40	60	0	100
	4	22BTCM412R	Project I	PC	0	0	12	0	6	6	6	0	0	100	100
	5	22BTCM413R	Industrial Mock Viva	PC	0	0	0	0	0	0	0	0	0	100	100
	6	22BTCM414R	Techno-Professional Skills VI	PC	0	0	2	0	1	1	1	0	0	100	100
	7	22UBCC411	Co-curricular	UC	0	0	0	4	1	1	1	0	0	100	100
	Total				8	0	14	4	14	14	16	120	180	400	700

	S. N.	Course Code	Course Title	Course Category	Engagement						C	Maximum Marks for			
					L	T	P	S	R	O		IA*	SEE*	PE*	Total
Semester VIII	1.	22BTCM423R	Railway and Airport Engineering	PC	3	0	0	0	0	0	3	40	60	0	100
	2	22BTCM421E	Professional Elective V	PE	3	0	0	0	0	0	3	40	60	0	100
		22BTCM424E	Generic Elective III	UE	2	0	0	0	0	0	2	40	60	100	200
		22BTCM425E	Generic Elective IV	UE	2	0	0	0	0	0	2	40	60	100	200
	4	Project II	22BTCM422R	PC	0	0	12	0	0	0	6	0	0	100	100
	Total				10	0	12	0	0	0	16	160	240	300	700

Professional Elective-I		
Sl. No	**Subject Name**	**Code**
1	Pavement Materials	PEC-CEEL101
2	Railway Engineering	PEC-CEEL102
3	Traffic Engineering and Management	PEC-CEEL103
4	Geometric Design of Highways	PEC-CEEL104
Professional Elective-II		
1	Construction Project Management	PEC-CEEL201
2	Building Construction Practice	PEC-CEEL204
Open Elective-I		
Sl. No	**Subject Name**	**Code**
1	Positive Psychology	OEEL101

Professional Elective-III		
Sl. No	**Subject Name**	**Code**
1	Water Quality Engineering	PEC-CEEL501
2	Surface Hydrology	PEC-CEEL502
3	Solid and Hazardous Waste Management	PEC-CEEL503
Professional Elective-IV		
1	Engineering Risk and Uncertainty	PEC-CEEL601
2	Concrete Technology	PEC-CEEL602
Open Elective II		
1	Introduction to Nanotechnology	OEEL201

Professional Elective-V		
Sl. No	**Subject Name**	**Code**
1	Foundation Engineering	PEC-CEEL701
2	Soil Mechanics-I	PEC-CEEL702
Open Elective-III		
Sl. No	**Subject Name**	**Code**
1	Economics for Engineers	OEEL301
Open Elective-IV		
Sl. No	**Subject Name**	**Code**
2	History of Science and Engineering	OEEL401

SEMESTER – I									
Course Title	**Engineering Mathematics I**								
Course code	**22BTCM111R**	**Total credits: 4** **Total hours: 60T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To make understand to evaluate definite and improper integrals. Apart from these some special functions like Beta and Gamma function must be introduced. 2. To provide the application of differential and integral calculus. 3. To make understand the convergence and divergence of sequence and series								
CO1	Enabling solving skills of definite and improper integrals.								
CO2	Understand the concept of calculus and linear algebra.								
CO3	Understand the application of differential and integral calculus.								
CO4	Evaluate functions of multiple variables, apply theorems of vector calculus, and solve optimization problems using Lagrange multipliers.								
CO5	Analyze complex functions, perform complex integration, and apply convergence tests and series representations.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit 1:**Techniques of integration: Integration by parts, trigonometric integrals, and hyperbolic functions; Application of integration to solve differential equations: Separable and exact equations; Improper integrals and their convergence criteria; Numerical methods for integration: Trapezoidal rule, Simpson's rule, and Romberg integration; Applications of integration in physics and engineering: Center of mass, moments of inertia, and fluid pressure.	**5**	Upon completing this unit, students will be proficient in various techniques of integration, including integration by parts, trigonometric integrals, and hyperbolic functions. They will learn to apply integration methods to solve separable and exact differential equations, understand and evaluate improper integrals, and determine their convergence criteria. Additionally, students will acquire skills in numerical integration techniques such as the trapezoidal rule, Simpson's rule, and Romberg integration. The unit also equips students to apply integration in practical physics and engineering problems, such as calculating the center of mass, moments of inertia, and fluid pressure.	1, 2
II	**UNIT 2:** Unit 2. Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.	**10**	Students will gain a thorough understanding of fundamental theorems in calculus, including Rolle's Theorem and the Mean Value Theorem, as well as Taylor’s and Maclaurin theorems with remainders.	1, 2, 3, 4

			They will learn to handle indeterminate forms using L'Hospital's rule and develop the ability to find the maxima and minima of functions. This unit strengthens the students' grasp of the theoretical underpinnings of calculus and enhances their problem-solving skills in optimization.	
III	**UNIT 3:** Complex numbers and functions: Analyticity and Cauchy-Riemann equations; Complex integration: Cauchy's theorem and Cauchy's integral formula; Power series and Laurent series; Classification of singularities: Poles and essential singularities; Residue theorem and applications to evaluating complex integrals; Convergence tests for series: Ratio test, root test, and comparison test; Representation of functions using series: Taylor and Laurent series	**5**	In this unit, students will explore the realm of complex numbers and functions, focusing on concepts such as analyticity and the Cauchy-Riemann equations. They will delve into complex integration through Cauchy's theorem and Cauchy's integral formula. The unit covers power series and Laurent series, classification of singularities, and the residue theorem, providing students with the tools to evaluate complex integrals. Furthermore, students will learn various convergence tests for series and how to represent functions using Taylor and Laurent series, equipping them with a solid foundation in complex analysis.	1, 2, 3, 4, 5
IV	**UNIT 4:** Limit, continuity, and partial derivatives; directional derivatives, total derivative, tangent plane and normal line, Maxima, minima, and saddle points, Method of Lagrange multipliers, Gradient, curl, and divergence, Multiple integrals and their applications (double and triple integrals), Line integrals and surface integrals, Green's theorem, Stokes' theorem, and the Divergence theorem	**5**	Students will become adept at handling functions of multiple variables, learning about limits, continuity, and partial derivatives. They will understand directional derivatives, total derivatives, and the geometric interpretations of the tangent plane and normal line. The unit covers methods for finding maxima, minima, and saddle points, and introduces the method of Lagrange multipliers for constrained optimization. Students will also study vector calculus concepts, including the gradient, curl, and divergence, and apply multiple integrals in various contexts. The unit concludes with an exploration of line and surface integrals, and key theorems such as Green's, Stokes', and the Divergence theorem.	2, 3, 4
V	**UNIT 5:** Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of	**5**	This unit equips students with a comprehensive understanding of linear algebra concepts, focusing on the inverse and rank of a matrix, and the rank-nullity theorem. Students will learn to solve systems of linear	2, 3, 4, 5

	matrices; Cayley-Hamilton Theorem, and Orthogonal transformation		equations and explore properties of symmetric, skew-symmetric, and orthogonal matrices. The unit covers determinants, eigenvalues, and eigenvectors, and teaches students how to diagonalize matrices and apply the Cayley-Hamilton theorem. Additionally, students will learn about orthogonal transformations, gaining skills crucial for various applications in mathematics and related fields.	

TEXT BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Enabling solving skills of definite and improper integrals.	1,2
2	Understand the concept of calculus and linear algebra.	3,5
3	Understand the application of differential and integral calculus.	6,9,10
4	Evaluate functions of multiple variables, apply theorems of vector calculus, and solve optimization problems using Lagrange multipliers.	5,9
5	Analyze complex functions, perform complex integration, and apply convergence tests and series representations.	4,1,11

SEMESTER – I									
Course Title	**Introduction to Basic Mathematics, Logic and Coding**								
Course code	**22BTCM112R**	**Total credits: 4** **Total hours: 60T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	. 1. To understand and be able to use the language, symbols and notation of mathematics 2. To develop the ability to create a programmable model for a given problem. 3. To become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations								
CO1	1. The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding								
CO2	2. Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.								
CO3	3. Solve and devise solutions to a range of elementary real-world problems in mathematics and programming								
CO4	4. Explore and apply key concepts in logical thinking to business problems.								
CO5	5. Enable students to critically analyze information in order to evaluate evidence and construct reasoned arguments								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basics of Set Theory and Functions:** **Sets**: Basic definitions, cardinality of a set, principle of exclusion and inclusion, combination of sets: union, intersection, difference, complement etc., De Morgan laws, Venn Diagram **Cartesian Products and Relations:** Basic Definitions, binary relations – composition and inverse, binary relation on a set : properties – reflexive, irreflexive, symmetric, anti-symmetric, transitive, equivalence relations, partial order relations **Functions:** Basic definition, domain and co-domain, image and range, identity function, one-to-one and onto functions, bijections, characteristic function, composition of functions, inverse of a function, operations on sets: unary operators – idempotence, binary operators – associativity, commutativity **Number systems:** Natural numbers, whole numbers, integers, rational numbers, real numbers, operations on numbers: addition, subtraction, multiplication and division	**5**	Students will gain a fundamental understanding of set theory, including basic definitions, cardinality, and operations on sets such as union, intersection, difference, and complement. They will learn the principle of exclusion and inclusion, De Morgan's laws, and how to represent sets using Venn diagrams. The unit covers Cartesian products, basic definitions of relations, and properties of binary relations including reflexivity, irreflexivity, symmetry, antisymmetry, transitivity, equivalence relations, and partial order relations. Additionally, students will explore the basics of functions, including domain, codomain, image, range, identity function, injective, surjective, and bijective functions, characteristic functions, composition and inverse of functions, and operations on sets involving unary and binary operators.	1, 2

II	**Introduction to Mathematical Logic and Induction:** **Mathematical Logic:** Truth values of mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables **Propositional Logic:** Constants, variables, assignment of variables in a formula, tautology, contradiction and satisfiability, truth table of a formula, equivalence of formulas, proving formulas and equivalences by truth table method **Mathematical Induction:** Principle of mathematical induction – induction basis and induction step, examples	**10**	This unit introduces students to various number systems such as natural numbers, whole numbers, integers, rational numbers, and real numbers, along with their basic operations: addition, subtraction, multiplication, and division. In the realm of mathematical logic, students will learn about truth values, logical operators (AND, OR, NOT), De Morgan's laws, and how to construct and interpret truth tables. The unit covers propositional logic, including constants, variables, tautology, contradiction, satisfiability, and equivalence of formulas. Students will also learn to prove formulas and equivalences using truth tables.	1, 2, 3, 4
III	**Introduction to Logic and Reasoning:** Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order , Puzzle, Blood Relations , Analogy, Cube and Dice, Coding-Decoding	**5**	Students will understand the principle of mathematical induction, learning to identify the induction basis and perform the induction step, with various examples to illustrate these concepts. The unit also introduces basic logic and reasoning skills, including alphanumeric series, directional reasoning, logical reasoning, data sufficiency, ranking and ordering, puzzles, blood relations, analogy, and coding-decoding. These topics will develop students' problem-solving abilities and logical thinking skills.	1, 2, 3, 4, 5
IV	**Introduction to Coding:** **C Programming constructs:** Types of Programming Languages, Evolution of 'C' Language, Structure of a 'C' Program, Executing and Debugging a 'C' Program, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. **Control Statements:** Decision Making using if statement, Types of if ...else block, Switch case Block, GOTO statement. **Looping:** Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement	**5**	This unit introduces students to the fundamentals of C programming, covering the types of programming languages and the evolution of the C language. Students will learn the structure of a C program, and how to execute and debug it. The unit covers C tokens such as keywords, identifiers, operators, constants, variables, data types, and operator precedence. Students will understand the scope and lifetime of variables, arithmetic expressions, and their evaluation. Control statements will be covered, including decision-making using if statements, types of if...else blocks, switch case blocks, and the GOTO statement.	2, 3, 4
V	**Introduction to Arrays, Strings and Functions** **Arrays:**	**5**	Students will delve deeper into C programming, focusing on control structures such as loops (for, while, do-	2, 3, 4, 5

	One Dimensional Arrays, Two-Dimensional Arrays, Multidimensional Arrays, Dynamic Arrays. **Strings:** Implementing String Variables, String handling Functions. **Functions:** Concept of Functions, user-defined Functions, System-defined Functions, passing in Functions.		while) and how to manage loop execution using break and continue statements. The unit introduces arrays, covering one-dimensional, two-dimensional, multidimensional, and dynamic arrays. Students will also learn about strings, including how to implement string variables and use string handling functions. The concept of functions is explored, differentiating between user-defined and system-defined functions, and understanding how to pass parameters to functions. This unit provides a comprehensive understanding of essential programming constructs and prepares students for more advanced coding tasks.	

TEXT BOOKS:

1. Schaum's Outline of Programming with C by Byron Gottfried, Third Edition
2. Programming in ANSI C by E. Balaguruswamy, Eight Edition
3. Discrete Mathematics by Lipschutz, Lipsonand and Patil, Revised Third Edition
4. A Textbook on Discrete Mathematics by Sastry and Nayak

REFERENCE BOOKS:

1. A Modern Approach To Verbal & Non Verbal Reasoning by R S Agarwal, Revised Edition
2. Analytical and Logical Reasoning by Sijwali B S, Revised Edition
3. The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie, Second Edition
4. 2000 Solved Problems in Discrete Mathematics by Lipschutz and Lipson

OTHER LEARNING RESOURCES:

https://www.javatpoint.com/discrete-mathematics-tutorial
https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logical-reasoning--article--getting-started
https://www.javatpoint.com/c-programming-language-tutorial

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding	1,8
2	Students will be able to apply of applications of concepts in other disciplines such as engineering, computer science, physics, etc.	3,7
3	Solve and devise solutions to a range of elementary real-world problems in mathematics and programming	6,9,10
4	Explore and apply key concepts in logical thinking to business problems.	5,9
5	Enable students to critically analyze information in order to evaluate evidence and construct reasoned arguments	7,1,12

SEMESTER – I									
Course Title	**Engineering Physics**								
Course code	**22BTCM113R**	**Total credits: 4** **Total hours: 60T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To understand the theories of physics 2. To apply the concepts in practical problems 3. To understand the physics of any process								
CO1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.								
CO2	Illustrate conservative and non-conservative forces, angular momentum and energy equations								
CO3	Explain basics of non-inertial frames and acceleration and its application in engineering field								
CO4	Comprehend on oscillations and its application in the field of engineering kinematics								
CO5	Understand the three dimensional rigid body motion and determine the moment of inertia.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit I: Electrostatics in Vacuum** Coulomb's law, electric field intensity, Gauss's law and its applications, electric potential and potential energy, conductors in electrostatic equilibrium, capacitors and capacitance calculations.	**10**	By the end of this unit, students will demonstrate a comprehensive understanding of the development of railways in India, including the evolution of permanent way and railway track components. They will be able to explain the significance of different gauges used in India and the process of conning wheels. Students will identify and describe the functions and characteristics of key components such as rails, sleepers, and ballast, detailing their types, spacing, and densities. They will analyze the advantages and disadvantages of various types of ballast and understand the requirements for subgrade and embankment construction. Additionally, students will be able to identify common rail defects, understand rail creep, and explain the principles behind rail joints and welding techniques.	1, 2
II	**Unit II: Magnetostatics** Biot-Savart law, Ampère's law and applications, magnetic vector potential, magnetic properties of materials (diamagnetism, paramagnetism, ferromagnetism).	**10**	Upon completing this unit on the geometric design of railway tracks, students will be able to analyze and design railway track layouts incorporating gradients, grade compensation, speed considerations for curves, and principles of super	1, 2, 3, 4

			elevation to enhance safety and efficiency. They will understand the concepts of cant deficiency and negative super elevation, applying them appropriately to track design. Furthermore, students will gain proficiency in designing and implementing various track layouts including switches, crossings (such as diamond and scissors crossings), and turnouts (including double turnouts). They will comprehend the operational requirements and design considerations for railway stations and yards, including traction and track resistance, stress analysis on track components (rails, sleepers, ballast), and the equipment necessary in yards. Additionally, students will grasp the fundamentals of signaling and control systems, their objectives, classifications, and the principles of interlocking signals and points to ensure safe railway operations.	
III	**Unit III: Faraday's Law** Electromagnetic induction, Faraday's law (integral and differential forms), magnetic flux, induced electromotive force (emf), practical applications.	**10**	The learning outcome of the unit on air transport and airport planning encompasses a comprehensive understanding of the historical evolution, regulatory frameworks, and operational aspects of air transport systems worldwide. Students will gain knowledge of aircraft types and their characteristics, aerodrome classifications, and the roles of air transport authorities. They will develop proficiency in airport planning principles according to international standards (ICAO and FAA), covering regional planning concepts, airport master planning, site selection criteria, zoning laws, and the design and classification of airport elements such as airfields and terminals. Additionally, students will learn to assess airport and runway capacities, estimate future air traffic demands, and apply principles for developing new airports, culminating in the ability to conceptualize ideal airport layouts.	1, 2, 3, 4, 5
IV	**Unit IV: Displacement Current and Maxwell's Equations** Displacement current, magnetic field due to time-dependent electric field, Maxwell's equations in	**10**	Upon completion of this unit on Airfield Design and Planning, students will be able to demonstrate comprehensive knowledge and skills in various critical aspects of airfield	2, 3, 4

	integral and differential forms, boundary conditions for electromagnetic fields.		infrastructure. They will understand the principles of runway design, including the influence of wind orientation and coverage on runway orientation and length requirements, as well as factors affecting runway length determination and geometric configurations. Students will be proficient in designing taxiways, considering geometric elements, layout, and exit strategies, as well as planning apron locations, sizes, and configurations for efficient aircraft parking and turnaround operations. Additionally, they will grasp the essentials of pavement design using the LCN system, comprehend common airfield pavement failures, and formulate strategies for maintenance and rehabilitation. This unit will equip students with the necessary expertise to contribute effectively to the planning, design, and operational efficiency of airfield facilities.	
V	**Unit V: Electromagnetic Waves** Wave equation for electromagnetic fields, propagation of electromagnetic waves in free space and in materials, energy and momentum of electromagnetic waves, reflection and refraction, polarization, electromagnetic wave applications	**5**	By the end of this unit, learners will demonstrate a comprehensive understanding of terminal area planning and design within an airport context. They will be able to analyze and apply the fundamental elements and requirements of terminal buildings, including functional spaces and spatial requirements. Students will also grasp essential concepts in vehicular parking area design and circulation networks, incorporating considerations for efficient operations and user experience. Furthermore, they will comprehend the significance of airport grading and drainage systems, understanding their roles in ensuring operational safety and efficiency.	2, 3, 4, 5

TEXT BOOKS:

1. Introduction to Electrodynamics. David Griffiths. Prentice Hall, Upper Saddle River, New Jersey, 07458
2. Basic Laws of Electromagnetism. IE IRODOV

REFERENCE BOOKS:

1. Principles of physics. Halliday Resnick

OTHER LEARNING RESOURCES:

1. https://www.sciencedirect.com/science/article/pii/S0951832022005142

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Develop a foundational understanding of the vectors and scalar representation of forces and nature of forces.	1,2
2	Illustrate conservative and non-conservative forces, angular momentum and energy equations	3,5
3	Explain basics of non-inertial frames and acceleration and its application in engineering field	6,9,10
4	Comprehend on oscillations and its application in the field of engineering kinematics	5,9
5	Understand the three dimensional rigid body motion and determine the moment of inertia.	4,1,11

SEMESTER – I									
Course Title	**Basic Electrical Engineering**								
Course code	**22BTCM114R**	**Total credits: 4**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60T	**2**	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Explain operative principle of transformer with background of magnetic circuits. 2. Classify and compare different types of Electrical machines. 3.								
CO1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems								
CO2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.								
CO3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.								
CO4	Explain the working priciples of common electrica instruments and their characteristics.								
CO5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and and elementary calculations for energy consumption								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**DC Circuits:** Electrical circuit elements (R,L,C), voltage and current source, Kirchoff's current and voltage law, analysis of simple circuit, Thevenin, Norton and Superposition theorem	**10**	Students will understand the properties of electrical circuit elements (R, L, C) and the behavior of voltage and current sources.	1, 2
II	**AC Circuit**: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single phase ac circuits consisting of R,L,C.RL,RC,RLC combination(series and parallel), voltage and current relationship in star and delta connection	**10**	Students will apply the concepts of sinusoidal waveforms, including peak and RMS values, and phasor representation.	2, 3, 4
III	**Transformer:** Magnetic materials, ideal and practical transformer, equivalent circuit, losses in transformer, regulation and efficiency, auto transformer,	**10**	Students will understand the properties of magnetic materials and the construction and operation of ideal and practical transformers.	1, 2, 3, 4

	three phase transformer connection			
IV	**Electrical Machines:** Generation of rotating magnetic fields, construction and working of three phase induction motor, torque-slip characteristics, losses and efficiency, Single phase induction motor, working of synchronous generator	**10**	Students will understand the generation of rotating magnetic fields and the construction and working principles of three-phase induction motors.	1, 2
V	**Power converter and electrical installation:** DC-DC buck and boost converter, single phase and three phase voltage source inverter, Fuse, MCB, ELCB, MCCB, Earthing, wires and cables, types of batteries	**5**	Students will apply the principles of DC-DC buck and boost converters, and single-phase and three-phase voltage source inverters.	2, 3, 4, 5

TEXT BOOKS:

1. D. P. Kothari and I. J.Nagrath, Basic Electrical Engineering , Tata McGraw Hill,2010

REFERENCE BOOKS:

D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill ,2009

E. Hughes, "Electrical and Electronics Technology", Pearson,2010

OTHER LEARNING RESOURCES:

https://nptel.ac.in

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the concept and theorems of basic electric and magnetic circuits for analyzing and designing electrical systems	1,2
2	Analyze the working principles of single-phase ac circuits, three phase balanced circuits, star and delta connection etc.	3,10
3	Identify the magnetic components and efficiency of auto-transformer and three-phase transformer connections.	6,9,12
4	Explain the working priciples of common electrica instruments and their characteristics.	5,9
5	Acquire skills in DC-DC converters, voltage source inverters, and LT Switchgear components and and elementary calculations for energy consumption	4,1,7

SEMESTER – I									
Course Title	**Introductory English for Engineers**								
Course code	22UBPD114R	**Total credits: 2** **Total hours: 30T**	**L** **0**	**T** **0**	**P** **4**	**S** **0**	**R** **0**	**O/F** **0**	**C** **2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be able to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.								
CO2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.								
CO3	Understand the process and purpose of listening, differentiate between listening and hearing, identify factors affecting listening, and implement strategies to improve their listening skills.								
CO4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.								
CO5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Module 1 - Grammar** i. Parts of Speech i. Articles i. Auxiliary Verbs v. Affirmative and Negative Sentences	**10**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and meaningful sentences.	1, 2
II	**Module 2- Grammar** i. Determiners i. Sentence Construction i. Types of Sentences (Assertive, Imperative, etc.)	**10**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and exclamatory). The concept of the degree	2, 3, 4

	v. Degree of Comparison v. Comprehension Exercises		of comparison (positive, comparative, and superlative) will be explored. The module will also include comprehension exercises designed to enhance students' ability to understand and interpret written texts effectively	
III	**Module 3 - Listening Skills** i. What is listening? i. The Process of Listening i. Factors that adversely affect Listening v. Difference between Listening and Hearing, v. Purpose and Importance of Effective Listening i. How to Improve Listening Process.	**10**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	**Module 4 - Speaking Skills** i. Introducing yourself i. Self-discovery i. Basics of Phonetics, pronunciation v. Extempore speech v. Video Recording for Self reflection	**10**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	**Module 5- Communication Skills** i. Introduction to Communication, i. Importance of Communication Skills, i. Purpose of Communication, v. Types of Communication, v. Formal and informal communication i. Importance of Communication, i. Barriers to Communication, i. How to improve/ tips to improve Communication skills. x. Responding to different questions in various situations	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	2, 3, 4, 5

	(formal/informal)			

Text Books:

1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.
2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & Company Ltd.: New Delhi.

Reference Books:

1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India
2. Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Klett

Other Learning Resources:

1. https://youtu.be/bEB8-SWMYhI
2. https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand and correctly use various grammar elements, including parts of speech, articles, auxiliary verbs, determiners, and degrees of comparison, to construct different types of sentences.	1,2
2	Analyze and comprehend written texts through comprehension exercises, demonstrating an understanding of sentence construction and types.	3,5
3	Understand the process and purpose of listening, differentiate between listening and hearing, identify factors affecting listening, and implement strategies to improve their listening skills.	6,9,10
4	Develop speaking skills by introducing themselves, practicing self-discovery, improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.	5,9
5	Understand the fundamentals of communication, including its types, purposes, barriers, and importance, and apply this knowledge to improve their communication skills in both formal and informal contexts.	4,1,11

SEMESTER – I

Course Title	**Workshop/Manufacturing Practices**								
Course code	**22BTCM115R**	**Total credits: 4** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ I semester of first year of the programme**								
Course Objectives	1. Learning this course will lead you to understand basic concepts of workshop and manufacturing 2. Apply fundamental knowledge of workshop and manufacturing in day-to-day life. 3. Recognize components using different materials.								
CO1	Infer about various manufacturing methods like casting, forming, machining etc								
CO2	Apply fitting oparation and power tools in manufacturing works								
CO3	Demonstrate to Carpentry & fitting operations and its application in industries								
CO4	Enhance skills in machining operations like material cutting and preparation of mould etc.								
CO5	Critique the different types of welding, metal cassting and its field of application.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Manufacturing Methods** Casting, forming, machining, joining, advanced manufacturing methods	**10**	Students will gain a comprehensive understanding of traditional manufacturing methods, including casting, forming, machining, and joining processes. They will explore the fundamentals of each method, learning about the materials and techniques used to shape and assemble components. The unit also introduces advanced manufacturing methods, focusing on CNC (Computer Numerical Control) machining and additive manufacturing. Students will gain an overview of the CNC machining process, including the programming, setup, and operation of CNC machines. They will also learn about additive manufacturing, covering its principles, technologies, and applications in modern manufacturing	1, 2
II	**CNC machining, Additive Manufacturing** Overview of CNC machining process, overview of additive manufacturing	**10**	This unit covers essential skills and knowledge in carpentry and fitting operations. Students will become familiar with various carpentry tools and their uses, as well as common carpentry operations such as cutting, shaping, and assembling wooden components. The unit also includes fitting tools and operations, teaching students how to measure, mark, cut, and assemble metal components with	2, 3, 4

			precision. These skills are fundamental for producing and maintaining high-quality mechanical systems and structures.	
III	**Carpentry & Fitting operations** Carpentry tools, carpentry operations, fitting tools, fitting operations	**10**	Students will delve into machining operations, focusing on turning and milling processes. They will learn the principles and techniques involved in turning, such as setting up the lathe, selecting cutting tools, and executing turning operations to produce cylindrical parts. The unit also covers milling processes, including the setup and operation of milling machines, and the selection of appropriate milling tools. Students will gain practical skills in producing components with complex shapes and precise dimensions.	1, 2, 3, 4
IV	**Machining operations** Turning, milling, turning processes, milling processes	**10**	In this unit, students will explore various welding techniques, with a focus on arc welding and gas welding. They will learn about the equipment, materials, and safety procedures involved in these welding methods. The unit also covers brazing, teaching students the principles and techniques for joining metals using a filler material that melts at a lower temperature than the base materials. Through hands-on practice, students will develop the skills needed to create strong, durable welds for a variety of applications.	1, 2
V	**Welding** Arc welding & gas welding, brazing	**5**	Students will gain an in-depth understanding of advanced manufacturing technologies, particularly CNC machining and additive manufacturing. The unit provides an overview of the CNC machining process, highlighting its precision, flexibility, and automation capabilities. Students will learn about the various types of CNC machines, programming techniques, and practical applications in industry. The unit also covers additive manufacturing, discussing its revolutionary impact on product design and production. Students will explore different additive manufacturing technologies, materials, and the wide range of applications, from prototyping to production of	2, 3, 4, 5

			complex, custom parts.	

TEXT BOOKS:

1. Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K Media promoters and publishers private limited, Mumbai.

Reference Books:

1. Workshop / Manufacturing Practices, Veeranna D. Kenchakkanavar Khanna Book Publishing Co. Pvt. Ltd , 1 Nov 2021

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Infer about various manufacturing methods like casting, forming, machining etc	1,3,5
2	Apply fitting oparation and power tools in manufacturing works	2,4
3	Demonstrate to Carpentry & fitting operations and its application in industries	6,8
4	Enhance skills in machining operations like material cutting and preparation of mould etc.	7,10,12
5	Critique the different types of welding, metal cassting and its field of application.	8,9

MAPPING TABLE

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM111R	Engineering Mathematics I	3	3	1	1	1		1					1
22BTCM112R	Introduction to Basic Mathematics, Logic and Coding	2	3	2	1	1	1	1					1
22BTCM113R	Engineering Physics	3	3	1	1	1		1					1
22BTCM114R	Basic Electrical Engineering	3	2	2	3	2	1				1		
22BTCM115R	Workshop/Manufacturing Practices			2	1	1	2	1	2	1			2

22UBPD114R	Introductory English for Engineers						1		1	2	3	2	2

SEMESTER – II									
Course Title	**Engineering Mathematics II**								
Course code	**22BTCM121R**	**Total credits: 4** **Total hours: 30T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**1**	**0**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Describe the concept of first order differential equation and apply them in understanding complex problems. 2. Apply the concept ofordinary differential equations of higher orders. 3. Analyze: To develop students' skills in basic probability and statistics, including the analysis of probability distributions, measures of central tendency, and statistical parameters, and to apply these concepts to real-world data and hypothesis testing.								
CO1	Apply complex variable and its differentiation in solving various complex problems.								
CO2	Understand the basic principles of probability and apply them in solving different complex problems.								
CO3	Apply the concepts of basic and applied Statistics. Apply complex variable differentiation techniques								
CO4	Calculate basic probability measures within probability spaces, including conditional probability, independence, and the behaviour of discrete random variables.								
CO5	Evaluate statistical parameters such as moments, skewness, and kurtosis for binomial, Poisson, and normal distributions.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	***First order ordinary differential equations:*** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	**7**	First-order ordinary differential equations include understanding and solving exact, linear, and Bernoulli equations, as well as Euler's equations for rigid body dynamics. Students will also learn to handle equations not of the first degree, including those solvable for pp, yy, or xx, and Clairaut's type equations. These outcomes focus on enhancing analytical and problem-solving skills in differential equations.	1,2
II	***Ordinary differential equations of higher orders:*** Second order linear differential equations with		Method of variation of parameters. Students will also understand and solve the Cauchy-Euler equation,	1,2

	variable coefficients, method of variation of parameters, Cauchy-Euler equation.	**9**	which is a specific type of second-order linear differential equation useful in various applications.	
III	***Complex variable-Differentiation:*** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions(exponential, trigonometric, logarithm) and their properties.	**8**	Gaining proficiency in solving second-order linear differential equations with variable coefficients using techniques like the variation of parameters. Additionally, students will learn to solve the Cauchy-Euler equation, a particular type of second-order differential equation, and comprehend its applications and solution methods. This expertise prepares students to tackle complex differential equations found in various scientific and engineering contexts	1,2
IV	***Basic probability:*** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution.	**8**	Understanding the foundational concepts of probability spaces and the ability to calculate conditional probability and determine the independence of events. Students will also learn about discrete random variables and how to analyze distributions involving independent random variables. Additionally, they will gain proficiency in working with the multinomial distribution and applying the Poisson approximation to the binomial distribution, equipping them with essential tools for solving a variety of probabilistic problems.	1,2
V	***Basic and applied Statistics:*** ***Basic:*** Measures of central tendency: Moments, skewness and Kurtosis- Probability distributions: Binomial, Poisson and Normal- evaluation of statistical parameters for these three distributions, Correlation and regression. ***Applied:*** Test of significance: Large sample test for single proportion. Difference of proportions, single mean, difference of means and difference of standard deviations.	**8**	Understanding and calculating measures of central tendency such as mean, median, and mode. Students will also learn to compute moments, and analyze skewness and kurtosis to describe data distribution shapes. Additionally, they will gain proficiency in working with key probability distributions (Binomial, Poisson, and Normal), including evaluating their statistical parameters. Furthermore, students will develop skills in correlation and regression analysis to examine relationships between variables.	1,2

TEXT BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

REFERENCE BOOKS:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2. S. L. Ross, Differential Equations, 3rd Ed. Wiley India, 1984.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply complex variable and its differentiation in solving various complex problems.	1,2
2	Understand the basic principles of probability and apply them in solving different complex problems.	3,4,8
3	Apply the concepts of basic and applied Statistics. Apply complex variable differentiation techniques	6,8,10
4	Calculate basic probability measures within probability spaces, including conditional probability, independence, and the behaviour of discrete random variables.	4,6
5	Evaluate statistical parameters such as moments, skewness, and kurtosis for binomial, Poisson, and normal distributions.	7,11,12

SEMESTER – II									
Course Title	**Engineering Chemistry**								
Course code	**22BTCM122R**	**Total credits: 5.5** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To develop a deep understanding of atomic and molecular structures, including the application of quantum mechanics to solve complex problems. 2. To apply theoretical concepts to real-world scenarios, such as predicting molecular properties and understanding spectroscopic techniques. 3. To foster critical thinking and analytical skills necessary for interpreting complex chemical phenomena.								
CO1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.								
CO2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.								
CO3	Analyze molecular orbitals of diatomic molecules and multicenter orbitals using quantum mechanical equations and visualize these orbitals through plots.								
CO4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.								
CO5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**KL**
I	Atomic and molecular structure Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal	**6**	Demonstrate proficiency in solving quantum mechanical problems related to atomic and molecular structures.						1

	field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures			
II	Spectroscopic techniques and applications Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.	**6**	Analyze spectroscopic data to deduce molecular structures and dynamics.	2
III	Use of free energy in chemical equilibria Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.	**6**	Evaluate the impact of intermolecular forces on the physical and chemical properties of substances.	3
IV	Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces. Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.	**6**	Apply thermodynamic principles to chemical equilibria and electrochemical systems.	4
V	**Stereochemistry** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity,	**6**	Interpret periodic trends and their implications on chemical behavior and reactivity.	5

	absolute configurations and conformational analysis. Isomerism in transitional metal compounds **Organic reactions and synthesis of a drug molecule** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule			

Text Books:

1 University chemistry, by B. H. Mahan

2 Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

3 Fundamentals of Molecular Spectroscopy, by C. N. Banwell

4 Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

Reference Books:

1 Physical Chemistry, by P. W. Atkins

2 Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.	1,3
2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.	3,4,7
3	Analyze molecular orbitals of diatomic molecules and multicenter orbitals using quantum mechanical equations and visualize these orbitals through plots.	6,8,12
4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.	4,6

5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties	7,11,12

SEMESTER – II									
Course Title	**Programming for Problem Solving**								
Course code	**22BTCM123R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**2**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1.To learn the fundamentals of computers. 2.To understand the various steps in program development. 3.To learn the syntax and semantics of C programming language. 4.To learn the usage of structured programming approach in solving problems								
CO1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.								
CO2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.								
CO3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.								
CO4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.								
CO5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)	**11**	Demonstrate proficiency in constructing and interpreting flowcharts and pseudocode for algorithm design.	1,2
II	Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.	**10**	Apply knowledge of variables, data types, and arithmetic expressions with appropriate precedence in programming tasks.	1,2
III	Arrays (1-D, 2-D), Character arrays and Strings	**10**	Implement conditional branching and iterative structures to control program flow and optimize algorithm efficiency.	1,2
IV	Basic Algorithms: Searching, Basic Sorting Algorithms, Finding roots of	**7**	Develop proficiency in manipulating arrays, character	1,2

	equations, idea of time complexity Function and Recursion: Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.		arrays, and strings to manage and process data effectively.	
V	Structure and Pointers: Pointers, Structures (including self referential structures e.g., linked list, notional introduction) File handling	**7**	Analyze and evaluate algorithm efficiency through the application of basic searching and sorting techniques, understanding time complexity implications.	1,2
Practical		**30**		1,2, 3,4

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply programming concepts such as flowcharts and pseudocode to design algorithms for solving computational problems.	1,3
2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.	3,4,8
3	Evaluate conditional statements and loops to control program flow and optimize algorithm efficiency.	6,8,12
4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.	4,6

5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.	7,11,12

SEMESTER – IV									
Course Title	**Engineering Graphics and Design**								
Course code	**22BTCM124R**	**Total credits: 3** **Total hours: 10T+40P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**4**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								
Semester	**Fall/ II semester of 1st year of the programme**								
Course Objectives (Minimum 3)	1. To introduce students to the principles and techniques of traditional and computer-based engineering graphics. 2. To equip students with the skills necessary to interpret, create, and analyze technical drawings and models. 3. To familiarize students with modern engineering graphics software and its applications in design and visualization.								
CO1	Introduction to engineering design and its place in society.								
CO2	Exposure to the visual aspects of engineering design.								
CO3	Exposure to engineering graphics standards.								
CO4	Exposure to solid modelling.								
CO5	Exposure to computer-aided geometric design								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Unit 1: Traditional Engineering Graphics**:** Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles.	**3**	Upon completion of the course, students will be able to demonstrate the application of orthographic projection using Descriptive Geometry principles.	1,2
II	Unit 2: Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.	**2**	Students will be able to interpret and create technical drawings incorporating isometric projection, sectional views, and accurate dimensioning.	1,2
III	Unit 3: Computer Graphics: Engineering Graphics Software; - Spatial Transformations; Orthographic Projections; Model Viewing.	**2**	Students will develop proficiency in utilizing engineering graphics software for spatial transformations, model viewing, and orthographic projections.	1,2
IV	Unit 4: Co-ordinate Systems; Multi-view Projection; Exploded Assembly	**2**	Upon completion, students will understand the principles of co-	1,2

			ordinate systems and multi-view projection, and apply them effectively in technical drawings.	
V	Unit 5:Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)	**1**	Students will be able to utilize surface and solid modeling techniques in BIM to design and visualize complex engineering structures.	1,2

Text Books:

1. Bhatt, N.D., Engineering Drawing, Charotar Publishing House Pvt. Ltd.
2. John, K.C. Engineering Graphics, Prentice Hall India Publishers.

Reference Books:

1. Anilkumar, K.N., Engineering Graphics, Adhyuth narayan Publishers
2. Agrawal, B. And Agrawal, C.M., Engineering Darwing, Tata McGraw Hill
3. Varghese, P.I., Engineering Graphics, V I P Publishers

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Introduction to engineering design and its place in society.	1,3,6
2	Exposure to the visual aspects of engineering design.	3,4,7
3	Exposure to engineering graphics standards.	6,8,12
4	Exposure to solid modelling.	4,6,8
5	Exposure to computer-aided geometric design	7,11

SEMESTER – II									
Course Title	**Effective English for Engineers**								
Course code	**22UBPD12R**	**Total credits: 2** **Total hours: 40P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To introduce students to fundamental grammatical concepts and sentence analysis techniques. 2. To enhance vocabulary skills through the study of synonyms, antonyms, and homonyms. 3. To develop practical skills in reading comprehension and information interpretation.								
CO1	Identify and classify different types of sentences using grammatical rules and structures.								
CO2	Demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.								
CO3	Apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.								
CO4	Apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.								
CO5	Demonstrate effective time management skills by prioritizing tasks and meeting deadlines.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Module 1- Grammar** i. Interchange of Interrogative and Assertive Sentences ii. Interchange of Exclamatory and Assertive Sentences iii. Analysis of Sentences iv. Types of Tenses v. Exercises on Tense	**3**	Students will be able to identify and classify different types of sentences using grammatical rules and structures.	1,2
II	**Module 2- Vocabulary** i. Synonyms ii. Antonyms iii. Homonyms	**2**	Students will demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.	1,2
III	**Module 3- Reading Skills** i. Techniques of Effective Reading ii. Gathering ideas and information from a text iii. The SQ3R Technique iv. Interpret the text	**2**	Students will apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.	1,2

IV	**Module 4- Dress Code Ethics** i. Introduction to Dress Code Ethics, ii. Purpose and Importance, iii. How to Make FIRST IMPRESSION iv. What to WearDuringInterviews or Any Other Formal Meetings – Male & Female Activity:	**1**	Students will apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.	1,2
V	**Module 5- Time-Management Skills** i. Introduction To Time Management, ii. Purpose And Importance of Time Management, iii. Basic Tips to Maintain Time. Activity: Problem solving activity: A situation will be given to the students and they will have to tell us how to handle the situation or solve the problem	**2**	Students will demonstrate effective time management skills by prioritizing tasks and meeting deadlines.	1,2

Text Books

1 Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2 Solid Mechanics by Dr. Utasv Chandra Kalita

Reference Books:

1 Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.

2 Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979

3 Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will be able to identify and classify different types of sentences using grammatical rules and structures.	1,3
2	Students will demonstrate proficiency in using synonyms, antonyms, and homonyms appropriately in written and spoken contexts.	3,4,7
3	Students will apply effective reading techniques such as SQ3R to gather and interpret information from diverse texts.	6,8
4	Students will apply dress code ethics effectively by choosing appropriate attire for interviews and formal meetings.	4,6,8
5	Students will demonstrate effective time management skills by prioritizing tasks and meeting deadlines.	7,12

SEMESTER – II									
Course Title	**Universal Human Values (UHV) + Professional Ethics**								
Course code	**22UUHV102R**	**Total credits: 2** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature								
CO1	**Analyze** the need and significance of Value Education, understanding its basic guidelines, content, and processes.								
CO2	**Evaluate** the concepts of self-exploration, natural acceptance, and experiential validation in achieving continuous happiness and prosperity.								
CO3	**Apply** the principles of right understanding, relationship, and physical facilities to prioritize and fulfill basic human aspirations.								
CO4	**Synthesize** the knowledge of harmony within the self, family, society, and nature, and formulate strategies to maintain this harmony.								
CO5	**Create** a framework for integrating human values and professional ethics into personal and professional practices, ensuring the development of eco-friendly and socially responsible technologies and systems.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation** 1. Understanding the need, basic guidelines, content and process for Value Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with	**3**	Students will **understand** the need for value education and its basic guidelines, content, and process.	1

	their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the currentscenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.			
II	**Understanding Harmony in the Human Being - Harmony in Myself!** 1. Understanding human being as a co-existence of the sentient 'I' and the material'Body' *2.* Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha* 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correctappraisal of Physical needs, meaning of Prosperity in detail Programs to ensure *Sanyam* and *Swasthya*- Practice Exercises and Case Studies will be taken up in Practice Sessions.	**3**	Students will **comprehend** the concept of self-exploration, including its content and process, and the mechanisms of natural acceptance and experiential validation.	2
III	**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship** 1. Understanding Harmony in the family – the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of *Nyaya* and programfor its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship 3. Understanding the difference between meaning of *Vishwas*; and competence 4. Understanding the difference between meaning of *Samman*, and differentiation; the other salient values in relationship 5. Understanding the harmony in the society (society being an extension of family):	**5**	Students will **gain insight** into the basic human aspirations of continuous happiness and prosperity and how to achieve them through right understanding, relationships, and physical facilities.	3

	Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals 6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!- Practice Exercises and Case Studies will be taken up in Practice Sessions.			
IV	**Understanding Harmony in the Nature and Existence - Whole existence asCo-existence** 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting unitsin all-pervasive space 4. Holistic perception of harmony at all levels of existence-Practice Exercises and Case Studies will be taken up in Practice Sessions.	**4**	Students will **recognize** the importance of harmony in human relationships, family, society, and nature, and how it contributes to a universal harmonious order.	4
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic UniversalOrder 4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universalhuman order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and managementpatterns for above production systems. 5. Case studies of typical holistic technologies, management models and productionsystems 6. Strategy for transition from the present state to Universal Human Order:	**5**	Students will **develop** competence in professional ethics by understanding human values, ethical human conduct, and strategies for transitioning to a universal human order.	5

	a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations			

Text Books:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values andprofessional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

2. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986,1991

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze the need for value education and its impact on personal and societal well-being.	1,4
2	Evaluate the concepts of self-exploration, natural acceptance, and experiential validation as mechanisms for understanding human aspirations.	3,4,7
3	Differentiate between happiness and prosperity and assess their implications on human aspirations in the current scenario.	6,8,10
4	Demonstrate understanding of harmony in human relationships, family, society, nature, and existence.	4,6,8
5	Apply principles of professional ethics to develop sustainable and humanistic solutions in their professional practice.	7,11

SEMESTER – II									
Course Title	**Computational Systems and Digital World**								
Course code	**22UUDL103R**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	To provide a comprehensive understanding of computer systems, office automation tools, and their practical applications. To equip students with skills for effective data management, analysis, and visualization using MS-Excel. To enhance knowledge of the internet, social media, e-commerce, and digital payment systems, including their ethical and legal aspects								
CO1	**Identify** the components of a computer system and explain their functions.								
CO2	**Apply** office automation tools like MS-Word, MS-Excel, and MS-PowerPoint for creating, managing, and presenting data.								
CO3	**Analyze** statistical data and create visualizations using MS-Excel.								
CO4	**Demonstrate** the use of computer networks, the Internet, and web searching techniques.								
CO5	**Evaluate** the impact of social media, e-commerce, and digital payment systems in modern society, including associated crimes and legal frameworks.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Fundamentals of Computer Systems, Office Automation and Internet Search** i. Components of a Computer and their functions. ii. Office Automation using MS-Word, MS-Excel, and MS-PowerPoint. iii. Data management, Statistical Data Analysis and Data Visualization with MS-Excel. iv. Use of Functions, Graphs & Charts in MS-Excel.	**2**	Students will **understand** the fundamental components of computer systems and their respective functions.	
II	**Internet & Cyber World** i. Introduction to Computer Networks, Internet and World Wide Web, Websites and Web portals. ii. Creation and use of Email Accounts. iii. Web browsing, Web Searching, Different aspects of Web Searching- Search Keywords, conditions and combinations. iv. Study of different Search Engines like Google, Microsoft Bing, Yahoo, Yandex, DuckDuckGo, Ask.com etc. v. Cyber Crimes, Cyber Laws and IT Act 2000, India	**2**	Students will **be proficient in** using MS-Word, MS-Excel, and MS-PowerPoint for office automation tasks.	
III	**Introduction to Social Media and E-Commerce**	**2**	Students will **be able to** manage and analyze data, and create data	

	i. Relevance of Social Media in present scenario. Posting different types of contents in Social Media. ii. Creating accounts and using some popular Social media portals and Apps like WhatsApp, Facebook, etc. Social Media Etiquettes & Crimes. iii. Definition of E-Commerce; E-Commerce versus traditional Commerce. iv. Case studies of popular E-Commerce portals like Amazon. v. E-commerce Etiquettes & Crimes.		visualizations using MS-Excel.	
IV	**Digital Payments and Digital Transactions** i. Introduction to Digital Payment Systems. ii. Creating accounts and using Digital Payment Systems like Credit Cards, Debit Cards, Netbanking, UPI. iii. Digital payments Etiquettes & Crimes.	**2**	Students will **gain skills in** web browsing, web searching, and understanding the use of various search engines.	
V	**Basic Accounting and Utility Software** i. Introduction to Basic accounting concepts, Introduction to an Accounting Software like GnuCash or Tally. ii. Introduction to Technical Document writing using LaTex. iii. Introduction to Data Visualization software – Sigma, Google Charts, Tableau.	**2**	Students will **acquire knowledge of** digital payment systems, social media, e-commerce, and their related etiquettes and crimes.	

Text Books:

1. Sinha Pradeep K. and Priti Sinha. *Computer Fundamentals: Concepts Systems & Applications*. 3rd ed. New Delhi: BPB Publications.
2. Goel, A, 2010. Computer Fundamentals, Pearson India.

Reference Books:

1. Balaguruswamy, E. 2009 Fundamentals of Computers, Tata McGraw-Hill Education.
2. Balaguruswamy, 2014. E. Fund Of Comp & Programming (Updated Ed Sem. I, Au) Tata McGraw-Hill Education.
3. Lawson, C. 2022. Introduction to Social Media, Oklahoma State University.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	**Identify** the components of a computer system and explain their functions.	1,3,6
2	**Apply** office automation tools like MS-Word, MS-Excel, and MS-PowerPoint for creating, managing, and presenting data.	3,4,7
3	**Analyze** statistical data and create visualizations using MS-Excel.	6,8,12
4	**Demonstrate** the use of computer networks, the Internet, and web searching techniques.	4,6,8
5	**Evaluate** the impact of social media, e-commerce, and digital payment systems in modern society, including associated crimes and legal frameworks.	7,11

SEMESTER – II									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC121**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2. To stimulate the interests in the students and provide equal opportunities to all the students to participate 3. To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.								
CO2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.								
CO3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.								
CO4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.								
CO5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**10**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2, 3,4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze: Students will be able to analyze and evaluate the effectiveness of various co-curricular activities in relation to their academic curriculum.	1,3
2	Organize: Students will be able to organize and execute workshops, exhibitions, and guest lectures that foster a deeper understanding of their academic subjects.	3,4,7
3	Demonstrate: Students will be able to demonstrate improved soft skills and aptitude by actively participating in related tests and activities.	6,8
4	Develop: Students will develop the ability to independently plan and implement programs that promote the exchange of ideas and information among peers.	4,6
5	Evaluate: Students will evaluate the impact of co-curricular activities on their personal and professional growth, particularly in terms of employment and higher education opportunities.	7,11

SEMESTER – II									
Course Title	**EXTRA-CURRICULAR ACTIVITIES**								
Course code	**22UBEC121**	**Total credits: 1** **Total hours: 10P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								
Semester	**Fall/ II semester of first year of the programme**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**10**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	1,2, 3,4, 5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,9,11,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,9,11,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,9,11,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,9,11,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,9,11,12

SEMESTER II									
Course Title	**MOOCS I: Ecosystem Services: A Method for Sustainable Development**								
Course code	**MOOCSCECE1**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech in Civil Engineering**								
Semester	**Fall/II Semester of First Year of the Programme**								
Course Objectives (Minimum 3)	1. To provide students with a comprehensive understanding of ecosystem services and their role in sustainable development. 2. To equip students with the skills to assess, value, and analyze ecosystem services using various economic, ecological, social, and cultural valuation methods. 3. To enable students to critically evaluate and apply policy and management strategies, tools, and techniques for the sustainable management of ecosystem services.								
CO1	To understand the concept and classification of ecosystem services and their importance in sustainable development.								
CO2	To analyze various methods for valuing ecosystem services and identify the challenges associated with their valuation.								
CO3	To apply knowledge of provisioning, regulating, cultural, and supporting services to assess their impact on human well-being.								
CO4	To evaluate policy and management strategies for integrating ecosystem services into environmental planning and impact assessments.								
CO5	To analyze and utilize tools and techniques, such as GIS and remote sensing, for assessing and mapping ecosystem services.								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**

I	**Introduction to Ecosystem Services** • Definition and Classification of Ecosystem Services • History and Evolution of Ecosystem Services Concept • Importance of Ecosystem Services in Sustainable Development • Ecological Foundations of Ecosystem Services • Case Studies of Ecosystem Services	**8**	Students will understand the definitions, classifications, and ecological foundations of ecosystem services, and recognize their significance in sustainable development through various case studies.	**1,2,3**
II	**Valuation of Ecosystem Services** • Economic Valuation Methods: Market Pricing, Hedonic Pricing, Contingent Valuation • Ecological Valuation Methods • Social and Cultural Valuation Methods • Cost-Benefit Analysis in Ecosystem Services • Challenges in Ecosystem Services Valuation	**12**	Students will analyze different economic, ecological, social, and cultural valuation methods for ecosystem services, conduct cost-benefit analyses, and identify challenges associated with the valuation process.	**3,4**
III	**cosystem Services and Human Well-being** • Linkages between Ecosystem Services and Human Well-being • Provisioning Services (e.g., food, water, raw materials) • Regulating Services (e.g., climate regulation, water purification) • Cultural Services (e.g., recreational, aesthetic, spiritual) • Supporting Services (e.g., nutrient cycling, soil formation)	**8**	Students will apply their knowledge to identify and assess the linkages between ecosystem services and human well-being, focusing on provisioning, regulating, cultural, and supporting services.	**3,4**
IV	**Policy and Management of Ecosystem Services** • Integrating Ecosystem Services into Policy and	**6**	Students will evaluate various policy and management strategies, including the integration of ecosystem services into policy and planning, environmental impact	**4**

	Planning • Ecosystem Services in Environmental Impact Assessment • Ecosystem-Based Management Approaches • Payment for Ecosystem Services (PES) Programs • Case Studies in Policy and Management		assessments, ecosystem-based management approaches, and payment for ecosystem services programs.	
V	**Tools and Techniques for Ecosystem Services Assessment** • Geographic Information Systems (GIS) in Ecosystem Services • Remote Sensing and Spatial Analysis • Modelling Ecosystem Services • Participatory Approaches and Stakeholder Engagement • Case Studies of Tools and Techniques	**5**	Students will analyze and utilize tools and techniques such as Geographic Information Systems (GIS), remote sensing, spatial analysis, modeling, and participatory approaches for assessing and mapping ecosystem services, supported by relevant case studies.	**4**

TEXT BOOKS:

1. "Ecosystem Services: From Concept to Practice"** by J. Maes, M. L. Paracchini, G. Zulian, M. Thijssen, and E. Bidoglio

REFERENCE BOOKS:

1. "Natural Capital: Theory and Practice of Mapping Ecosystem Services"** edited by Peter Kareiva, Heather Tallis, Taylor H. Ricketts, Gretchen C. Daily, and Stephen Polasky

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	To understand the concept and classification of ecosystem services and their importance in sustainable development.	1,2,3,4,
2	To analyze various methods for valuing ecosystem services and identify the challenges associated with their valuation.	3,4,5
3	To apply knowledge of provisioning, regulating, cultural, and supporting services to assess their impact on human well-being.	5,10,12
4	To evaluate policy and management strategies for integrating ecosystem services into environmental planning and impact assessments.	10,12
5	To analyze and utilize tools and techniques, such as GIS and remote sensing, for assessing and mapping ecosystem services.	1,2,3,,10

SEMESTER – II									
Course Title	**Techno Professional Skills-I**								
Course code	**22BTCM125R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ III semester of first year of the programme**								
Course Objectives (Minimum 3)	Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.								
CO1	Understand the basic principles and standards of engineering graphics.								
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.								
CO3	Create accurate and detailed 2D engineering drawings of civil structures.								
CO4	Interpret and visualize engineering designs through graphical representation.								
CO5	Apply engineering graphics skills in practical civil engineering projects.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of orthographic projection, multi-view drawing, and sectional views.	6	Create accurate orthographic projections and sectional views of civil structures.	3, 4
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and perspective drawings. Visualization of 3D objects on 2D planes.	6	Interpret and visualize engineering designs through isometric and perspective drawings.	4, 5
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic principles and standards of	**5, 7**

	engineering graphics.	
2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

MAPPING TABLE (2nd Semester):

Subject Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM121R	Engineering Mathematics II	3	2	2	2	1		1					2
22BTCM122R	Engineering Chemistry	1		2									
22BTCM123R	Programming for Problem Solving	2		3	1	2							2
22BTCM124R	Engineering Graphics and Design	1	2	3		2	1						2
22UBPD12R	Effective English for Engineers						1		1	2	3	2	2
MOOCSCECE1	MOOCS I	2		3	1	2							2
22UBCC121	Co-curricular	1	2	3		2	1						2
22UBEC121	Extra-curricular	1	2	3		2	1						2
22BTCM125R	Techno-Professional Skills I						1		1	2	3	2	2
22UUHV102R	Universal Human Values (UHV) + Professional Ethics						1		1	2	3	2	2
22UUDL103R	Computational Systems	2		3	1	2							2

	and Digital World												

SEMESTER – III										
Course Title	**Engineering Mechanics**									
Course code	**22BTCM211R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**2**	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ III semester of second year of the programme**									
Course Objectives (Minimum 3)	1. This course teaches students how to apply Newtonian physics to relatively simple real-life applications 2. This course covers statics, dynamics and elementary part of strength of materials 3. This course covers statics, dynamics, and mechanics of materials, offering fundamental principles to analyze engineering problems involving forces, motion, and materials. 4. Students gain a deep understanding of these principles, enabling them to effectively solve engineering problems related to forces, motion, and materials.									
CO1	Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.									
CO2	Study the effect of friction in static and dynamic conditions.									
CO3	Understand the different surface properties, property of masses and material properties.									
CO4	Analyze and solve different problems of kinematics and kinetics.									
CO5	Apply the concepts of mechanics and work in force analysis.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT I Importance of the knowledge of engineering mechanics in engineering. Introduction to Statics, Concept of particle and rigid body, types of forces; collinear, concurrent, coplanar forces. Concepts of concentrated and distributed forces, vector and scalar quantities, force is a vector, principle of transmissibility. Force is a vector, principle of transmissibility. Introduction of vector algebra, parallelogram law, addition and subtraction vectors, Lami's theorem statement & proof. Free vector, Bound vector, Representation of forces in terms of I, j, k Cross product and Dot product and their applications. Moment of a force about a point and about an axis. Numerical problems discussion Two dimensional force system; resolution of forces; Moment. Varignon's theorem;	**5**	Students will be introduced to fundamental concepts of force systems, including types of forces (concurrent, coplanar, and spatial), components of forces in space, and moment of forces. They will learn how to analyze and resolve force systems using principles of equilibrium and free body diagrams. The concept of static indeterminacy will also be covered.	1, 2

	statement and proof Couple; resolution of a force by its equivalent force - couple system; resultant of forces. Numerical problem discussion			
II	UNIT II Concept and Equilibrium of forces in two dimensions; Free body concept and diagram, Conditions of equilibrium. Discussion on concept of free body with different examples Numerical problem discussion Concept of Friction; Coulomb's law of dry friction; Angle of friction; Angle of Repose; Coefficient of friction. Angle of friction, cone of friction concept of drawing FBD for different problems Numerical problems discussion Concept of Distributed Force: Centroid and Centre of Gravity;	**10**	Students will study the equilibrium of particles in both two and three dimensions, understanding how forces act to maintain static equilibrium. They will extend this knowledge to rigid bodies, applying principles of equilibrium to analyze systems of forces acting on bodies in static equilibrium. Methods for determining resultant forces, moments of forces, and solving equilibrium equations will be taught.	1, 2, 3, 4
III	UNIT III Centroid of a triangle, quadrilateral, rectangle and circular sector. To determine coordinates of centroid of composite areas consisting of above figures. Theorem of Pappus & Guldinus and its applications To find out the coordinates of the centroid of different composite area, curves etc. Discussion of the different numerical problems. Concept of mass moment of inertia, concept of moment of inertia of areas about an axis in its plane. Parallel axis theorem, perpendicular axis theorem and its applications Mass moment of inertia of symmetrical bodies like cylinder, sphere and cone; To determine MI of plane areas and solid	**10**	Students will calculate centroids of simple figures and composite sections using first principles. They will understand the concept of centre of gravity and its practical implications in engineering applications. The unit includes the calculation of area moment of inertia for plane sections, including theorems of moment of inertia and their applications in structural analysis. Mass moment of inertia for circular plates, cylinders, cones, spheres, and hooks will also be covered.	1, 2, 3, 4, 5
IV	UNIT IV Concept of simple stresses and strains, Normal stress, Shear stress, Bearing stress, Normal strain and shearing strain, L Hooke's Law, Elastic constants and their relation. Poisson's ratio; Stress -strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety Discussion of some numerical	**10**	The unit revisits particle dynamics, covering rectilinear motion, plane curvilinear motion (rectangular, path, and polar coordinates), and 3-D curvilinear motion. Students will apply Newton's second law of motion in different coordinate systems and study work-kinetic energy, power, potential energy, impulse-momentum (linear and angular), and impact (direct and oblique).	2, 3, 4

	applications; Principle of virtual work – Explanation and its applications. Numerical problem based on the principle of virtual work Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity. Rectilinear motion of particles; determination of position, velocity and acceleration under uniform acceleration rectilinear motion; construction of x -t, v -t and a -t graphs non -uniformly accelerated rectilinear motion; construction of x -t, v -t and a -t graphs; Numerical problems on uniform and non - uniform acceleration Plane curvilinear motion of particles: Rectangular components; Normal and tangential components (circular motion).			
V	UNIT V Radial and transverse components of acceleration; Projectile motion. Numerical problem on the above problems; D.Alembert's principle and free body diagram – principle, concept and examples Principle of work and energy applied to particle and rigid bodies; Principle of conservation of energy; Applications of D.Alembert's principle – – numerical discussion. Applications of conservation of energy; Power and efficiency Applications of conservation of work energy & moment principle Kinetics of particles: Newton's second law; Equation of motion.	**10**	Students will understand basic terms and general principles in dynamics, including types of motion and instantaneous centre of rotation in plane motion. They will study D'Alembert's principle and its applications in plane motion and connected bodies. The work-energy principle will be applied to analyze plane motion of connected bodies and kinetics of rigid body rotation	2, 3, 4, 5

Text Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

Reference Books:

1. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics

2. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
3. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.	1,2,3
2	Study the effect of friction in static and dynamic conditions.	3,5,6
3	Understand the different surface properties, property of masses and material properties.	7,2,4
4	Analyze and solve different problems of kinematics and kinetics.	8,1,9
5	Apply the concepts of mechanics and work in force analysis .	10,4,7

SEMESTER – III									
Course Title	**Engineering Geology**								
Course code	**22BTCM212R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**0**	**2**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of Second year of the programme**								
Course Objectives (Minimum 3)	1. Use suitable software to examine geology, soil, geologic hazard, and NEHRP data to characterize a geologic site. 2. Calculate the bulk properties of rocks and unconsolidated sediments such as density, void ratio, water contents, and unit weights. 3. Evaluate rock-mass quality and perform a kinematic analysis.								
CO1	1. Discuss the importance of Geology in making engineering decisions specially site selection of engineering projects.								
CO2	2. Analyze the concepts of how minerals form and their uses for identifying the rock forming.								
CO3	3. Analyze graphs and models used in structural geology for demonstrating stress, strain and tectonics.								
CO4	4. Generalize rocks using basic geological systems for selective construction material								
CO5	5. Apply quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction- Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, Rock forming minerals, megascopic identification of common primary & secondary minerals.	**5**	Geological studies are crucial for site selection, foundation design, and material sourcing. They prevent hazards like landslides and sinkholes and aid in environmental assessments and resource management for sustainable construction.	1, 2
II	Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. IUGS Classification of phaneritic and volcanic rock.. Field Classification chart. Structures. Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic	**5**	Geology provides essential knowledge to civil engineering through structural geology, hydrogeology, and engineering geology. Structural geology helps understand rock behavior under stress, while hydrogeology deals with groundwater flow. Engineering geology assesses geological factors affecting construction sites.	1, 2, 3, 4

	Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, Hornfels. Metamorphic Aureole, Kaolinization. Landform as Tors. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, and Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration.			
III	Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits.	**5**	Geological studies are crucial for site selection, foundation design, and material sourcing. They prevent hazards like landslides and sinkholes and aid in environmental assessments and resource management for sustainable construction.	1, 2, 3, 4, 5
IV	Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.	**5**	Physical geology examines weathering (mechanical, chemical), erosion, and denudation processes influencing rock properties. Superficial deposits like alluvium and glacial deposits impact construction and groundwater management. Geological structures such as folds, faults, and joints affect rock strength and stability. Understanding these structures is vital for engineering operations, preventing hazards like landslides and earthquakes	2, 3, 4

V	Geological Hazards-Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India.	**10**	Geological hazards include slope instability, groundwater dynamics, and seismic activities. Prevention measures like drainage systems, slope reinforcement, and seismic design mitigate risks in civil engineering projects. This structured approach covers essential topics in geology relevant to civil engineering, ensuring a comprehensive understanding of geological principles and their practical applications.	2, 3, 4, 5

Text Books:

1. P.C. Varghese, Engineering Geology for Civil Engineers, PHI Learning private limited.
2. Parbin Singh, Engineering & General Geology, S.K. Kataria and Sons- Delhi.

Reference Books:

1. Dr. D.V. Reddy, Engineering Geology, Vikas Publishing House.
2. Chadha S. K., Elements of Geological Maps for Geology, Geography & Civil Engineering, CBS Publishers & Distributors- New Delhi.
3. Gautam Mahajan, Evaluation and Development of Ground Water, APH Publishers.
4. Jerome V. Degraff Robert B. Johnson, Principles of Engineering Geology, Wiley India Pvt Ltd.
5. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Discuss the importance of Geology in making engineering decisions specially site selection of engineering projects.	1,2
2	Analyze the concepts of how minerals form and their uses for identifying the rock forming.	3,5,6
3	Analyze graphs and models used in structural geology for demonstrating stress, strain and tectonics.	7,2
4	Generalize rocks using basic geological systems for selective construction material	1,9
5	Apply quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.	4,7

SEMESTER – III									
Course Title	**Computer-aided Civil Engineering Drawing**								
Course code	**22BTCM214R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To develop parametric design and the conventions of formal engineering drawing 2. Produce and interpret 2D & 3D drawings 3. To communicate a design idea/concept graphically/ visually 4. To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs								
CO1	**CO1-** Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.								
CO2	**CO2-** Get a Detailed study of an engineering artifacts.								
CO3	**CO3-** Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D								
CO4	**CO4-** Construct accurate 2D geometry as per the dimensions following standard drawing practices with proper dimensioning using Computer Aided drafting software								
CO5	**CO5-** Create 2D representations of 3D objects as plan view, elevations, side views and sections / auxiliary views using Computer Aided drafting software								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT-I: INTRODUCTION; Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.	**5**	This unit introduces the concept of engineering drawings, emphasizing their interpretation and planning for concise and comprehensive information presentation. It covers optimal layout techniques, scales, and the basics of computer-aided drawing (CAD), including coordinate systems and essential commands like drawing entities, modifications, layers, text, dimensioning, and blocks. Standards and norms for drawing presentation are also discussed to ensure clarity and consistency in technical documentation.	1, 2

II	UNIT-II: SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards	**5**	Symbols and sign conventions play a crucial role in engineering drawings across various disciplines such as materials, architecture, structural engineering, electrical systems, and plumbing. This unit explores standard symbols used in rebar drawings, structural steel fabrication, and welding, alongside dimensioning standards. Understanding these conventions is essential for accurate communication and interpretation of technical details in construction and engineering projects.	1, 2, 3, 4
III	UNIT-III: MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall	**10**	Building drawing essentials are covered in this unit, including terms, planning elements, and methods for creating line drawings and detailed architectural drawings. It includes the depiction of site plans, floor plans, elevations, sections, foundation plans, and roof drainage plans for small residential buildings. Detailing of joinery, fittings, fixtures, and finishes, along with the use of notes for clarity, enhances the communicative value of architectural drawings.	1, 2, 3, 4, 5
IV	UNIT-IV: BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity	**5**	Building drawing essentials are covered in this unit, including terms, planning elements, and methods for creating line drawings and detailed architectural drawings. It includes the depiction of site plans, floor plans, elevations, sections, foundation plans, and roof drainage plans for small residential buildings. Detailing of joinery, fittings, fixtures, and finishes, along with the use of notes for clarity, enhances the communicative value of architectural drawings.	2, 3, 4
V	UNIT-V: PICTORIAL VIEW: Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information	**5**	Principles of isometric and perspective drawing techniques are explored in this unit, emphasizing their application in architectural representation. It includes creating perspective views of buildings and introduces fundamentals of Building Information Modelling	2, 3, 4, 5

	Modelling (BIM)		(BIM), highlighting its role in digital representation, collaboration, and project management in contemporary architectural and construction practices.	

Text Books:

1. Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education,

Reference Books:

1. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age
2. International Pvt. Ltd.,
3. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing
4. KDR building, Calicut,
5. (Corresponding set of) CAD Software Theory and User Manuals.
6. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd
7. New Asian.
8. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.	1,2,3
2	Get a Detailed study of an engineering artifacts.	3,5,6
3	Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D	7,2,4
4	Construct accurate 2D geometry as per the dimensions following standard drawing practices with proper dimensioning using Computer Aided drafting software	8,1,9
5	Create 2D representations of 3D objects as plan view, elevations, side views and sections / auxiliary views using Computer Aided drafting software	10,4,7

SEMESTER – III									
Course Title	**Biology for Engineers**								
Course code	**22BTCM213R**	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To make connections between the various branches of science. 2. To identify and define the basic life processes, the basic needs and the chemistry of living things. 3. Biology for Engineers is designed to introduce engineering students to fundamental concepts in biology and their applications in engineering disciplines.								
CO1	Discuss biological sciences, its scope and perspectives.								
CO2	Discuss regarding the ecological energetics, its working mechanism, identification of organisms.								
CO3	Analyse the mechanism of transfer of character from parent to next generation.								
CO4	Explain the genetic code and production of proteins.								
CO5	Interprets the relation between various physiological processes of our body								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT I Introduction Importance and scope of Biology as an important scientific discipline Branches of biological sciences Fundamental differences between science and engineering Comparison between the working mechanism of eye and camera, Bird flying and aircraft Biological observations of 18th century that lead to major discoveries in the world Steps in scientific research works Brownian motion in biological sciences	**10**	This unit introduces the importance and scope of biology, covering its branches and comparing fundamental differences between science and engineering. It explores biological systems such as the eye versus a camera and bird flight versus aircraft dynamics. Students also learn about key 18th-century biological observations and phenomena like Brownian motion.	1, 2
II	UNIT II Classification & Ecology Classification of organisms, Basis of classification: Morphological, biochemical or ecological, level of organization, symmetry, germ layer organization, segmentation, notochord Concept of unicellular and multicellular organisms; prokaryotes and eukaryotes; Habitat & Adaptations Concept of Ecosystem: Structure & Function Energy flow in an ecosystem: Lindemann ten percent law Types of excretion:	**10**	Students study organism classification based on morphology, biochemistry, and ecology. They learn about unicellular and multicellular organisms, prokaryotes versus eukaryotes, and habitats and adaptations. The unit covers ecosystem structures, functions, energy flow, and types of excretion (ammonotelism, ureotelism, uricotelism).	2, 3, 4

	Ammonotelism, Ureotelism and Uricotelism Animal Kingdom: Characters of phylum with examples Model organisms for the study of biology come from different groups. E. coli, S. cerevisiae, D. Melanogaster, C. elegans, A. thaliana, M. musculus			
III	UNIT III Genetics & Biomolecules Concept of Allele; Dominance & Recessive; Monohybrid, Dihybrid & Trihybrid cross; Mitosis & Meiosis Mendel's laws, Concept of Segregation and Independent assortment Concept of co-dominance and incomplete dominance with illustrations Sex determination in human Genetic disorders in human beings DNA & RNA as genetic material Enzymes: Classification; Mechanism of enzyme action	**10**	This unit covers basic genetics including alleles, dominance, and recessiveness. Students learn about monohybrid, dihybrid, and trihybrid crosses, mitosis, meiosis, Mendel's laws, and genetic disorders. Biomolecules like DNA, RNA, enzymes (classification and mechanism), and genetic material are also discussed.	1, 2, 3, 4
IV	UNIT IV Information Transfer & Metabolism Genetic code: Properties Structure of DNA Concept of recombination and crossing over Proteins: Primary secondary, tertiary and quaternary structure Concept of Central dogma ATP as an energy currency of cell Concept of docking: Protein Ligand interaction	**10**	Students delve into the genetic code, DNA structure, recombination, crossing over, and protein structures (primary, secondary, tertiary, quaternary). The unit covers the central dogma of biology, ATP as an energy carrier, and protein-ligand interactions.	1, 2
V	UNIT V Physiology Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosis fetalis Neuroendocrine system of human: Endocrine glands and their functions Human Excretory system: Structure of Kidney and Nephron Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse Human Respiratory System: Structure of lungs and exchange of gases Human digestive enzymes: Components and enzymes Mechanism of muscle contraction.	**5**	This unit focuses on human physiology, covering the circulatory system (heart function, blood groups), neuroendocrine system (endocrine glands and functions), excretory system (kidney structure, nephron), nervous system (neuron structure, nerve impulse), respiratory system (lung structure, gas exchange), digestive enzymes, and muscle contraction mechanisms.	2, 3, 4, 5

Text Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.

Reference Books:

1. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
2. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C.
3. Brown Publishers

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Discuss biological sciences, its scope and perspectives.	2,6,4
2	Discuss regarding the ecological energetics, its working mechanism, identification of organisms.	3,9,7
3	Analyse the mechanism of transfer of character from parent to next generation.	1,3,5
4	Explain the genetic code and production of proteins.	2,9
5	Interprets the relation between various physiological processes of our body	10,12

SEMESTER – III									
Course Title	**English for Employability for Engineers**								
Course code	**22UBPD213R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To capacitate the students with mastery over Basic English grammar. 2. To enable the students to communicate confidently with a focus on listening and speaking skills. 3. With the help of the basics of Phonetics, the students will be able to pronounce words correctly. 4. To interact successfully and with decorum.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Parts of Speech Articles Auxiliary Verbs Affirmative and Negative Sentences	**5**	In this module, students will master the foundational elements of grammar. They will explore the parts of speech, including nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions, and interjections. Understanding articles (definite and indefinite) and their correct usage will be emphasized. Students will learn about auxiliary verbs and their role in forming tenses, voices, and moods. The module will also cover the construction of affirmative and negative sentences, helping students to build grammatically correct and meaningful sentences.	1, 2
II	Determiners Sentence Construction Types of Sentences (Assertive, Imperative, etc.) Degree of Comparison Comprehension Exercises	**5**	Building on the basics, this module will delve into determiners and their functions in sentences. Students will learn sentence construction techniques and the different types of sentences (assertive, imperative, interrogative, and exclamatory). The concept of the degree of comparison (positive, comparative, and superlative) will be explored. The module will also include comprehension	2, 3, 4

			exercises designed to enhance students' ability to understand and interpret written texts effectively	
III	What is listening? The Process of Listening Factors that adversely affect Listening Difference between Listening and Hearing, Purpose and Importance of Effective Listening How to Improve Listening Process.	**5**	Students will be introduced to the fundamentals of listening, distinguishing it from hearing. They will study the process of listening and identify factors that adversely affect it. The module will highlight the purpose and importance of effective listening and provide strategies to improve the listening process. By understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	1, 2, 3, 4
IV	Introducing yourself Self-discovery Basics of Phonetics, pronunciation Extempore speech Video Recording for Self reflection	**10**	This module focuses on developing students' speaking abilities. They will learn how to introduce themselves and engage in self-discovery to build confidence. Basics of phonetics and pronunciation will be covered to ensure clear and correct speech. Students will practice extempore speech to improve their ability to speak spontaneously. Video recording for self-reflection will be used as a tool for students to evaluate and improve their speaking skills.	1, 2
V	Introduction to Communication, Importance of Communication Skills, Purpose of Communication, Types of Communication, Formal and informal communication Importance of Communication, Barriers to Communication, How to improve/ tips to improve Communication skills. Responding to different questions in various situations (formal/informal)	**5**	Students will gain a comprehensive understanding of communication and its significance. The module will cover the types and purposes of communication, distinguishing between formal and informal contexts. Students will learn about the importance of communication skills and the barriers that can impede effective communication. Tips and strategies to improve communication skills will be provided. The module will also include exercises on responding to different questions in various situations, enhancing students' adaptability and effectiveness in both formal and informal interactions.	2, 3, 4, 5

Text Books:

1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.
2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first

edition, S. Chand & Company Ltd.: New Delhi.

Reference Books:

1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India
2. Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a high IELTS speaking and listening score. Book + CD-ROM, Delta Publishing by Klett

Other Learning Resources:

1. https://youtu.be/bEB8-SWMYhI
2. https://youtu.be/-zZau_dttRY

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	2,6,3
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	3,9,8
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	1,3,9
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	2,9,4
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	10,12

SEMESTER – III									
Course Title	**Introduction to Civil Engineering**								
Course code	**22BTCM215R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering. 2. to motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness. 3. To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.								
CO1	Gaining practical and theoretical experience in conducting independent research on any Civil Engineering subject, as well as in oral and written presentations, in team work and in self-discipline								
CO2	Explore the scope of various disciplines of Civil Engineering.								
CO3	The student will learn about role of transportation as well as of water and its conservation								
CO4	Ability to define construction management, environmental issues and the sustainable development.								
CO5	Assess possible avenues of career and entrepreneurial opportunities in the Civil Engineering profession.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Basic Understanding**: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. **History of Civil engineering**: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers. **Overview of National Planning for Construction and Infrastructure Development**; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for	**5**	This unit covers basics of corrosion and other structural distress mechanisms, focusing on simple rehabilitation systems. It introduces non-destructive testing methods and discusses the use of carbon fibre wrapping and composites in structural repairs.	1, 2

	infrastructure works.			
II	**Fundamentals of Architecture & Town Planning**: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities **Fundamentals of Building Materials**: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes **Basics of Construction Management & Contracts Management**: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management.	**10**	This unit highlights typical software applications in civil engineering such as Finite Element Method, Computational Fluid Dynamics, and Computational Geotechnical Methods. It includes software for highway design (MX), Building Information Modelling (BIM), and various other tools like SAP, STAAD, ABAQUS, MATLAB, and AUTOCAD.	2, 3, 4
III	**Environmental Engineering & Sustainability**: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction. **Geotechnical Engineering**: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling. **Hydraulics, Hydrology &Water Resources Engineering**: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects. **Ocean Engineering**: Basics of Wave and Current Systems; Sediment	**5**	Industry professionals present case studies of large civil engineering projects, covering comprehensive planning through commissioning. Topics include project management strategies, challenges faced, and solutions implemented.	1, 2, 3, 4

	transport systems; Ports & Harbours and other marine structures			
IV	**Power Plant Structures**: Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects **Structural Engineering**: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies; **Surveying & Geomatics**: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR; **Traffic &Transportation Engineering**: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and FreightTransportation; Road Safety under heterogeneous traffic; Sustainable and resilientpavement materials, design, construction and management; Case studies and examples.	**5**	This unit explores professional ethics, entrepreneurial opportunities, and encourages creative and innovative approaches in civil engineering. It enhances technical writing skills and discusses facilities management, quality assurance, and health, safety, and environment (HSE) systems in construction.	1, 2
V	**Repairs & Rehabilitation of Structures:** Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non- Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs. **Computational Methods, IT, IoT in Civil Engineering:** Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD,	**5**	This unit focuses on sustainability principles in civil engineering, addressing environmental, social, and economic aspects. It covers sustainable construction materials and practices, energy-efficient design, and green building certifications. Topics include lifecycle assessment, carbon footprint reduction strategies, and renewable energy integration in infrastructure projects. Case studies highlight successful sustainable initiatives and their impact on the built environment.	2, 3, 4, 5

	ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD,…GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM, …) **Industrial lectures**: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning; **Basics of Professionalism**: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction			

Text Books:

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. Avtarsingh (2002), Law of Contract, Eastern Book Co.
3. Dutt (1994), Indian Contract Act, Eastern Law House.

Reference Books:

1. Anson W.R.(1979), Law of Contract, Oxford University Press
2. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on
3. UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
4. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
5. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
6. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency.
7. The National Building Code, BIS, (2017).
8. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Gaining practical and theoretical experience in conducting independent research on any Civil Engineering subject, as well as in oral and written presentations, in team work and in self-discipline	2,6,4
2	Explore the scope of various disciplines of Civil Engineering.	3,9,7
3	The student will learn about role of transportation as	1,3,5

	well as of water and its conservation	
4	Ability to define construction management, environmental issues and the sustainable development.	2,9
5	Assess possible avenues of career and entrepreneurial opportunities in the Civil Engineering profession.	10,12

SEMESTER – III									
Course Title	**PDE and transform mathematics**								
Course code	**22BTCM216R**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**2**	**1**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To familiarize the students with Laplace Transform, Fourier Transform, their application, logic group, sets, lattices, Boolean algebra and Karnaugh mapso make connections between the various branches of science. 2. It aims to present the students with standard concepts and tools. 3. This course delves into the theory and applications of Partial Differential Equations (PDEs) and Transform Mathematics, providing students with a strong foundation in these fundamental mathematical concepts.								
CO1	Understand the concept and application of transform calculus in solving various complex problems.								
CO2	Understand the basic principles of set theorem and apply them in solving different complex problems.								
CO3	Understand and apply the concepts of proposition logic.								
CO4	Understand the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems.								
CO5	Understand apply the concept of graphs.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Transform Calculus -1 Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness,	10	This unit covers polynomials, including orthogonal polynomials like Lagrange's and Chebyshev polynomials, as well as trigonometric polynomials. It introduces the Laplace Transform, its properties, and the Laplace transform of periodic functions. Methods for finding the inverse Laplace transform, the convolution theorem, and the evaluation of integrals using Laplace transforms are also discussed. Applications of the Laplace Transform in solving ordinary differential equations (ODEs) and partial differential equations (PDEs) are included.	1, 2

	completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.			
II	Transform Calculus-2 Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications. Sets, relations and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.	10	This unit focuses on Fourier transforms, Z-transforms, and Wavelet transforms, covering their properties, methods, inverses, and applications. It also delves into set theory, exploring basic operations on sets, Cartesian products, disjoint unions (sums), and power sets. Different types of relations and functions, along with their compositions and inverses, are also examined.	2, 3, 4
III	Partially ordered sets: Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	10	The propositional logic section addresses syntax, semantics, proof systems, satisfiability, validity, soundness, completeness, and the deduction theorem. Decision problems of propositional logic and an introduction to first-order logic and theory are also included. The unit then explores partially ordered sets, including concepts like complete partial ordering, chains, lattices, and Boolean lattices.	1, 2, 3, 4
IV	Algebraic Structures: Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operationsring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	5	This unit covers algebraic structures with one binary operation, such as semigroups, monoids, and groups. Topics include cosets, Lagrange's theorem, normal subgroups, homomorphic subgroups, congruence relations, and quotient structures. The unit also introduces error-correcting codes and algebraic structures with two binary operations, such as rings, integral domains, fields, Boolean algebra, and Boolean rings, with definitions and simple examples.	1, 2
V	Introduction to Counting: Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination,	10	This unit introduces basic counting techniques, including inclusion and exclusion, the pigeonhole principle, permutations, combinations, and summations. It also covers recurrence	2, 3, 4, 5

	summations. Introduction to recurrence relation and generating functions. Introduction to Graphs: Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.		relations and generating functions. The introduction to graphs section explores basic properties of graphs, such as degrees, paths, cycles, subgraphs, isomorphism, Eulerian and Hamiltonian walks, and trees.	

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

3. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.

4. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

5. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.

Reference Books:

1. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
2. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
3. N. Deo, Graph Theory, Prentice Hall of India, 1974.
4. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
5. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concept and application of transform calculus in solving various complex problems.	2,6,3
2	Understand the basic principles of set theorem and apply them in solving different complex problems.	3,9,8
3	Understand and apply the concepts of proposition logic.	1,3,9
4	Understand the concept of algebraic structures including Boolean algebra and Boolean ring and apply them in understanding complex problems.	2,9,4
5	Understand apply the concept of graphs.	10,12

SEMESTER – III									
Course Title	**Techno Professional Skill 2**								
Course code	**22BTCM217R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with advanced AutoCAD skills necessary for civil engineering projects, enhancing their technical proficiency and professional competency. Develop students' ability to create precise engineering drawings and detailed designs, fostering attention to detail and accuracy in their work. Enhance problem-solving and critical thinking abilities through practical AutoCAD applications, preparing students for real-world engineering challenges.								
CO1	Demonstrate proficiency in using AutoCAD tools for creating complex civil engineering drawings.								
CO2	Apply advanced AutoCAD techniques to design detailed structural plans and layouts.								
CO3	Develop the ability to interpret and convert conceptual sketches into precise digital drawings.								
CO4	Integrate AutoCAD skills with other engineering tools and software for comprehensive project development.								
CO5	Exhibit improved problem-solving skills and technical knowledge through practical AutoCAD applications.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL**
I	**Introduction to Advanced AutoCAD Features:** Overview of advanced drawing tools, customization options, and productivity features.	4	Master advanced drawing tools and customization features in AutoCAD.	1, 2
II	**Creating Detailed Civil Engineering Drawings:** Techniques for creating detailed structural and architectural drawings, including layering, dimensioning, and annotation.	4	Create precise and detailed civil engineering drawings with advanced techniques.	2, 3
III	**3D Modeling and Visualization:** Introduction to 3D modeling, rendering, and visualization techniques in AutoCAD for civil engineering applications.	4	Develop 3D models and visualize civil engineering designs using AutoCAD.	3, 4
IV	**Integration with Other Tools:** Methods for integrating AutoCAD with other engineering software and tools, including importing/exporting files and collaborative project workflows.	4	Integrate AutoCAD skills with other tools for comprehensive engineering project development.	4, 5
V	**Practical Applications and Projects:** Hands-on projects and case studies to apply AutoCAD skills in real-world civil engineering scenarios, including project presentation and documentation.	4	Apply AutoCAD skills in practical projects, demonstrating problem-solving and technical proficiency.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate proficiency in using AutoCAD tools for creating complex civil engineering drawings.	5, 7
2	Apply advanced AutoCAD techniques to design detailed structural plans and layouts.	8
3	Develop the ability to interpret and convert conceptual sketches into precise digital drawings.	7.9,10
4	Integrate AutoCAD skills with other engineering tools and software for comprehensive project development.	11,12
5	Exhibit improved problem-solving skills and technical knowledge through practical AutoCAD applications.	10

SEMESTER – III									
Course Title	**Material Testing and Evaluation**								
Course code	**22BTCM218R**	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			1	**1**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Provide students with all information concerning principle, way of measurement, as well as practical application of mechanical characteristics. 2. Make measurements of behavior of various materials used in Civil Engineering. 3. Introduce experimental procedures and common measurement instruments, equipment, devices giving exposure to a variety of established material testing procedures and techniques. 4. Make measurements of behavior of various materials used in Civil Engineering								
CO1	Describe the various engineering materials, their qualities, and how they are made								
CO2	Identify the mechanical behavior and characteristics, the strength characteristics, and the history of fracture mechanics. Metals can deform in both elastic and plastic ways								
CO3	Perform mechanical testing on a range of metals, including iron, steel, and various non-ferrous metals. Additional mechanical testing includes impact testing, background fracture toughness research, creep, and fatigue research								
CO4	Discuss the methods used to evaluate soils, bitumen, bitumen blends, bricks, sand, concrete, and other materials								
CO5	Identify the mechanical characteristics and qualities of special materials, metals, cementitious materials, composites, and polymers								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT 1- Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete), Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geotextiles,	10	This unit provides an overview of various engineering materials essential in civil engineering. It covers different types of cements, M-Sand, and various forms of concrete such as plain, reinforced, steel fibre/glass fibre-reinforced, lightweight, high-performance, and polymer concrete. The unit also delves into ceramics, refractories, bitumen, asphaltic materials, timbers, glass, plastics, structural steel, and other metals. Additionally, it discusses paints, varnishes, acoustical materials, and geotextiles, highlighting their properties and applications in construction.	1, 2
II	UNIT 2- Introduction to Material Testing covering, What is the "Material Engineering"?; Mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic	10	This unit introduces material engineering and its significance, focusing on the mechanical behaviour and characteristics of materials. It explains elasticity and plastic deformation in metals, standards for tensile testing of different materials,	2, 3, 4

	deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on), True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics;		and the interpretation of true stress-strain curves. The unit also covers hardness tests, bending and torsion tests, the strength of ceramics, and the fundamentals of internal friction and creep.	
III	UNIT 3- Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.	5	This unit addresses the brittle fracture of steel, particularly focusing on the temperature transition approach. It provides background knowledge on fracture mechanics, discusses fracture toughness testing for various materials, and introduces the concept of material fatigue. The unit also covers structural integrity assessment procedures using fracture mechanics principles.	1, 2, 3, 4
IV	UNIT 4-Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures	10	This unit covers the standard procedures and laboratory practices for mechanical testing. It includes discussions on mechanical testing methods, naming systems for various irons, steels, and nonferrous metals. The unit explores elastic and plastic deformation, impact tests, and transition temperatures, emphasizing the importance of these tests in material evaluation	1, 2
V	UNIT 5-Testing of polymers and polymer-based materials, tests and testing of metals, special materials, composites and cementitious materials. Explanation of mechanical behaviour of these materials.	10	This unit focuses on the testing of polymers and polymer-based materials, as well as metals, special materials, composites, and cementitious materials. It explains the mechanical behaviour of these materials and the specific tests used to evaluate their properties, providing a comprehensive understanding of their performance in engineering applications.	2, 3, 4, 5

TextBooks:

1. S. Delhi. Peter Domone and J. M. Illston. (2018), Construction Materials: Their Nature and Behaviour", Taylor & Francis
2. SK Duggal, Building materials(2019), New Age Publishers
3. Materials Testing and Evaluation for Civil Engineering, by K. Subramanian, Oxford
4. University Press (2019)

Reference Books:

1. Material Testing for Civil Engineering, by E.A. Avallone (McGraw-Hill, 2009)

2. Materials Testing for Civil and Construction Engineers, by A.G. Kulkarni and R.T. Johns (CRC Press, 2011)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe the various engineering materials, their qualities, and how they are made	2,6,8
2	Identify the mechanical behavior and characteristics, the strength characteristics, and the history of fracture mechanics. Metals can deform in both elastic and plastic ways	3,9,5
3	Perform mechanical testing on a range of metals, including iron, steel, and various non-ferrous metals. Additional mechanical testing includes impact testing, background fracture toughness research, creep, and fatigue research	1,7,9
4	Discuss the methods used to evaluate soils, bitumen, bitumen blends, bricks, sand, concrete, and other materials	9,1,8
5	Identify the mechanical characteristics and qualities of special materials, metals, cementitious materials, composites, and polymers	10,12,6

SEMESTER III									
Course Title	**CO CURRICULAR ACTIVITIES**								
Course code	**22UBCC211**	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology Civil Engineering**								
Semester	**Fall/ IV semester of the second year of the program**								
Course Objectives (Minimum 3)	1. Complement classroom education by integrating practical experiences and hands-on activities that reinforce and expand upon academic concepts. 2. Develop essential skills such as problem-solving, critical thinking, communication, and collaboration through structured, curriculum-aligned activities. 3. Encourage students to explore their interests and talents, build self-confidence, and cultivate a well-rounded character by participating in diverse co-curricular programs.								
CO1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.								
CO2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.								
CO3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.								
CO4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.								
CO5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.								
Unit-No.	**Content**		**Contact Hour**	**Learning Outcome**					**BL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		**15**	Co-curricular activities enhance students' practical application of academic concepts, critical skills development (problem-solving, communication), foster personal growth (confidence, self-awareness), promote social responsibility through community engagement, and cultivate teamwork and leadership abilities, preparing them for holistic success in academic and social contexts.					3

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate the ability to apply theoretical knowledge from the classroom to real-world situations through hands-on experiences and projects.	1,2,3,4,5,6,10,12
2	Exhibit improved problem-solving, critical thinking, communication, and collaboration skills, essential for both academic and professional success.	1,2,3,4,5,6,10,12
3	Show increased self-confidence, self-awareness, and a well-rounded character by exploring and developing their interests and talents.	1,2,3,4,5,6,10,12
4	Engage in community service and social initiatives, fostering a sense of responsibility, empathy, and active citizenship.	1,2,3,4,5,6,10,12
5	Demonstrate strong teamwork and leadership abilities, learned through participation in group activities and leadership roles within co-curricular programs.	1,2,3,4,5,6,10,12

SEMESTER III									
Course Title	**EXTRA-CURRICULAR**								
Course code	**22UBEC211**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 60P	**0**	**0**	**0**	**4**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Civil Engineering**								
Semester	**Summer/ V semester of the third year of the program**								
Course Objectives (Minimum 3)	1. Develop social and soft skills: Foster the acquisition of interpersonal skills and time management abilities among learners. 2. Promote holistic development: Encourage students to engage in multifaceted activities beyond academics, nurturing their leadership and interests. 3. Facilitate in-depth expression: Provide opportunities for students to articulate their ideas and opinions clearly and critically analyze topics of interest.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**BL**

I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development to the learners, Keeping in mind the3 60 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**8**	Students develop a well-rounded personality, including effective planning, leadership skills, participation in diverse activities, clear expression of ideas, and integration of learning experiences, fostering holistic development.	2,3

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	Course Outcome (CO)	Mapped Program Outcome
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	1,2,3,4,5,9,11,12
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	1,2,3,4,5,9,11,12
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	1,2,3,4,5,9,11,12
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	1,2,3,4,5,9,11,12
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	1,2,3,4,5,9,11,12

SEMESTER – III									
Course Title	**Basic Life Saving Skills**								
Course code	**22UULS212R**	**Total credits: 1** **Total hours: 15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with essential knowledge and skills in basic life-saving techniques, including CPR and first aid. 2. Develop the ability to assess emergency situations and respond effectively to various types of injuries and medical conditions. 3. Foster an understanding of preventive measures and safety protocols to minimize the occurrence of emergencies and enhance overall community safety.								
CO1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).								
CO2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care								
CO3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.								
CO4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.								
CO5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Unit 1: Introduction to Life-Saving Skills** • Importance of life-saving skills • Basic principles of first aid • Legal and ethical aspects of providing first aid • Personal safety and use of protective equipment • Assessing the scene of an emergency	5	This unit covers the importance of life-saving skills and the basic principles of first aid. It discusses the legal and ethical aspects of providing first aid, emphasizing the importance of personal safety and the use of protective equipment. Students will learn how to assess the scene of an emergency to ensure safety and efficiency in providing aid.	1, 2
II	**Unit 2: Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillators (AED)**	5	Students will delve into the anatomy and physiology relevant to CPR, learning the steps for performing CPR on adults, children, and infants. This unit includes the principles and procedures for using	2, 3, 4

	• Anatomy and physiology relevant to CPR • Steps for performing CPR on adults, children, and infants • Use of an AED: principles and procedures • Hands-on practice sessions for CPR and AED use • Recognizing and responding to cardiac emergencies		an AED, with hands-on practice sessions to ensure proficiency. The unit also focuses on recognizing and responding to cardiac emergencies.	
III	**Unit 3: First Aid Techniques** • Managing bleeding, wounds, burns, and fractures • Providing first aid for choking, poisoning, and shock • Practical sessions for bandaging, splinting, and other first aid procedures	5	This unit teaches essential first aid techniques for managing bleeding, wounds, burns, and fractures. Students will learn how to provide first aid for choking, poisoning, and shock. The unit includes practical sessions to practice bandaging, splinting, and other first aid procedures	1, 2, 3, 4
IV	**Unit 4: Emergency Medical Conditions** • Recognizing symptoms of heart attacks, strokes, asthma attacks, and diabetic emergencies • Immediate response actions for medical emergencies • Ongoing care until professional help arrives • Importance of staying calm and effective communication during emergencies	5	Students will explore common medical emergencies such as heart attacks, strokes, asthma attacks, and diabetic emergencies. This unit covers the recognition of symptoms, immediate response actions, and ongoing care until professional help arrives. Emphasis is placed on staying calm and effective communication during emergencies.	1, 2
V	**Unit 5: Safety and Prevention** • Home and workplace safety measures • Fire prevention and electrical safety • Accident prevention strategies • Community safety programs • Advocating for safety and preventive measures within the community	5	The final unit focuses on preventive measures to minimize the occurrence of emergencies. Students will learn about home and workplace safety, including fire prevention, electrical safety, and accident prevention. The unit also covers community safety programs and how to advocate for safety and preventive measures within the community.	2, 3, 4, 5

Textbooks:

1. **"First Aid Manual"** by British Red Cross, St John Ambulance, St Andrew's First Aid, 2016.
2. **"Emergency Care and Transportation of the Sick and Injured"** by American Academy of Orthopaedic Surgeons (AAOS), 2016.
3. **"Advanced First Aid, CPR, and AED"** by American Academy of Orthopaedic Surgeons (AAOS), 2011.

Reference Books:

1. **"Wilderness First Responder: How to Recognize, Treat, and Prevent Emergencies in the Backcountry"** by Buck Tilton, 2010.
2. **"Prehospital Trauma Life Support"** by National Association of Emergency Medical Technicians (NAEMT), 2014.
3. **"Fundamentals of Basic Emergency Care"** by Richard W. O. Beebe, Deborah L. Funk, 2013.
4. **"CPR and AED"** by Alton L. Thygerson, Steven M. Thygerson, 2011.
5. **"Basic Life Support (BLS) Provider Manual"** by American Heart Association, 2020.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Demonstrate proficiency in performing CPR, administering first aid, and using automated external defibrillators (AEDs).	2,3,4
2	Exhibit the ability to quickly assess emergency situations and make informed decisions to provide immediate care	1,2,4
3	Understand and apply basic safety protocols to prevent accidents and handle emergencies efficiently.	3,5,6
4	Display confidence and competence in handling a range of medical emergencies, from minor injuries to life-threatening conditions.	3,2,5
5	Advocate for and promote safety and preventive measures within the community, contributing to a safer environment.	2,3,7

SEMESTER – III									
Course Title	**Personal Financial Planning**								
Course code	**22UUFL213R**	**Total credits: 1** **Total hours: 15T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ III semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Understand the fundamental principles and concepts of personal financial planning. 2. Develop skills in setting SMART financial goals and creating effective budget plans. 3. Gain knowledge of various investment vehicles, their risks, returns, and suitability for different financial goals. 4. Learn strategies for tax-efficient financial planning and retirement savings. 5. Acquire knowledge of estate planning essentials and legal considerations for asset distribution.								
CO1	Ability to create comprehensive personal financial plans aligned with individual goals and values.								
CO2	Proficiency in analyzing and selecting appropriate investment options based on risk tolerance and financial objectives.								
CO3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.								
CO4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.								
CO5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	UNIT 1- Fundamentals of Financial Planning • Principles of financial planning • Setting financial goals • Budgeting and cash flow management	5	This unit covers the foundational principles of financial planning, including setting financial goals, creating budgets, and managing cash flow effectively. It emphasizes the importance of understanding personal financial statements and the role of financial planning in achieving long-term financial security.	1, 2
II	UNIT 2- Investment Planning • Types of investments (stocks, bonds, mutual funds, etc.) • Risk and return analysis • Portfolio management strategies	5	This unit focuses on different types of investments such as stocks, bonds, mutual funds, and real estate. It explores risk and return analysis, asset allocation strategies, and portfolio management techniques to help individuals build and manage their investment portfolios effectively.	2, 3, 4

III	UNIT 3- Retirement Planning • Retirement savings vehicles (401(k), IRA, pension plans) • Estimating retirement needs • Social Security and Medicare considerations	5	TRetirement planning addresses the process of saving and investing for retirement. It covers retirement savings vehicles like 401(k) plans and IRAs, estimating retirement needs based on lifestyle expectations, and navigating Social Security and Medicare benefits to optimize retirement income.	1, 2, 3, 4
IV	UNIT 4- Tax Planning • Tax-efficient investment strategies • Tax deductions and credits • Tax implications of retirement distributions	5	Tax planning involves strategies to minimize tax liabilities and maximize after-tax income. This unit discusses tax-efficient investment strategies, deductions, credits, and tax implications related to retirement contributions, distributions, and estate planning.	1, 2
V	UNIT 5 -Estate Planning • Wills, trusts, and probate • Power of attorney and healthcare directives • Charitable giving and legacy planning	5	Estate planning encompasses the process of managing and distributing assets in accordance with an individual's wishes upon death. It covers essential topics such as wills, trusts, probate, power of attorney, healthcare directives, charitable giving, and strategies for minimizing estate taxes.	2, 3, 4, 5

Textbooks:

1. **"Personal Finance"** by Jeff Madura, 2016.
2. **"Personal Financial Planning"** by Lawrence J. Gitman, Michael D. Joehnk, and Randy Billingsley, 2013.
3. **"Fundamentals of Financial Planning"** by Michael A. Dalton, James F. Dalton, 2011.

Reference Books:

1. **"The Bogleheads' Guide to Retirement Planning"** by Taylor Larimore, Mel Lindauer, Richard A. Ferri, Laura F. Dogu, 2009.
2. **"The Financial Planning Workbook: A Practical Guide to Creating Your Own Financial Plan"** by Coventry House Publishing, 2018.
3. **"The Millionaire Next Door: The Surprising Secrets of America's Wealthy"** by Thomas J. Stanley, William D. Danko, 2010.
4. **"Your Money or Your Life: 9 Steps to Transforming Your Relationship with Money and Achieving Financial Independence"** by Vicki Robin, Joe Dominguez, 2008.
5. **"Smart Couples Finish Rich: 9 Steps to Creating a Rich Future for You and Your Partner"** by David Bach, 2009.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Ability to create comprehensive personal financial plans aligned with individual goals and values.	2,3,4
2	Proficiency in analyzing and selecting appropriate investment options based on risk tolerance and financial objectives.	1,2,4
3	Competence in managing cash flow, budgeting effectively, and optimizing financial resources.	3,5,6
4	Capability to navigate tax laws and regulations to minimize tax liabilities and maximize savings.	3,2,5
5	Understanding of estate planning strategies to protect and transfer wealth according to personal wishes and legal requirements.	2,3,7

SEMESTER – III									
Course Title	**MOOCS-III THE AGE OF SUSTAINABLE DEVELOPMENT**								
Course code	**22UBPD224R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To provide students with a comprehensive understanding of the principles, theories, and frameworks of sustainable development and their application to global challenges. 2. To equip students with the knowledge and skills to address environmental, economic, and social sustainability issues through practical applications and case studies. 3. To enable students to critically evaluate integrated and interdisciplinary approaches to sustainable development and develop effective strategies for policy integration and governance.								
CO1	Understand the definitions, principles, and historical context of sustainable development, as well as the global challenges addressed by the Sustainable Development Goals (SDGs).								
CO2	Apply knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to address environmental sustainability challenges.								
CO3	Analyze economic sustainability concepts, including sustainable economic growth, green economy, and corporate social responsibility, and evaluate case studies of sustainable economic practices.								
CO4	Apply principles of social sustainability to promote social equity, community participation, education for sustainable development, and overall health and well-being.								
CO5	Evaluate integrated approaches to sustainable development, including interdisciplinary and transdisciplinary methods, systems thinking, and sustainable urban planning, and assess the effectiveness of policy integration and governance.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**KL**

I	**Introduction to Sustainable Development** • Definition and Principles of Sustainable Development • Historical Context and Evolution of the Concept • Global Challenges and Sustainable Development Goals (SDGs) • Key Theories and Frameworks • Case Studies of Sustainable Development Initiatives	7	Students will understand the definitions, principles, and historical context of sustainable development, and recognize the significance of global challenges addressed by the Sustainable Development Goals (SDGs), supported by relevant case studies.	1,2
II	**Environmental Sustainability** • Ecosystem Functions and Services • Biodiversity Conservation • Climate Change: Science, Impacts, and Mitigation • Renewable Energy Sources and Technologies • Environmental Policy and Legislation	7	Students will apply their knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to propose and implement solutions for environmental sustainability challenges.	1,2
III	**Economic Sustainability** • Sustainable Economic Growth • Green Economy and Circular Economy • Corporate Social Responsibility (CSR) and Ethical Business Practices • Economic Instruments for Environmental Management • Case Studies of Sustainable Economic Practices	7	Students will analyze concepts related to sustainable economic growth, green economy, corporate social responsibility, and economic instruments for environmental management, and evaluate case studies demonstrating sustainable economic practices.	1,2
IV	**Social Sustainability** • Social Equity and Justice • Community Development and Participation • Education for Sustainable Development • Health and Well-being • Cultural Dimensions of Sustainability	7	Students will apply principles of social sustainability to promote social equity and justice, enhance community participation, support education for sustainable development, and improve health and well-being.	1,2
V	**Integrated Approaches to Sustainable Development**	7	Students will evaluate integrated approaches to sustainable development, including	1,2

	• Interdisciplinary and Transdisciplinary Approaches • Systems Thinking and Resilience • Sustainable Urban Planning and Development • Policy Integration and Governance for Sustainability • Monitoring and Evaluation of Sustainable Development Projects		interdisciplinary and transdisciplinary methods, systems thinking, sustainable urban planning, and the effectiveness of policy integration and governance for sustainability.	

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

5. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
6. Fast track Objective mathematics for Competitive exam by Arihant
7. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the definitions, principles, and historical context of sustainable development, as well as the global challenges addressed by the Sustainable Development Goals (SDGs).	**5, 7**
2	Apply knowledge of ecosystem functions, biodiversity conservation, and renewable energy technologies to address environmental sustainability challenges.	**8**

3	Analyze economic sustainability concepts, including sustainable economic growth, green economy, and corporate social responsibility, and evaluate case studies of sustainable economic practices.	**7.9,10**
4	Apply principles of social sustainability to promote social equity, community participation, education for sustainable development, and overall health and well-being.	**11,12**
5	Evaluate integrated approaches to sustainable development, including interdisciplinary and transdisciplinary methods, systems thinking, and sustainable urban planning, and assess the effectiveness of policy integration and governance.	**10**

MAPPING TABLE (3RD SEM)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM211R	Engineering Mechanics	3	3	1	1	1		1					1
22BTCM212R	Engineering Geology	2	3	2	1	1	1	1					1
22BTCM213R	Biology for Engineers	3	3	1	1	1		1					1
22BTCM214R	Computer Aided Design (CAD)	3	2	2	3	2	1				1		
22BTCM215R	Introduction to Civil Engineering	3	3	1	1	1		1					1
22BTCM216R	PDE and transform mathematics	2	3	2	1	1	1	1					1
22BTCM217R	Techno-Professional Skills II	3	3	1	1	1		1					1
22BTCM218R	Material Testing and Evaluation	3	2	2	3	2	1				1		
22UBPD213R	English for Employability for Engineers	3	3	1	1	1		1					1
22UBCC211	Co-curricular	2	3	2	1	1	1	1					1

22UBEC211	Extra-curricular	3	3	1	1	1		1					1
22UULS212R	Basic Life Saving Skills	3	2	2	3	2	1				1		
22UUFL213R	Personal Financial Planning	3	3	1	1	1		1					1

SEMESTER – IV										
Course Title	**Basic Electronics for Civil Engineering Application**									
Course code	**22BTCM225R**	**Total credits: 3** **Total hours: 30T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	4. Understand the principles of electronic components, circuits, and semiconductor devices relevant to civil engineering applications. 5. Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 6. Acquire proficiency in digital electronics, including the understanding and application of logic gates for civil engineering applications. 7. Improve problem-solving skills through hands-on exercises and practical application of electronic principles in civil engineering projects. 8. Apply acquired knowledge in projects, designing and implementing electronic systems tailored for specific civil engineering applications.									
CO1	Attain foundational knowledge in electronic components, circuits, and semiconductor devices.									
CO2	Analyze electronic applications in civil engineering for infrastructure design and maintenance									
CO3	Attain digital electronics expertise, including logic gates, for civil engineering applications.									
CO4	Enhance problem-solving with hands-on application of electronic principles in civil projects									
CO5	Apply knowledge in projects, design tailored electronic systems, fostering practical skills.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	***Introduction to Electronics and Circuit Fundamentals*** ● Overview of electronics and its relevance to civil engineering ● Basic electronic components: resistors, capacitors, inductors	**7**	Understand basic electronic components and fundamental circuit analysis techniques using Ohm's Law and Kirchhoff's Laws in the context of civil engineering applications.	1,2

	● Ohm's Law, Kirchhoff's Laws, and circuit analysis Series and parallel circuits			
II	***Semiconductor Devices and Diodes*** ● Introduction to semiconductor materials ● Diodes and their applications in civil engineering ● Zener diodes and voltage regulation Rectifiers and power supply basics	**7**	Comprehend the properties and applications of semiconductor materials and diodes, including rectification and voltage regulation in civil engineering.	1,2
III	***Transistors and Amplifiers*** ● Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs) ● Transistor amplifiers and amplifier configurations Operational amplifiers (Op-amps) and their applications	**7**	Learn the operation and applications of BJTs, FETs, and operational amplifiers, and their use in designing transistor amplifiers and amplifier configurations.	1,2
IV	***Sensors and Instrumentation in Civil Engineering*** ● Overview of sensors and transducers ● Types of sensors relevant to civil engineering Data acquisition systems and instrumentation	**7**	Gain knowledge of various sensors and transducers, their applications in civil engineering, and the principles of data acquisition systems and instrumentation.	1,2
V	***Digital Electronics and Control Systems*** ● Basics of digital electronics ● Logic gates and digital circuits Introduction to control systems in civil engineering applications	**7**	Understand the basics of digital electronics, logic gates, digital circuits, and the introduction of control systems for civil engineering applications.	1,2
Practical	1. To study about the components used in electronics laboratory 2. To Study the V-I characteristics of Forward Biased PN junction diode. 3. To Study the Reverse characteristics of Zener diode. 4. To Study the working of a diode as half wave rectifier with and without filter 5. To Study the working of a diode as full wave rectifier with and without filter. 6. To study the input and output characteristic of in CE configuration.	**30**	Describe, illustrate and explain and apply the concepts of electronics engineering in engineering prospect.	1,2, 3,4

	7. To study and verify the truth table of logic gates. 8. Practical Implementation of Electronic circuit based 35 projects in real world			

TEXT BOOKS:

1. **Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky**
2. **Introduction to Control System Technology" by Robert N. Bateson**

REFERENCE BOOKS:

1. **Basic Electronics, Santiram Kal, Prentice Hall**
2. **Basic Electronics, BL Thareja, S.Chand Publishing**
3. **All-in-One Electronics Simplified, A.K. Maini, Khanna Book Publishing**

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Attain foundational knowledge in electronic components, circuits, and semiconductor devices	**1,3 & 4**
2	Analyze electronic applications in civil engineering for infrastructure design and maintenance	**1,2**
3	Attain digital electronics expertise, including logic gates, for civil engineering applications.	**7.9,10**
4	Enhance problem-solving with hands-on application of electronic principles in civil projects	**5,7**
5	Apply knowledge in projects, design tailored electronic systems, fostering practical skills.	**5,8**

SEMESTER – IV

Course Title	Environmental Science								
Course code	22UBPD226R	Total credits: 2 Total hours: 30T	L	T	P	S	R	O/F	C
			2	0	0	0	0	0	2
Pre-requisite	Nil	Co-requisite	Nil						
Programme	B.Tech Civil Emgineering								
Semester	Fall/ IV semester of second year of the programme								

Course Objectives (Minimum 3)

1. This course provides students with a comprehensive overview of fundamental ecological principles, environmental chemistry, biodiversity conservation, and the impacts of human activities on the environment.

2. Through a blend of theoretical knowledge and practical applications, students delve into the complexities of pollution, resource management, and sustainable development. The course emphasizes the interconnectedness of ecological systems, aiming to cultivate an understanding of the delicate balance required for environmental harmony.

3. By studying environmental chemistry, biodiversity, and pollution, students develop the skills needed to critically analyze and propose solutions to contemporary environmental challenges.

CO1	Understand the relationships between natural and man-made systems.
CO2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.
CO4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment
CO5	Analyse various aspects of human population, and the impact of the population growth on the environment.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	To Develop a comprehensive understanding of the components of the environment, including the atmosphere, hydrosphere, lithosphere, and biosphere. Gain knowledge of the structure and composition of these systems, as well as the principles governing life systems, metabolic processes, and the diversity of plant and animal life.	**6**	Develop a holistic understanding of the environment's components and principles governing life systems, metabolic processes, and biodiversity.	1,2
II	To Acquire proficiency in ecological concepts, including terminology, ecosystem structure and function, mineral cycling, energy flow, trophic chains, and the development and evolution of ecosystems. Understand the relationships between different components of ecosystems and their ecological roles.	**6**	Acquire proficiency in ecological terminology, ecosystem structure, energy flow, trophic chains, and understand the relationships between ecosystem components and their ecological roles.	1,2

III	To Develop the ability to analyze environmental pollution by examining its sources, causes, assessment, effects, and methods of prevention and control. Explore strategies for managing different types of pollution, emphasizing the concept of sustainability and the relationships between energy, environment, and human activities.	**6**	Develop the ability to analyze environmental pollution sources, causes, effects, and prevention methods, emphasizing sustainability and the interplay between energy, environment, and human activities.	1,2
IV	To Gain knowledge of the utilization and sustainable management of water and forest resources. Understand the role of human activities in shaping the environment, including the management of rivers, lakes, forests, and wildlife. Explore concepts related to urbanization, green cities, global warming, and carbon sequestration.	**6**	Gain knowledge of sustainable water and forest resource management, understand human impacts on the environment, and explore concepts related to urbanization, global warming, and carbon sequestration.	1,2
V	To Develop awareness of international agreements and protocols addressing global environmental issues. Understand the role of society, non-governmental organizations (NGOs), and government agencies in addressing environmental challenges. Familiarize yourself with national forest policies, environmental laws, acts, and Environmental Impact Assessment (EIA) processes.	**6**	Develop awareness of international agreements and protocols addressing global environmental challenges, understand the roles of society, NGOs, and government agencies, and familiarize oneself with national environmental policies and laws, including Environmental Impact Assessment processes.	1,2

Text Books:

1 H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International.

2 J. G. Henry and G.H. Heinke, Environmental Science and Engineering, Prentice Hall International.

Reference Books:

1 G.M. Masters, Introduction to Environmental Engineering and Science, Pearson Education.

2 R.T. Wright and D.F. Boorse, Environmetal Science Towards a Sustainable Future, PHI Learing.

3 P.A. Vesilind and S.M. Morgan, Introduction to Environmental Engineering, Thomson Books.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Understand the relationships between natural and man-made systems.	**1,3 & 4**
2	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.	**1,2**
3	Understand the consequences of human actions on the web of life, global economy, and quality of human life.	**7.9,10**
4	Understand about Environment Pollution, Global Environment issues, Impact of Human Population and modern civilization on the Environment	**5,7**
5	Analyse various aspects of human population, and the impact of the population growth on the environment.	**5,8**

SEMESTER – IV									
Course Title	**Geotechnical Engineering**								
Course code	**22BTCM224R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. To focus on the study of soil behaviour and properties to design secure foundations, assess slope stability, and conduct geotechnical investigations for construction and environmental projects. 2. To impart knowledge on the various factors governing the Engineering behaviour of soils and the suitability of soils for various Geotechnical Engineering applications. 3. To characterize the failure criteria and to evaluate the shear strength and compressibility parameters of soils.								
CO1	Distinguish various soil type based on their properties and behaviour.								
CO2	Calculate soil parameters of soils at different site condition.								
CO3	Predict the occurrence of failure of sub-soil beneath any foundation.								
CO4	Determine the bearing capacity of soil and possible settlement of the foundation.								
CO5	Test various direct and indirect soil exploration.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	***Introduction***–Origin and types of soils, Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weights voids ratio- moisture content, unit weight- percent air voids, saturation-moisture content, moisture content-specific gravity etc. Determination of various parameters (such as: Moisture content, Specific gravity, Unit weight of soil), Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and Consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit, Classification of Soils.	**11**	Understand the origin, types, and basic properties of soils, and establish relationships between key parameters such as moisture content, unit weights, and void ratios.	1,2
II	***Permeability of Soil***- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method, Seepage Analysis-Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table, Stresses in soils.	**10**	Learn and apply Darcy's law to determine soil permeability using laboratory methods and perform seepage analysis through the construction of flow nets.	1,2
III	***Compression of soil:***Compaction of Soil-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. *Consolidation of Soil* - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation,.	**10**	Grasp the concept of effective stress, analyze the impact of the water table on soil stress, and differentiate between soil compaction and consolidation processes.	1,2
IV	***Shear Strength***- Mohr circle and its	**7**	Analyze soil shear strength using	1,2

	characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, unconfined compression test, vane shear test, Types of slopes and their failure mechanisms, factor of safety, Introduction to of finite and infinite slopes.		Mohr-Coulomb theory and various shear tests, and understand the mechanisms of slope failures and the factor of safety in slope stability.	
V	***Soil Exploration*-** Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trail pits, borings, penetrometer tests, analysis of borehole logs, geophysical methods.	**7**	Acquire knowledge of site exploration methods, soil sampling techniques, and the interpretation of borehole data for geotechnical investigations.	1,2
Practical	1. Moisture content by oven dry method 2. Field density by core cutter method 3. Sieve analysis 4. Liquid limit test by Casagrande Apparatus 5. Plastic limit test 6. Standard compaction test (OMC & MDD) 7. Consolidation test 8. Direct shear test 9. Unconfined compression test	**30**	Describe, illustrate and explain and apply the concepts of geotechnical engineering in engineering prospect.	1,2, 3,4

Text Books:

1. Ranjan G., Rao A.S.R (2011), Basic and Applied Soil Mechanics
2. Saran S. (2015) Analysis and Design of Substructures
3. Punmia B.C. (2005), Soil Mechanics And Foundation Engineering

Reference Books:

1. Soil Mechanics by Craig R.F., Chapman & Hall
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Distinguish various soil type based on their properties and behabior.	**1,3 & 4**
2	Calculate soil parameters of soils at different site condition.	**1,2**
3	Predict the occuarance of failure of sub-soil beneath any foundation.	**7.9,10**
4	Determine the bearing capacity of soil and possible settlement of the foundation.	**5,7**
5	Test various direct and indirect soil exploration.	**5,8**

SEMESTER – IV									
Course Title	**Introduction to Fluid mechanics**								
Course code	**22BTCM222R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	4. The course introduces fundamental fluid mechanics principles, including fluid statics, fluid dynamics, and flow measurement, emphasizing their application across various engineering fields such as mechanical, civil, and aerospace engineering. 5. Students engage in theoretical lectures, laboratory experiments, and computational exercises to gain a deep understanding of fluid behavior, enhancing their problem-solving skills and critical analysis of fluid flow phenomena. 6. The course equips students with the knowledge and skills necessary to apply fluid mechanics principles to real-world engineering problems, preparing them for advanced study and professional practice in the field.								
CO1	Determine the various fluid characteristics that affect fluid behaviour.								
CO2	Explain the fluid pressure and about its measurements.								
CO3	Summarize the various fluid flow.								
CO4	Apply the conservation laws for fluids in fluid dynamics.								

CO5	Discuss various non dimensional parameters of fluid flow.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.	**11**	Comprehend fundamental fluid properties such as viscosity, density, surface tension, and compressibility, and understand the distinction between fluids and solids.	1,2
II	Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, UTube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.	**10**	Analyze fluid pressure variations and measure pressure using various manometers and gauges, while understanding hydrostatic forces and buoyancy on submerged and floating bodies.	1,2
III	Fluid Kinematics-Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates	**10**	Classify different types of fluid flow, understand flow patterns and visualization methods, and apply the continuity equation in one, two, and three dimensions.	1,2
IV	Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced	**7**	Apply Euler's and Bernoulli's equations to solve fluid flow problems and analyze forces in practical applications like venturimeters, orifice meters, and pipe bends.	1,2
V	Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.	**7**	Utilize dimensional analysis and understand dimensionless numbers like Reynolds, Froude, Mach, Weber, and Euler for modeling and analyzing fluid flow similarity.	1,2
Practical	1. Bernoulli's Theorem 2. Discharge Over Notches ● Triangular ● Rectangular 3. Impact Of Jet On Vanes ● Flat ● Hemispherical 4. Flow Through Orifice And Mouthpiece	**30**	Describe, illustrate and explain and apply the properties of fluid in engineering prospect.	1,2, 3,4

	5. Reynolds's Number Determination 6. Losses Due To Pipe Friction 7. Determination of metacentric height of a given ship model			

Text Books:

1. Dr. D.S. Kumar , "Fluid Mechanics and Fluid Power Engineering".

2. Dr. R.K.Bansal, " A textbook on Fluid Mechanics and Hydraulic Machines", Laxmi Publication ltd

3. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.

Reference Books:

1. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House.
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Determine the various fluid characteristics that affect fluid behaviour.	**1,3 & 4**
2	Explain the fluid pressure and about its measurements.	**1,2**
3	Summarize the various fluid flow.	**7.9,10**

4	Apply the conservation laws for fluids in fluid dynamics.	**5,7**
5	Discuss various non dimensional parameters of fluid flow.	**5,8**

SEMESTER – IV									
Course Title	**SOLID MECHANICS**								
Course code	**22BSB221R**	**Total credits: 3** **Total hours: 35T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Introduce to continuum mechanics and material modelling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design 2. To understand analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system. 3. Understanding, modelling and design of a large range of engineering materials								
CO1	Relate and describe the strain and strain produced by engineering materials when they are subjected to various forms of stress.								
CO2	Summarize the equations of equilibrium for constructing the shear force and bending moment diagrams for different types of loads on cantilever and simply supported beams.								
CO3	Identify the principal stresses, maximum shearing stresses and angles acting on any arbitrary plane within a structural element using Mohr's circle method.								
CO4	Apply the knowledge of theories of failure, shear force and bending moment relations for analyzing the flexural stress, shear stress distributions and failure of beam sections.								
CO5	Understand the concept of torsion and buckling of thin shells, spheres, etc. to determine the stresses at various points of geometry.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.	**7**	Understand the fundamental concepts of stress and strain, including their types, relationships, and applications in various loading conditions.	1,2

	:Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.			
II	Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.	**7**	Analyze and construct bending moment and shear force diagrams for various beam configurations and loading conditions to determine critical values and points of contraflexure.	1,2
III	Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections. Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.	**7**	Apply the theory of simple bending and shear stress distribution to calculate stresses in different beam sections and design simple beam sections.	1,2
IV	Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.	**7**	Utilize moment-area and Macaulay's methods to determine the slope and deflection in determinate beams.	1,2
V	Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs, Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.	**7**	Derive and apply torsion equations for circular shafts, analyze combined torsion and bending stresses, and calculate stresses in thin-walled cylinders and spheres under internal pressure.	1,2

Text Books: Example

1 Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2 Solid Mechanics by Dr. Utasv Chandra Kalita

Reference Books: Example

1 Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.

2 Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979

3 Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Relate and describe the strain and strain produced by engineering materials when they are subjected to various forms of stress.	**1,3 & 4**
2	Summarize the equations of equilibrium for constructing the shear force and bending moment diagrams for different types of loads on cantilever and simply supported beams.	**1,2**
3	Identify the principal stresses, maximum shearing stresses and angles acting on any arbitrary plane within a structural element using Mohr's circle method.	**7.9,10**
4	Apply the knowledge of theories of failure, shear force and bending moment relations for analyzing the flexural stress, shear stress distributions and failure of beam sections.	**5,7**
5	Understand the concept of torsion and buckling of thin shells, spheres, etc. to determine the stresses at various points of geometry.	**5,8**

SEMESTER – IV									
Course Title	**Surveying and Geomatics**								
Course code	**22BTCM223R**	**Total credits: 4** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**1**	**0**	**0**	**0**	**4**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. The course equips students with essential theoretical knowledge and practical skills required for surveying and geomatics, preparing them for careers in engineering and land management industries. 2. Students gain hands-on experience in modern surveying techniques, enhancing their ability to apply these skills in real-world geospatial data analysis and mapping. 3. The curriculum is designed to prepare students for professional success, enabling them to excel in various applications of surveying and geomatics within engineering and land management sectors.								
CO1	Use of various surveying instruments and mapping								
CO2	Explain Methods of Leveling and setting Levels with different instruments								
CO3	Explain the principle and working of theodolitefor measuring angles in vertical and horizontal planes.								
CO4	Apply the methods of radiation and intersectionfor obtaining an area enclosed with in the traverse								
CO5	Discuss the concept and principle of modern surveying.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. **Measurement of Distances and Directions** **Linear distances-** Approximate methods,	**11**	Understand the fundamental principles, classifications, and objectives of surveying, including the use of scales, conventional symbols, and various surveying accessories.	1,2

	Direct Methods- Chains- Tapes, ranging, Tape corrections. **Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination and dip.			
II	**Leveling-** Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction. **Contouring-** Characteristics and uses of Contours, methods of contour surveying. **Areas -**Determination of areas consisting of irregular boundary and regular boundary. **Volumes -**Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.	**10**	Acquire skills in measuring linear distances and directions using chains, tapes, and prismatic compasses, and comprehend corrections for tape measurements and the impact of magnetic declination.	1,2
III	**Theodolite Surveying:** Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible. **Traversing:** Methods of traversing, traverse computations and adjustments, Omitted measurements.	**10**	Master different leveling techniques, including the use of various types of levels and levelling staves, and understand the methods and applications of contour surveying.	1,2
IV	**Curves:** Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves. **Tachometric Surveying:** Principles of Tacheometry, stadia and tangential methods of Tacheometry, **Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.	**7**	Learn to calculate areas with irregular and regular boundaries and determine the volumes of earthwork in different contexts, such as cutting, embankments, borrow pits, and reservoir capacities.	1,2
V	**Photogrammetry Surveying:**Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic	**7**	Apply advanced surveying methods using theodolites, traverse computations, curves, tacheometry, and modern instruments like EDM, total stations, and GPS, along with understanding the principles and	1,2

	mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.		applications of photogrammetry.	
Practical	1. To range a line more than one chain length and recording the details in a field book. 2. Profile leveling and cross section leveling with Dumpy level. 3. Trigonometric Constant 4. Close Compass Traversing to plot the existing layout or built up area 5. Measurement of horizontal and angles with Theodolite 6. Measurement of vertical angles with Theodolite 7. Contouring of a given area by method of grid and prepare the contour map of that area.	**30**	Describe, illustrate and explain and apply the concepts of surveying in engineering prospect.	1,2, 3,4

Text Books:

1. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Reference Books:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Use of various surveying instruments and mapping	**1,3 & 4**
2	Explain Methods of Leveling and setting Levels	**1,2**

	with different instruments	
3	Explain the principle and working of theodolitefor measuring angles in vertical and horizontal planes.	**7.9,10**
4	Apply the methods of radiation and intersectionfor obtaining an area enclosed with in the traverse	**5,7**
5	Discuss the concept and principle of modern surveying.	**5,8**

SEMESTER – IV									
Course Title	**Basic Acclimatizing Skills (BAS)**								
Course code	**22UULS201R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 20P	**0**	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	Unit 1- Introduction to Accommodation Management • Telephone handling technique • Organizing of Rooms. • Cleaning equipments and uses. • Bed making Process.	**4**	Develop skills in telephone handling, room organization, cleaning equipment usage, and bed-making processes.	1,2
II	Unit-2- Fundamental of Cooking • Uses of basic cooking equipments • Uses of fire & Fuel • Different cuts of vegetables • Uses of herbs & spices • Regional Food Habits	**4**	Gain proficiency in using basic cooking equipment, fire, and fuel, as well as preparing different cuts of vegetables, utilizing herbs, spices, and understanding regional food habits.	1,2
III	Unit 3- Food and Beverage skills • Introduction to catering industry • Types menus and beverages • Identifications of Cutlery, crockery & glassware • Table etiquettes or manners • Customer handling skills or Situation Handling	**4**	Understand catering industry basics, menu types, beverage identification, table etiquette, and customer handling skills.	1,2
IV	Unit 4- Travel management • Travel Documentation (Types) • Application of passport & Visa • Tourism products (UNESCO sites) • Types of logistics in travel and tourism management	**4**	Learn about travel documentation, passport and visa applications, tourism products like UNESCO sites, and various logistics in travel and tourism management.	1,2
V	Unit 5- Basic Hospitality Skills • Various Egg Preparations • Canapés preparations • Mocktail & Shakes Preparations • Butter Rice / Lemon Rice • Various Lentils Preparations • 1 non-veg preparation/ 1 veg preparation	**4**	Master various egg preparations, canapés, mocktails, shakes, rice dishes, lentil preparations, and both vegetarian and non-vegetarian dishes.	1,2

Text Books:

1. Arora K (2011). Theory of cookery, Frank brothers & company (pub) pvt ltd-New Delhi.

2. Bruce H. Axler, Carol A. Litrides (2010) Food and Beverage Service Volume 1 of Wiley Professional Restauranteur, Guides.

3. Mohammed Zulfikar (2010) - Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.

Reference Books

1..Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – IV									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities								

	and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**30**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt	**5, 7**

	effectively in diverse environments and situations.	
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7.9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – IV									
Course Title	**ENGLISH LANGUAGE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD224R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								

CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.			
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** i. Introduction of pipes and cistern iii.Solving different types of questions iv. Workshee1 and Worksheet 2	**7**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Workshee1 and Worksheet 2	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement Iv. Workshee1 and Worksheet 2	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2

	Sitting arrangement (puzzle) i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Workshee1			
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Workshee1 and Worksheet 2	**7**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

1. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
2. Fast track Objective mathematics for Competitive exam by Arihant
3. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**

2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – IV									
Course Title	**Extra-curricular Activities**								
Course code	**22UBEC221**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of second year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								

CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.			
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.	**30**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality	**7.9,10**

	development.	
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

SEMESTER – IV									
Course Title	**Techno Professional Skills-III**								
Course code	**22BTCM227R**	**Total credits: 2** **Total hours: 20P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**2**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ IV semester of first year of the programme**								
Course Objectives (Minimum 3)	Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.								
CO1	Understand the basic principles and standards of engineering graphics.								
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.								
CO3	Create accurate and detailed 2D engineering drawings of civil structures.								
CO4	Interpret and visualize engineering designs through graphical representation.								
CO5	Apply engineering graphics skills in practical civil engineering projects.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of orthographic projection, multi-view drawing, and sectional views.	6	Create accurate orthographic projections and sectional views of civil structures.	3, 4
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and	6	Interpret and visualize engineering designs through	4, 5

	perspective drawings. Visualization of 3D objects on 2D planes.		isometric and perspective drawings.	
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic principles and standards of engineering graphics.	**5, 7**
2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

SEMESTER – IV									
Course Title	**MOOCS IV-Excel Skills for Business: Essentials**								
Course code	**22MOCE221R**	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 15T	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Summer/ V semester of second year of the programme**								
Course	Introduce the fundamental concepts and interface of Excel.								

Objectives (Minimum 3)	Teach data manipulation and analysis techniques in Excel. Develop skills for creating and customizing data visualizations. Equip students with advanced Excel functions and macro automation. Apply Excel skills to real-world business scenarios.
CO1	Navigate and utilize the Excel interface for basic data management tasks.
CO2	Manipulate and analyze complex datasets using advanced Excel functions.
CO3	Create clear and impactful data visualizations.
CO4	Automate repetitive tasks with macros and advanced functions.
CO5	Apply Excel skills to financial modeling, budgeting, forecasting, and other business applications.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Unit 1: Introduction to Excel** This unit introduces the basics of Excel, including the user interface, navigation, and essential functions. Students will learn how to create, save, and open workbooks, enter and edit data, and use basic formulas. This unit lays the foundation for more advanced Excel skills, ensuring students are comfortable with the fundamental operations and tools available in Excel.	**3**	Upon completing this unit, students will be able to confidently navigate the Excel interface, understanding the structure of workbooks and worksheets. They will acquire basic data entry skills and learn essential formatting techniques to manage data effectively.	1, 2
II	**Unit 2: Data Management and Analysis** Students will delve into data management techniques, including sorting, filtering, and using Excel tables. This unit covers data validation, conditional formatting, and the use of functions for data analysis such as SUM, AVERAGE, COUNT, and IF statements. The focus is on organizing and analyzing data efficiently to extract meaningful insights.	**3**	This unit will enable students to manipulate and analyze data efficiently within Excel. They will learn to sort and filter data, use advanced functions such as VLOOKUP and HLOOKUP, and apply data validation techniques to ensure data accuracy.	1, 2, 3, 4
III	**Unit 3: Advanced Formulas and Functions** Building on the basics, this unit introduces more advanced formulas and functions. Students will learn about VLOOKUP, HLOOKUP, INDEX, MATCH, and complex nested formulas. This unit also covers text functions, date and time functions, and logical operators, enabling students to perform sophisticated data manipulations and analyses.	**3**	Students will gain the ability to create and customize various types of charts and graphs, essential for effective data visualization. They will learn to use pivot tables and pivot charts to summarize large datasets and generate meaningful visual representations. The unit will also emphasize best practices for designing clear and impactful visualizations, which are crucial for business reports and presentations. By the end of this unit, students will be proficient in visually communicating data insights and findings.	1, 2, 3, 4, 5

IV	**Unit 4: Data Visualization with Charts and Graphs** Effective data visualization is crucial for business reporting and decision-making. This unit teaches students how to create and customize various types of charts and graphs in Excel, including bar charts, line charts, pie charts, and scatter plots. Students will learn how to use chart elements, formatting options, and design principles to present data clearly and effectively.	**3**	In this unit, students will be introduced to advanced Excel functions and the use of macros to automate repetitive tasks. They will learn complex functions such as INDEX and MATCH, array formulas, and logical functions like IF, AND, and OR.	2, 3, 4
V	**Unit 5: PivotTables and PivotCharts** PivotTables and PivotCharts are powerful tools for summarizing and analyzing large datasets. In this unit, students will learn how to create, format, and manipulate PivotTables and PivotCharts to explore data from different perspectives. The unit covers grouping, filtering, and using calculated fields to enhance data analysis.	**3**	The final unit will focus on applying Excel skills to real-world business scenarios. Students will learn to create financial models, perform budgeting and forecasting, and conduct what-if analysis using tools like Scenario Manager and Goal Seek.	2, 3, 4, 5

Textbooks:

1. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, 2018.
2. "Microsoft Excel 2019 Step by Step" by Curtis Frye, 2018.
3. "Excel 2016 in Depth" by Bill Jelen, 2015.

Reference Books:

1. "Excel Data Analysis: Modeling and Simulation" by Hector Guerrero, 2018.
2. "Excel Formulas and Functions for Dummies" by Ken Bluttman and Peter G. Aitken, 2018.
3. "Pivot Table Data Crunching" by Bill Jelen and Michael Alexander, 2016.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Navigate and utilize the Excel interface for basic data management tasks.	1,4,7
2	Manipulate and analyze complex datasets using advanced Excel functions.	2,3,5
3	Create clear and impactful data visualizations.	3,7,9
4	Automate repetitive tasks with macros and advanced	6,8,10

	functions.	
5	Apply Excel skills to financial modeling, budgeting, forecasting, and other business applications.	10,12,4

MAPPING TABLE (4TH Semester)

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM221R	Solid Mechanics	3	2	3	1	1	1	1					1
22BTCM222R	Introduction to Fluid mechanics	3	3	3	2					1		1	1
22BTCM223R	Surveying and Geomatics	3	3	2	2	2				1			3
22BTCM224R	Geotechnical Engineering	2	2	1	1	1	1	1					
22BTCM225R	Basic Electronics for Civil Engineering Application	2	2	1	1	3	1	1	1				
22BTCM226R	Environmental Science	3	2	2	3	2	2	2					
22UBPD223R	English Language Proficiency for Engineers	2	2	2	3	2	3	3		1	1		1
22UBCC221	Co-curricular	3	3	2	2	2				1			3
22UBEC221	Extra-curricular	2	2	1	1	1	1	1					
22BTCM227R	Techno-Professional Skills III	2	2	1	1	3	1	1	1				
22MOCE221R	MOOCS III	3	2	2	3	2	2	2					
22UULS221R	Basic Acclimatizing Skills (BAS)	2	2	2	3	2	3	3		1	1		1

SEMESTER – V									
Course Title	**Environmental Engineering**								
Course code	**22BTCM311R**	**Total credits: 3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	0	2	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of third year of the programme**								
Course Objectives (Minimum 3)	1. To understand the basic principles and concepts and processes involved in water and waste water treatment. 2. To develop a student's skill in the basic design of unit operations and processes involved in water and wastewater treatment. 3. To learn the basics of water treatment plant composition and its characteristics 4. To design the structures involved in an water treatment plant								
CO1	Analyze characteristics of water and wastewater								
CO2	Estimate the quantity of drinking water and domestic wastewater generated								
CO3	Identify the components of water supply systems								
CO4	Design sewerage system								
CO5	Plan strategies to control, reduce and monitor pollution.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	1.Water: -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processe	**9**	Understand the implications of water quality parameters on public health and environmental sustainability.	1,2
II	Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems.	**9**	Understand the factors influencing water demand and wastewater generation.	1,2

	Small bore systems, Storm Water-Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.			
III	Air - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations, Noise- Basic concept, measurement and various control methods.	**9**	To be able to explain the role of infrastructure in ensuring reliable and safe water supply.	1,2
IV	Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities, Government authorities and their roles in water supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.	**9**	Understand the principles of gravity flow and hydraulic design in sewerage systems.	1,2
V	Building Plumbing-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.	**9**	To be able to design and implement monitoring programs to track pollution levels in water bodies.	1,2

TEXT BOOKS:

1. Droste R.L., (1997)., Theory and Practice of water wastewater treatment, John Wiley & sons.
2. Garg S.K., (2001), Environmental Engineering, Vols. I and II, 12th Edition, Khanna Publishers, New Delhi.

Reference Books

1. PeavyH.S.,.Rowe D.R and George Tchobanoglous (2001), Environmental Engineering, McGraw-Hill Company, New Delhi.
2. Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition.
3. Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES (PO)

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Analyze characteristics of water and wastewater	**1,2,7&10**
2	Estimate the quantity of drinking water and domestic wastewater generated	**1,3,6&7**
3	Identify the components of water supply systems	**1,2,3,5,6 &7**
4	Design sewerage system	**1,2,3,5&6**
5	Plan strategies to control, reduce and monitor pollution.	**1,2,3,7**

SEMESTER –V									
Course Title	Mechanics of Materials								
Course code	22BTCM312R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum	1. 1. Mechanics of Materials gives the student basic tools for stress, strain and deformation analysis. 2. Methods for determining the stresses, strains and deformations produced by applied loads								

3)	are presented. 3. Engineering design concepts are integrated throughout the course
CO1	Learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
CO2	Infer the mechanism of load transfer in beams, the induced stress resultants and deformations.
CO3	Estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.
CO4	Explain the effect of torsion on shafts and springs.
CO5	Analyze plane trusses using method of joint and the method of section.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	***Deformation and Strain covering description of finite deformation, Infinitesimal deformation:*** *Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder;* ***Generalized state of stress and strain:*** *Stress and strain tensor, Yield criteria and theories of failure; Tresca, Von-Mises, Hill criteria, Heigh-Westerguard's stress space.*	**9**	To be able to describe and differentiate between finite and infinitesimal deformation in materials.	1,2
II	*Momentum Balance and Stresses covering Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States / Failure Criterion* *Mechanics of Deformable Bodies covering Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate Trusses*	**9**	Understand the principles of momentum balance in the context of mechanical structures.	1,2
III	***Force-Stress-Equilibrium covering***	**9**	Analyze stress-strain-temperature relationships and	1,2

	Multiaxial Stress and Strain ***Displacement –*** *Strain covering Multiaxial Strain and Multiaxial Stress-strain Relationships Elasticity and Elasticity Bounds covering Stress-strain-temperature Relationships and Thin-walled Pressure Vessels, Stress and strain Transformations and Principal Stress, Failure of Materials*		their implications in thin-walled pressure vessels.	
IV	*Stress and Strains; Deflections and Torsion covering Pure Bending, Moment-curvature Relationship, Beam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams, Shear and Torsion, Torsion and Twisting, Thermo elasticity, Energy methods, Variational Methods; Strain energy, elastic, complementary and total strain energy, Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems, Castigliano's theorem, Maxwell Bettie's reciprocal theorem; Virtual work and unit load method for deflection, Application to problems of beams and frames*	**9**	Analyze pure bending in beams and derive the moment-curvature relationship.	1,2
V	***Structural stability:*** *Stability of columns, Euler's formula, end conditions and effective length factor, Columns with eccentric and lateral load; Plasticity and Yield Design covering 1D-Plasticity – An Energy Approach, Plasticity Models, Limit Analysis and Yield Design*	**9**	Apply limit analysis and yield design principles to ensure the structural integrity and safety of materials and structures.	1,2

Text Books:

1. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455
2. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979. ISBN: 9780070662308

Reference Books:

1. Gere, J. M. Mechanics Of Materials. 2Ed (Pb 2004)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.	**1,3 & 4**
2	Infer the mechanism of load transfer in beams, the induced stress resultants and deformations.	**1,2**
3	Estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.	**7,9,10**
4	Explain the effect of torsion on shafts and springs.	**5,7**
5	Analyze plane trusses using method of joint and the method of section.	**5,8**

SEMESTER – V									
Course Title	Construction Materials and Methods								
Course code	22BTCM313R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. Introduction to Construction Materials 2. Construction Methods and Systems 3. Construction Details and Specifications								
CO1	Give examples on various materials commonly used in civil engineering construction and their properties.								
CO2	Explain various types of binding and constituent materials used in construction.								
CO3	Summarize the manufacturing and testing of concrete.								

CO4	Distinguish the various materials used in construction.
CO5	Infer the varying modern materials incorporated in construction practice.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	INTRODUCTION; Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.	**9**	Identify and differentiate common construction materials and their applications.	1,2
II	PLANNING AND ORGANIZING CONSTRUCTION SITE AND RESOURCES: Resource allocation, resource aggregation and resources levelling	**9**	Explain construction methods for different building elements.	1,2
III	PERT CPM AND GERT NETWORKS: concepts of PERT, CPM and GERT, analysis of network and determining the critical path and duration of the network	**9**	Analyze and select materials and methods based on project requirements.	1,2
IV	CONTRACTS MANAGEMENT BASICS AND CONSTRUCTION COSTS: Make up of construction costs including capital costs operational costs and life cycle cost	**9**	Describe and apply safe construction practices and regulations.	1,2
V	COST ANALYSIS TECHNIQUES: Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety.	**9**	Interpret and communicate effectively using construction drawings and specifications.	1,2

Text Books:

1. Saurabh Kumar Soni (2013), “Building construction and management”, S.K Kataria and Sons.
2. Denis Lock (2010), “Project management in construction”, Pearson Education,
3. Sidney M. Levy (2009), “project control and Practice”, Pearson Education,

Reference Books:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.

2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.

4. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.

5. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Give examples on various materials commonly used in civil engineering construction and their properties.	**1,3 & 4**
2	Explain various types of binding and constituent materials used in construction.	**1,2**
3	Summarize the manufacturing and testing of concrete.	**7.9,10**
4	Distinguish the various materials used in construction.	**5,7**
5	Infer the varying modern materials incorporated in construction practice.	**5,8**

SEMESTER – V									
Course Title	Transportation Engineering								
Course code	22BTCM314R	**Total credits:3** **Total hours: 45T+30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	0	2	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. To introduce the students about different classifications/types of roads 2. To explain the students about different geometric features of highways 3. To describe about traffic characteristics and traffic control devices 4. To describe about different pavement materials, their properties and laboratory experiments. 5. To describe about different design phenomenon of pavement design								
CO1	Describe different types of roads, its administration and highway survey techniques								

CO2	Determine ideal road alignment in different topographies and design different geometric features of flexible and rigid pavement.
CO3	Perform traffic survey to collect data required for traffic regulations and control
CO4	Discuss about different materials and their suitability to be used in construction of road.
CO5	Design various components of flexible and rigid pavements as per the latest code of practice.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Highway development and planning** Classification of roads, road development inIndia, Current Road projects in India; highway alignment, Highway Survey, and project preparation	**9**	Understand the classification of roads and the historical and current road development projects in India.	1,2
II	**Geometric design of highways** Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems	**9**	Learn the principles of geometric design, including the cross-section elements of highways and sight distance requirements.	1,2
III	**Traffic engineering & control** Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems	**9**	Design road intersections, parking facilities, and highway lighting, and learn traffic regulation and control techniques.	1,2
IV	**Highway Materials and Construction** Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification – Concrete Mix Design, construction of bituminous and rigid pavements, Highway Maintenance – Material recycling	**9**	Understand the components, functions, and design principles of rigid pavements, and solve design problems as per IRC standards.	1,2
V	**Design of pavements-** Introduction; flexible pavements, factors	**9**	To be introduced to the factors affecting the design and	1,2

	affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements-components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.		performance of flexible pavements, including stress analysis and IRC design standards	

Text Books:

1. S.K.Khanna, C.E.G.Justo, (2001) " Highway Engineering", Nem Chand & Bros, Roorkee.
2. Rao.G.V., (2005) "Principles of Transportation and Highway Engineering", Tata McGraw Hill Co.

Reference Books:

2. L.R.Kadiyali, (2003) "Principles and Practice of Highway Engineering", Khanna Publishers.
3. ParthaChakroborthy, Animesh Das, (2005) "Principles of Transportation Engineering", Prentice-Hall of India.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe different types of roads, its administration and highway survey techniques	**1,3 & 4**
2	Determine ideal road alignment in different topographies and design different geometric features of flexible and rigid pavement.	**1,2**
3	Perform traffic survey to collect data required for traffic regulations and control	**7.9,10**
4	Discuss about different materials and their suitability to be used in construction of road.	**5,7**
5	Design various components of flexible and rigid pavements as per the latest code of practice.	**5,8**

SEMESTER – V									
Course Title	**Hydrology and Water Resource Engineering**								
Course code	22BTCM315R	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	1	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	• To study occurrence movement and distribution of water that is a prime resource for development of a civilization. • To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology. • To know the basic principles and movement of ground water and properties of ground water flow.								
CO1	Remember the key drivers on water resources, hydrological processes and their integrated behavior in catchments.								
CO2	Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph								
CO3	Explain the concept of hydrological extremes such as flood and drought and its management strategies								
CO4	Apply the concepts of groundwater for water resources management								
CO5	Understand the importance of spatial analysis of rainfall and design water storagereservoirs								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction:** hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data	**9**	Understand the components and processes of the hydrologic cycle and apply the water-budget equation to various scenarios.	1,2
II	**Precipitation:** forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, deptharea-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India, evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction,	**9**	Apply depth-area-duration relationships, analyze maximum intensity/depth-duration-frequency relationships, and estimate probable maximum precipitation (PMP).	1,2

	evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices			
III	**Runoff:** runoff volume, SCS-CN method of estimating runoff volume, flowduration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.	**9**	Estimate runoff volume using methods like the SCS-CN method and analyze flow-duration and flow-mass curves.	1,2
IV	**Ground water:** forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.	**9**	Analyze well hydraulics, including steady-state flow in wells, equilibrium equations for confined and unconfined aquifers, and conduct aquifer tests.	1,2
V	**Dam and Spillway:** embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site	**9**	Analyze forces on gravity dams, causes of failure, and stress analysis, and understand the design of arch and buttress dams, components of spillways, and reservoir management, including sedimentation and economic considerations.	1,2

Text Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.

Reference Books:

1. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
2. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill

3. G L Asawa, Irrigation Engineering, Wiley Eastern

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Remember the key drivers on water resources, hydrological processes and their integrated behavior in catchments.	**1,3 & 4**
2	Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph	**1,2**
3	Explain the concept of hydrological extremes such as flood and drought and its management strategies	**7.9,10**
4	Apply the concepts of groundwater for water resources management	**5,7**
5	Understand the importance of spatial analysis of rainfall and design water storagereservoirs	**5,8**

SEMESTER – V									
Course Title	**Construction Engineering & Management**								
Course code	22BTCM316R	**Total credits:3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	0	0	0	0	0	3
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Engineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. To train the students with the latest and the best in the rapidly changing fields of Construction Engineering, Technology and Management. **2.** To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry. **3.** To continually work with industry to enhance the program's effectiveness and the opportunities for innovation in the construction industry. **4.** To conduct research to develop advanced technologies and management approaches								

CO1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.
CO2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.
CO3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.
CO4	Analyze and manage construction contracts, encompassing a comprehensive understanding of construction costs considerations.
CO5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	INTRODUCTION**;** Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.	**9**	Learn to define work tasks, precedence relationships among activities, estimate activity durations, resource requirements, and use coding systems effectively.	1,2
II	PLANNING AND ORGANIZING CONSTRUCTION SITE AND RESOURCES: Resource allocation, resource aggregation and resources levelling	**9**	Apply resource leveling methods to optimize the use of resources on construction sites.	1,2
III	PERT CPM AND GERT NETWORKS: concepts of PERT, CPM and GERT, analysis of network and determining the critical path and duration of the network.	**9**	Understand the concepts of PERT, CPM, and GERT for project scheduling and management.	1,2
IV	CONTRACTS MANAGEMENT BASICS AND CONSTRUCTION COSTS: Make up of construction costs including capital costs operational costs and life cycle cost	**9**	Comprehend the components of construction costs, including capital, operational, and life cycle costs.	1,2
V	COST ANALYSIS TECHNIQUES: Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety.	**9**	Apply statistical quality control methods, including sampling by attributes and variables, and learn total quality control techniques to ensure high standards in construction projects.	1,2

Text Books:

1. Saurabh Kumar Soni (2013), “Building construction and management”, S.K Kataria and Sons.
2. Denis Lock (2010), “Project management in construction”, Pearson Education,
3. Sidney M. Levy (2009), “project control and Practice”, Pearson Education,

Reference Books:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.

2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.

4. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.

5. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.	**1,3 & 4**
2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.	**1,2**
3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.	**7.9,10**
4	Analyze and manage construction contracts, encompassing a comprehensive understanding of construction costs considerations.	**5,7**
5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.	**5,8**

SEMESTER – V									
Course Title	**Hydraulics Engineering**								
Course	**22BTCM317R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**

code		**Total hours: 30T**	2	0	0	0	0	0	2
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	• To introduce the importance of study of open channel flow, to give brief description on different types of flows and channels and hydraulic design principles of channels. • To learn the fundamentals of Uniform and Non-Uniform flow in open channels. • To understand about the concepts of specific energy, critical flow and their applications. • To give an idea about the gradually varied flow and rapidly varied flow and their equations and computations.								
CO1	Summarize the boundary layer analysis and their separation.								
CO2	Illustrate the flow occurring in open channel and velocity distribution.								
CO3	Assess energy equation and momentum equation with respect to uniform flow.								
CO4	Summarize characteristics of surface profile by graphical and numerical approach in non-uniform flow.								
CO5	Compile models related to hydraulic jump and web based modeling in water resource engineering								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**Laminar Flow**- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. **Turbulent Flow**- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. **Boundary Layer Analysis**-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and	**6**	Comprehend the transition from laminar to turbulent flow, define turbulence, and analyze its effects using Prandtl's mixing length theory, Reynolds stresses, and Moody's diagram.	1,2

	Control.			
II	**Dimensional Analysis and Hydraulic Similitude:** Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem. **Introduction to Open Channel Flow-** Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.	**6**	Analysis of laminar and turbulent boundary layers on a flat plate, understand local and average friction coefficients, and learn about boundary layer separation and control.	1,2
III	**Uniform Flow-**Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient "n" Most economical section of *ch*annel. Computation of Uniform flow, Normal depth. **Non-Uniform Flow-** Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Direct integration method	**6**	Application of dimensional homogeneity using Rayleigh and Buckingham's Pi methods, and understand the formation and application of dimensionless groups.	1,2
IV	**Hydraulic Jump-** Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel,	**6**	Comparison of open channel flow with pipe flow, understand geometrical parameters and classification of open channels.	1,2

	length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,			
V	**Flow through Pipes:** Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.	**6**	Application the continuity, energy, and momentum equations to characterize uniform flow using Chezy's and Manning's formulas, and compute normal depth.	1,2

Text Books:

1. Open channel Flow, K. Subramanya, Tata McGraw Hill.
2. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House

Reference Books:

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
2. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**

1	Summarize the boundary layer analysis and their separation.	**5, 7**
2	Illustrate the flow occurring in open channel and velocity distribution.	**8**
3	Assess energy equation and momentum equation with respect to uniform flow.	**7.9,10**
4	Summarize characteristics of surface profile by graphical and numerical approach in non-uniform flow.	**11,12**
5	Compile models related to hydraulic jump and web based modeling in water resource engineering	**10**

SEMESTER – V									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC311	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360	**15**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by	1,2

	degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.		experts.	

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

SEMESTER –V									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	**22UBCC221**	**Total credits: 1** **Total hours: 15P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	0	4	0	0	1
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtUhas included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the	**15**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1,2

	degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7,9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**
5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – V									
Course Title	**Competent English for Engineers**								
Course code	**22UBPD314R**	**Total credits: 2** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	0	4	0	0	0	2
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ V semester of Third year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing,								

	constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** ii. Introduction of pipes and cistern iii.Solving different types of questions iv. Workshee1 and Worksheet 2	**6**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Workshee1 and Worksheet 2	**6**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism	**6**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2

	ii.Statement and conclusion Iii. Course of action based on statement Iv. Workshee1 and Worksheet 2			
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Workshee1	**6**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt) **Profit loss and discount** i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Workshee1 and Worksheet 2	**6**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving exercises in linear, circular, and matrix arrangements.	1,2

Text Books:

4. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
5. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
6. A Modern Approach to Logical Reasoning All Exams
7. General Mental Ability & Logical Reasoning Compendium

Reference Books:

8. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
9. Fast track Objective mathematics for Competitive exam by Arihant
10. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**
3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7, 9&10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – V	
Course Title	**Techno Professional Skills-IV**

Course code	22BTCM317R	Total credits: 2 Total hours: 20P	L	T	P	S	R	O/F	C
			0	0	2	0	0	0	1
Pre-requisite	Nil	Co-requisite	Nil						
Programme	B.Tech Civil Engineering								
Semester	Fall/ V semester of first year of the programme								
Course Objectives (Minimum 3)	1. Introduce students to the fundamental principles and techniques of engineering graphics relevant to civil engineering. 2. Develop students' ability to create accurate and detailed engineering drawings using basic graphical tools. 3. Enhance spatial visualization skills and the ability to interpret engineering designs through graphical representation.								
CO1	Understand the basic principles and standards of engineering graphics.								
CO2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.								
CO3	Create accurate and detailed 2D engineering drawings of civil structures.								
CO4	Interpret and visualize engineering designs through graphical representation.								
CO5	Apply engineering graphics skills in practical civil engineering projects.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction to Engineering Graphics:** Overview of engineering graphics, drawing standards, and conventions. Importance in civil engineering.	6	Understand the principles and standards of engineering graphics.	1, 2
II	**Basic Drawing Tools and Techniques:** Introduction to drawing instruments, scales, and basic construction techniques. Use of lines, angles, and geometric shapes.	6	Develop proficiency in using basic drawing tools and techniques.	2, 3
III	**Orthographic Projections:** Principles of orthographic projection, multi-view drawing, and sectional views.	6	Create accurate orthographic projections and sectional views of civil structures.	3, 4
IV	**Isometric and Perspective Drawing:** Techniques for creating isometric and perspective drawings. Visualization of 3D objects on 2D planes.	6	Interpret and visualize engineering designs through isometric and perspective drawings.	4, 5
V	**Practical Applications and Projects:** Hands-on projects involving the creation of detailed engineering drawings for civil engineering applications.	6	Apply engineering graphics skills in practical civil engineering projects.	5

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the basic principles and standards of engineering graphics.	**5, 7**
2	Develop proficiency in using basic drawing tools and techniques for civil engineering applications.	**8**
3	Create accurate and detailed 2D engineering drawings of civil structures.	**7.9,10**
4	Interpret and visualize engineering designs through graphical representation.	**11,12**
5	Apply engineering graphics skills in practical civil engineering projects.	**10**

MAPPING TABLE (5TH SEM)

Subject Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM311R	Environmental Engineering	3	3	2	2	2	2	3					
22BTCM312R	Mechanics of Materials	3	2	2	2	2	2	1					2
22BTCM313R	Structural Analysis I	3	2	3	1	1	1	1					3
22BTCM314R	Transportation Engineering	3	3	3	1	2	2	2					2
22BTCM315R	Hydrology and Water Resource Engineering	3	2	3	2	2		1					2
22BTCM316R	Construction Engineering& Management	3	3	2		2	2						3
22BTCM317R	Hydraulics Engineering	3	2	2	2	3	3	2					2
22UBPD314R	Competent English for	3	2	3	2	2		1					2

	Engineers												
22UBCC311	Co-curricular	3	3	2		2	2						3
22UBEC311	Extra-curricular	3	2	2	2	3	3	2					2
22MOCE221R	MOOCS IV-Excel Skills for Business: Essentials	3	2	3	2	2		1					2
22BTCM317R	Techno-Professional Skills IV												

SEMESTER – VI										
Course Title	**Design of RC Structure**									
Course code	**22BTCM321R**	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
			2	**1**	**0**	**0**	**0**	**0**	**3**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ VI semester of third year of the programme**									
Course Objectives (Minimum 3)	The objective of the teacher is to impart knowledge and abilities to the students to: 1. Develop an understanding and appreciation for basic concepts in the behavior and design of reinforced concrete systems and elements. 2. Differentiate between working stress design and limit state design. 3.Understand the basic concepts for reinforced concrete sectional design mainly in accordance with ultimate strength. 4.Assess the structural and material behavior for the design of reinforced concrete systems and elements.									
CO1	Understand the general mechanical behavior of reinforced concrete in accordance with IS456:2000.									
CO2	Identify and apply the applicable industry design codes relevant to the design of reinforced concrete members.									
CO3	Analyze and design reinforced concrete flexural members with detailing.									
CO4	Design and check for serviceability (crack and deflection) and ultimate limit state conditions.									
CO5	Assess the stresses and design vertical and horizontal shear reinforcements in reinforced concrete members with detailing.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**BL**
I	Concepts of RC. Design – Working Stress Method - Limit State method – Material StressStrain Curves – Safety factors – Characteristic values. Stress Block parameters – IS – 456 –2000. Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections	**10**	Upon completion of the course, students will demonstrate proficiency in applying both the Working Stress Method and the Limit State Method in the design of reinforced concrete structures, including beams, columns, slabs, and footings.	1, 2
II	Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing; Design of canopy.	**10**	Students will be able to analyze and design reinforced concrete beams for both flexural and shear capacities using appropriate IS code provisions. They will also be competent in designing various types of columns under axial loads, uniaxial bending, and biaxial bending scenarios.	1, 2, 3, 4
III	Short and Long columns – under axial loads, uniaxial bending and biaxial bending – I S Code provisions.	**8**	By the end of the course, students will have acquired skills in detailing reinforced concrete elements such as beams and footings, ensuring compliance with design specifications and structural integrity requirements.	1, 2, 3, 4, 5

IV	Footings: Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.	**7**	Students will be capable of designing different types of footings (isolated, square, rectangular, circular, and combined footings) to support varying loads and soil conditions. They will also be proficient in designing one-way slabs, two-way slabs, and continuous slabs, considering IS coefficients and limit state design principles.	2, 3, 4
V	Design of one-way slab, Two-way slabs and continuous slab Using I S Coefficients Limit state design for serviceability for deflection, cracking and codal provision. Design of doglegged staircase.	**10**	Upon completion of the course, students will be able to assess and design reinforced concrete structures while ensuring compliance with safety factors, characteristic values, and codal provisions related to serviceability criteria such as deflection, cracking, and durability.	2, 3, 4, 5

Text Books:

1 Reinforced concrete design by by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.

2. Limit state designed of reinforced concrete – P. C. Varghese, Prentice Hall of India,New Delhi.

3. Limit state designed of reinforced concrete – P. C. Varghese, Prentice Hall of India, New Delhi

Reference Books:

1. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand &

company.

2. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers

3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W.

Dolar, Tata McGraw-Hill, 3rd Edition, 2005.

OTHER LEARNING RESOURCES:

Design Of Reinforced Concrete Structures - Course (nptel.ac.in)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the general mechanical behavior of reinforced concrete in accordance with IS456:2000.	**1,3 & 4**
2	Identify and apply the applicable industry design codes	**1,2**

	relevant to the design of reinforced concrete members.	
3	Analyze and design reinforced concrete flexural members with detailing.	**7.9,10**
4	Design and check for serviceability (crack and deflection) and ultimate limit state conditions.	**5,7**
5	Assess the stresses and design vertical and horizontal shear reinforcements in reinforced concrete members with detailing.	**5,8**

SEMESTER – VI									
Course Title	**Engineering Economics, Estimation and Costing**								
Course code	**22BTCM322R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**2**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Summarize the basic principal and standard methods for working out quantities in estimating. 2. Demonstrate the detailed estimate of buildings and workout rate analysis of the various items ofwork. 3. Understand the material requirements as per specified norms and standards 4. Assess the valuation of buildings and provide practical knowledge of standard specifications of items of buildings construction.								
CO1	Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses								
CO2	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure								
CO3	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.								
CO4	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.								
CO5	Detailed estimate of minor structure and deriving an approximate estimate for a multi-storeyed building by approximate methodsand preparation of valuation report in standard Government form								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve	**5**	Demonstrate proficiency in estimating quantities for various construction materials and activities using industry-standard methods.	1, 2
II	Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control –	**5**	Understand the importance and application of specifications in different types of construction projects.	1, 2, 3, 4

	Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial.Case Study Method. Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment– Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.			
III	*Estimation* / Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying	**10**	Be capable of conducting rate analysis for accurate cost estimation and budgeting.	1, 2, 3, 4, 5
IV	Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures. Rate analysis-Purpose,	**5**	Gain practical skills in preparing tender documents, including bid price formulation and contract management.	2, 3, 4

	importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity			
V	Tender- Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management. Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights	**5**	Acquire knowledge of relevant legal aspects and Acts related to construction contracts and labor rights in the industry.	2, 3, 4, 5

Text Books:

1. Mankiw Gregory N. (2002), *Principles of Economics,* Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics,* Tata McGraw Hill
3. Misra, S.K. and Puri (2009), *Indian Economy,* Himalaya
T4. Pareek Saroj (2003), *Textbook of Business Economics,* Sunrise Publishers

Reference Books:

1. M Chakravarty, Estimating, Costing Specifications & Valuation
2. Joy P K, Handbook of Construction Management, Macmillan
3. B.S. Patil, Building & Engineering Contracts
4. Relevant Indian Standard Specifications.

OTHER LEARNING RESOURCES:

Engineering Economic Analysis - Course (nptel.ac.in)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping

SN	Course Outcome (CO)	Mapped Program Outcome
1	Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses	1,3 & 4
2	Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure	1,4
3	Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	7.9,10
4	Be able to understand how competitive bidding works and how to submit a competitive bid proposal.	5,7
5	Detailed estimate of minor structure and deriving an approximate estimate for a multi-storeyed building by approximate methodsand preparation of valuation report in standard Government form	5,8

SEMESTER – VI									
Course Title	**Structural Engineering**								
Course code	22BTCM323R	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Students will develop the ability to analyze statically determinate beams and frames using influence lines and design these structures to withstand specified loads by calculating critical stress resultants. 2. Students will gain proficiency in using Muller Breslau's principle to analyze indeterminate beams and frames, with a focus on understanding the distribution of shear force, bending moment, and support reactions. 3. Students will be equipped to analyze different types of arches and suspension systems, taking into account settlement, temperature effects, and the behavior of cables under various loading conditions, and apply plastic theory to determine plastic moments, plastic moduli, and load factors for statically indeterminate structures.								
CO1	Demonstrate their knowledge of structural mechanics in addressing design problems of structural engineering.								
CO2	Distinguish the varying materials and different loading systems in a structure.								
CO3	Classify structures and explain their behaviour by drawing its components and forces acting on it.								
CO4	Apply the design concepts to develop a R.C.C. members.								
CO5	Explain the basic concepts of special structures.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.	**5**	Upon completing the course, students will demonstrate proficiency in deriving and interpreting influence lines for reactions, shear force, bending moment, and member forces in determinate and indeterminate beams and pin-jointed plane frames.	1, 2

II	Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams	**10**	Students will be able to analyze various types of arch structures, including three-hinged, two-hinged, and fixed arches, considering settlement and temperature effects, and applying equilibrium principles specific to arch geometry.	1, 2, 3, 4
III	Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening gird	**5**	By the end of the course, students will understand the principles governing cables and suspension bridges, including the equilibrium of cables, determination of cable length, and the role of stiffening girders in suspension bridge design.	1, 2, 3, 4, 5
IV	Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders	**5**	Students will gain proficiency in plastic analysis techniques for statically indeterminate structures, including determining plastic moment of resistance, plastic modulus, and understanding the behavior of plastic hinges and mechanisms under loading conditions.	2, 3, 4
V	Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.	**5**	Upon completion, students will be able to apply theoretical concepts such as Muller Breslau's principle, plastic theory, and influence line analysis to solve practical engineering problems related to structural analysis, including beams, arches, cables, and suspension bridges.	2, 3, 4, 5

Text Books:

1. Analysis Of Structures - S. Ramamrutham., DhanpatRai Publishing Co Pvt Ltd
2. Analysis Of Structures - N. Subramanian

Reference Books:

1. Analysis of Indeterminate Structures by C.K. Wang.

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - Structural Analysis II

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate their knowledge of structural mechanics in addressing design problems of structural engineering.	**1,2**
2	Distinguish the varying materials and different loading systems in a structure.	**1,2, 3, 4**
3	Classify structures and explain their behaviour by drawing its components and forces acting on it.	**7.9,10**
4	Apply the design concepts to develop a R.C.C. members.	**5,7**

5	Explain the basic concepts of special structures.	5,8

SEMESTER – VI									
Course Title	**Pavement Materials**								
Course code	22BTCM324E	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Understanding different types of pavement materials and their characteristics 2. To have knowledge about the various tests which need to be carried out on soils, aggregate and bitumen for the design of bituminous mixes and pavements. 3. To understand and enable students to carry out design of bituminous mixes and superpave design								
CO1	Classify different types of soil and different laboratory test to estimate soil strength								
CO2	Explain different tests related to characterization of aggregates								
CO3	Describe different types of bituminous material and their characterization								
CO4	Explain different characteristics of bituminous mixes and design bituminous mixes for various condition								
CO5	Explain different composition of super pave								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Soil: Classification, characterization, evaluation of soil strength-shear test, CBR Test, Plate load test, Triaxial test	**5**	Students will gain proficiency in classifying soils and characterizing aggregates, utilizing a range of testing methods to evaluate their mechanical properties.	1, 2
II	Aggregate: Source, Characterization, Tests on aggregate-Crushing strength test, Abrasion Test, Impact Test, Soundness test, Shape Test, Specific gravity and water absorption test, Stripping value test, Aggregate gradation, voids in aggregates, Cement Concrete	**10**	By completing this lesson, students will be able to identify different types of bitumen, understand their properties, and conduct various tests to assess their suitability for construction applications.	1, 2, 3, 4
III	Bitumen: Source, Characterization, Cutback bitumen, Bitumen emulsion, Tests on bituminous binder-viscosity, ductility, specific gravity, durability, purity, safety	**8**	Upon completion, students will demonstrate competence in designing bituminous mixes, applying rheological models, and optimizing bitumen content to meet specified performance criteria.	1, 2, 3, 4, 5
IV	Bituminous mixes: Mix volumetric, Rheological models for asphalt mix- Two component models, Maxwell model, Kelvin model , Three component models , Generalized models, Linear viscoelasticity , Time-temperature	**10**	Students will learn to apply Superpave concepts in asphalt mix design, including binder and aggregate selection, volumetric analysis, compaction methods, and performance evaluation.	2, 3, 4

	superposition,Selection of Optimum bitumen content, Marshall method, Numerical examples, Mix Specification, Stiffness modulus and fatigue performance of bituminous mix			
V	Concept of Superpave: Components, Binder Selection, Aggregate selection, Superpave volumetrics, Compaction, Evaluation of mix performance	**7**	This lesson aims to integrate theoretical knowledge with practical applications, preparing students for effective utilization of soil, aggregate, bitumen, and bituminous mixes in civil engineering projects.	2, 3, 4, 5

Text Books:

1. Principles of Transportation Engineering- Partha Chakroborty, Animesh Das

2. Pavement Analysis and Design-Yang H Huang

3. Analysis of Pavement Structures- Animesh Das

Reference Books:

1. Principles of Pavement design- Yoder and Witezak

2. IRC: 37-2012 and IRC: 58-2011

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - NOC:Pavement Materials (Under Pavement Engineering)

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Classify different types of soil and different laboratory test to estimate soil strength	**1, 4**
2	Explain different tests related to characterization of aggregates	**2, 3**
3	Describe different types of bituminous material and their characterization	**7.9,10**
4	Explain different characteristics of bituminous mixes and design bituminous mixes for various condition	**5,7**
5	Explain different composition of super pave	**5,8**

SEMESTER – VI										
Course Title	**BUILDING CONSTRUCTION PRACTICE**									
Course code	22BTCM324E	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**	
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**	
Pre-requisite	**Nil**	**Co-requisite**	**Nil**							
Programme	**Bachelor of Technology in Civil Engineering**									
Semester	**Fall: Winter/ VI semester of third year of the programme**									
Course Objectives (Minimum 3)	The course should enable the students to: I. Develop knowledge of material science and behavior of various building materials used in construction. II. Identify the construction materials required for the assigned work. III. Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc. IV. List the requirements and different types of stairs									
CO1	Recognize the various phases associated with simple residential and commercial construction.									
CO2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.									
CO3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.									
CO4	Understand construction procedure of different components									
CO5	Understand the property, use, advantage and disadvantage of different material used in construction.									

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Introduction- Objectives, Requirements Of Foundation, Aim Of Superstructure, Types Of Construction, Aim Of Site Inspection, Laying Out The Building Plan At Site For Foundation	**5**	Understanding the objectives and requirements of foundation construction.	1, 2
II	UNIT II CONSTRUCTION PRACTICES Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.	**10**	Describing the aims and types of superstructure construction	1, 2, 3, 4
III	UNIT III SUB STRUCTURE CONSTRUCTION Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.	**5**	Implementing effective site inspection techniques	1, 2, 3, 4, 5

IV	UNIT IV SUPER STRUCTURE CONSTRUCTION Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.	**5**	Planning and executing the layout of building plans for foundations at a construction site.	2, 3, 4
V	UNIT V CONSTRUCTION EQUIPMENT Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunnelling.	**5**	Applying specifications and coordinating activities for efficient construction practices	2, 3, 4, 5

Text Books:

1 Building construction: metric volume 1 by WR McKay.

2 Fundamentals of building construction: materials and methods by Edward Allen and Joseph Iano.

Reference Books:

1 Building materials and construction book with reference to B.C.Rangawala, Sushil Kumar, B.P.Bindra, A.Kamala.

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - Civil Engineering - Building materials and Construction

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Recognize the various phases associated with simple residential and commercial construction.	**1,3 & 4**
2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.	**1,2**
3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.	**7.9,10**
4	Understand construction procedure of different components	**5,7**

5	Understand the property, use, advantage and disadvantage of different material used in construction.	**5,8**

SEMESTER – VI										
Course Title	**Construction Engineering Materials**									
Course code	22BTCM324E	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. To train the students with the latest and the best in the rapidly changing fields of Construction Engineering, Technology and Management. **2.** To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry. **3.** To continually work with industry to enhance the program's effectiveness and the opportunities for innovation in the construction industry.									
CO1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.									
CO2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.									
CO3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.									
CO4	Analyze and manage construction contracts, encompassing a comprehensive understanding of construction costs considerations.									
CO5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	INTRODUCTION**;** Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.	**5**	Apply core concepts to schedule and plan construction projects.	1, 2
II	PLANNING AND ORGANIZING CONSTRUCTION SITE AND RESOURCES: Resource allocation, resource aggregation and resources levelling	**10**	Allocate and optimize resources for efficient construction operations.	1, 2, 3, 4
III	PERT CPM AND GERT NETWORKS: concepts of PERT, CPM and GERT, analysis of network and determining the critical path and duration of the network	**5**	Utilize network techniques to analyze project schedules and identify critical paths.	1, 2, 3, 4, 5
IV	CONTRACTS MANAGEMENT BASICS	**5**	Manage construction contracts and	2, 3, 4

	AND CONSTRUCTION COSTS: Make up of construction costs including capital costs operational costs and life cycle cost		understand cost implications throughout the project lifecycle.	
V	UNIT V CONSTRUCTION EQUIPMENT Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunnelling.	**5**	Select and utilize appropriate equipment for various construction tasks.	2, 3, 4, 5

Text Books:

1. Saurabh Kumar Soni (2013), “Building construction and management”, S.K Kataria and Sons.
2. Denis Lock (2010), “Project management in construction”, Pearson Education,
3. Sidney M. Levy (2009), “project control and Practice”, Pearson Education,

Reference Books:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.

2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.

4. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.

5. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

OTHER LEARNING RESOURCES:

NPTEL :: Civil Engineering - Civil Engineering - Building materials and Construction

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Proficiently apply construction planning principles to systematically choose technologies, define tasks, and estimate activity durations.	**1,3 & 4**
2	Proficiently plan and organize construction sites by mastering resource allocation, aggregation, and leveling strategies for optimal project efficiency.	**1,2**
3	Apply PERT, CPM, and GERT techniques to analyze project networks, identify critical paths, and determine project durations.	**7.9,10**
4	Analyze and manage construction contracts, encompassing a comprehensive understanding of construction costs considerations.	**5,7**
5	Proficiently apply cost analysis techniques, incorporating quality and safety considerations in construction projects.	**5,8**

SEMESTER – VI									
Course Title	**CORPORATE PROFICIENCY FOR ENGINEERS**								
Course code	**22UBPD324R**	**Total credits: 2** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			0	**0**	**4**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Develop students' abilities in technical writing, speaking, and presentations to effectively convey engineering concepts and solutions.Analyze electronic applications in civil engineering for designing, constructing, and maintaining infrastructure. 2. Focus on crafting professional resumes and cover letters tailored for engineering positions, improving students' chances of securing employment. 3. Strengthen teamwork abilities and prepare students for job interviews through practical exercises and targeted training, enhancing their readiness for engineering careers.								
CO1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.								
CO2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.								
CO3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.								
CO4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.								
CO5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.								
Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**						**KL**

I	**Writing Skills** **i.** Paragraph Writing & Narratives ii. Letter Writing iii. Technical Writing **Pipe and cistern** iii. Introduction of pipes and cistern iii.Solving different types of questions iv. Workshee1 and Worksheet 2	**7**	Develop proficiency in various forms of writing, including paragraph and narrative construction, letter writing, and technical documentation.	1,2
II	**Self-Management Skills** **i.** SWOT Analysis ii. Goal Setting and Personal Hygiene **Mixture allegation and Clock** i.Introduction of basics ii.Solving questions on mixture and alligationion. iii.Workshee1 and Worksheet 2	**7**	Gain competency in solving practical problems related to pipes and cisterns, mixtures and alligations, clocks, and profit, loss, and discounts through targeted practice and worksheets.	1,2
III	**Vocabulary Development** i.Understanding different aspects of a word (such as the use of say, tell, speak) . ii. Learning strategies to develop vocabulary iii Contextual vocabulary learning iv. Use of phrasal verbs and idioms in a conversation v. Effectively using dictionary, thesaurus **Statement and Course of action** i.Revision of syllogism ii.Statement and conclusion Iii. Course of action based on statement Iv. Workshee1 and Worksheet 2	**7**	Enhance personal effectiveness through SWOT analysis, goal setting, and maintaining personal hygiene.	1,2
IV	**Interview Skills & Dress Code Ethics** i. Types of interview- telephonic, virtual & face to face online interview, personal interview, Panel interview, Group interview ii. Common interview questions and answering strategies iii. Dress Code Ethics during Interviews iv. Mock Interview Session **Sitting arrangement (puzzle)** i.Linear arrangement puzzle ii.Circular arrangement puzzle iii.Matrix Iv. Workshee1	**7**	Improve vocabulary through understanding word usage, contextual learning, and effective dictionary use, and strengthen logical reasoning with practice in syllogisms, statements, conclusions, and courses of action.	1,2
V	**Grammar (Flipped Classroom)** i. Word-stress, Syllables Practice Session: Common Errors (testing the students' grammar already learnt)	**7**	Master interview techniques for various formats, understand dress code ethics, and improve performance through mock interviews and puzzle-solving	1,2

	Profit loss and discount i.Introduction to basics ii.Introduction to discount iii.Probems related on the topics Iv. Workshee1 and Worksheet 2		exercises in linear, circular, and matrix arrangements.	

Text Books:

1. Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
2. McDowell, Gayle Laakmann.2008.*Cracking the Coding Interview* (Indian Edition)
3. A Modern Approach to Logical Reasoning All Exams
4. General Mental Ability & Logical Reasoning Compendium

Reference Books:

1. Zinsser, William. (2006) *On Writing Well: The Classic Guide to Writing Nonfiction*
2. Fast track Objective mathematics for Competitive exam by Arihant
3. General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Demonstrate clear and concise technical communication in both written and oral formats, incorporating industry-specific terminology.	**5, 7**
2	Develop expertise in crafting resumes, cover letters, and technical reports to effectively showcase engineering qualifications.	**8**

3	Acquire proficiency in creating and delivering impactful presentations, utilizing visual aids to convey engineering concepts to diverse audiences.	**7.9,10**
4	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.	**11,12**
5	Prepare for engineering job interviews by articulating qualifications, experiences, and career goals, addressing both technical and behavioral questions confidently.	**10**

SEMESTER – VI									
Course Title	**CO-CURRICULAR ACTIVITIES**								
Course code	22UBCC321	**Total credits: 1** **Total hours: 30P**	**L**	**T**	**P**	**S**	**R**	**O/ F**	**C**
			0	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. 1. Meeting the needs of the students and covering a broad/wide range of their abilities and talents. 2.To stimulate the interests in the students and provide equal opportunities to all the students to participate 3.To enhance the learning experience of the students and help in recognizing and developing their inner skills such as leadership qualities, creative or innovative skills etc.								
CO1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.								
CO2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.								
CO3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.								
CO4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.								
CO5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**

I	AdtU has included co-curricular activities as an integral and mandatory part of the curriculum with an aim to encourage team work and the spirit of self-reliance among the students. Students will plan and organize various programs like Workshop, Project Exhibition, Guest Lectures, Soft-skill and Aptitude Test etc. These activities will provide a common platform for the students to exchange ideas and information on the topics of their interest e.g. curriculum, employment / higher educational opportunities, emerging trends, new development etc. Such activities will enhance the understanding and the degree of association of students with their prescribed curriculum and help them perform better from a 360 degree perspective.	**30**	Engage in mandatory co-curricular activities to foster teamwork and self-reliance, enhance understanding of the curriculum, and improve performance through organizing and participating in various programs and events.	1, 2

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Apply foundational acclimatization principles to adapt effectively in diverse environments and situations.	**5, 7**
2	Analyze environmental factors influencing acclimatization, demonstrating a comprehensive understanding of adaptation mechanisms.	**8**
3	Evaluate personal adaptability through practical exercises, fostering a proactive approach to acclimatization challenges.	**7.9,10**
4	Synthesize acclimatization strategies for varying contexts, demonstrating creativity and flexibility in response.	**11,12**

5	Demonstrate mastery in acclimatization techniques, utilizing critical thinking to address unforeseen challenges.	**10**

SEMESTER – VI									
Course Title	**Extra-curricular Activities**								
Course code	22UBEC321	**Total credits: 1**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30P	**0**	**0**	**0**	**4**	**0**	**0**	**1s**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VI semester of third year of the programme**								
Course Objectives (Minimum 3)	1. Equip students with effective time management and prioritization skills, fostering leadership qualities and a commitment to their endeavors. 2. Encourage exploration of interests beyond academics and participation in co-curricular activities, cultivating well-rounded individuals capable of making meaningful community contributions. 3. Enhance students' abilities to express ideas clearly and engage in in-depth evaluation and analysis, while integrating learning experiences to practice transferable skills across various activities.								
CO1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.								
CO2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.								
CO3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.								
CO5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	AdtU encourages a range of activities outside the regular curriculum intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a holistic development of the learners, Keeping in mind the 360 degree learning methodology the students are engaged in different activities headed under different clubs viz. Dance, music, photography, drama, literary etc., The students are encouraged to participate in regular club activities, workshops, competitions as per their interest and hobbies, The student members of the club are trained represent AdtU in various inter University student and national level competitions, Renewed personalities are invited to conduct	**30**	Participate in diverse club activities to develop social and soft skills, achieve holistic development, and gain exposure through workshops and competitions led by experts.	1,2

	workshops that benefit the members and students by giving them the platform to learn from experts in the respective fields.			

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn to a plan so that they can make meaningful contributions, maintain a commitment, and manage their time and priorities.	**5, 7**
2	Transform passionate students who demonstrate leadership and pursue interests beyond their academics.	**8**
3	Learn to participate in various co-curricular activities leading to their multifaceted personality development.	**7.9,10**
4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their interest.	**11,12**
5	Demonstrate and practices different activities, by Integrating learning experiences by demonstrating transferable skills.	**10**

MAPPING TABLE

Subject Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
22BTCM321R	Design of RC Structure	3	2	3	1	1	1	1					1
22BTCM322R	Engineering Economics, Estimation and Costing	3	3	3	2					1		1	1
22BTCM323R	Structural Engineering	3	3	2	2	2				1			3
22BTCM324E	Pavement Materials	2	2	1	1	1	1	1					
22BTCM324E	Construction Engineering Materials/Building Construction Practice	2	2	1	1	3	1	1	1				1
22UBPD324R	Corporate Proficiency for Engineers								1	1	1	1	
22UBCC321	Co-curricular									1	1		1
22UBEC321	Extra-curricular									1	1		1

SEMESTER – VII									
Course Title	**Construction Safety and Risk Management**								
Course code	**22BTCM411R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VII semester of fourth year of the programme**								

Course Objectives (Minimum 3)	1. To provide an understanding of the principles and practices of construction safety management. 2. To equip students with the skills to identify, assess, and mitigate risks in construction projects. 3. To foster knowledge of legal and regulatory frameworks governing construction safety.
CO1	Understand the importance of construction safety and the regulatory frameworks governing it.
CO2	Apply hazard identification and risk assessment techniques to construction projects.
CO3	Analyze the components of safety management systems and their implementation.
CO4	Evaluate construction safety practices and techniques to ensure workplace safety.
CO5	Create comprehensive safety plans and risk management strategies that comply with legal and ethical standards.

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Introduction to Construction Safety: Importance of construction safety; Key safety concepts and terminology; Historical perspective on construction safety; Overview of construction safety laws and regulations	**5**	Understand the importance and fundamental concepts of construction safety. Gain knowledge of the historical evolution and current regulatory frameworks.	1, 2
II	Hazard Identification and Risk Assessment: Types of hazards in construction; Techniques for hazard identification; Risk assessment methodologies; Risk management process	**10**	Identify various hazards present in construction projects. Apply risk assessment techniques to evaluate potential risks.	1, 2, 3, 4
III	Safety Management Systems: Components of a safety management system (SMS); Safety policies and objectives; Safety culture and leadership; Incident reporting and investigation	**10**	Develop and implement effective safety management systems. Understand the role of safety culture and leadership in promoting safety.	1, 2, 3, 4, 5
IV	Construction Safety Practices and Techniques: Personal protective equipment (PPE); Safe work practices and procedures; Safety training and education; Emergency preparedness and response	**10**	Utilize PPE and safe work practices effectively, Prepare and respond to construction site emergencies.	2, 3, 4

V	Legal and Ethical Aspects of Construction Safety: Legal responsibilities and liabilities; Ethical issues in construction safety; Case studies on construction accidents and legal outcomes; Best practices for compliance and ethical conduct	**10**	Understand legal responsibilities and ethical considerations in construction safety, Analyze case studies to learn from past construction safety incidents.	2, 3, 4, 5

Text Books:

Goetsch, D. L. (2013). Construction safety management and engineering (2nd ed.). Pearson.

Goetsch, D. L. (2013). Construction safety and health (3rd ed.). Pearson.

Reference Books:

Hislop, R. D. (1999). Construction site safety: A guide for managing contractors. CRC Press.

Li, R. Y. M. (Ed.). (2020). Handbook of construction safety, health, and well-being in the industry 4.0 era. Springer.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the importance of construction safety and the regulatory frameworks governing it.	**1,3 & 4**
2	Apply hazard identification and risk assessment techniques to construction projects.	**1,2**
3	Analyze the components of safety management systems and their implementation.	**7.9,10**
4	Evaluate construction safety practices and techniques to ensure workplace safety.	**5,7**
5	Create comprehensive safety plans and risk management strategies that comply with legal and	**5,8**

	ethical standards.	

SEMESTER – VII									
Course Title	**Professional Elective-IV Concrete Technology**								
Course code	**22BTCM412E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. Understand the essential properties of concrete and its key constituents, focusing on how these impact concrete performance. 2. Learn the principles of concrete mix design, production techniques, and quality control measures to ensure the durability and strength of concrete structures. 3. Explore various types of concrete, such as normal strength, high strength, lightweight, and special concretes, and their specific applications in different construction projects.								
CO1	Learn the constituents and their roles in concrete, including cement, aggregates, water, and admixtures.								
CO2	Develop proficiency in proportioning concrete ingredients for desired properties like strength, workability, and durability.								
CO3	Develop practical skills in conducting tests to assess fresh and hardened concrete properties.								
CO4	Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.								
CO5	Learn to conduct tests to maintain industry standards and ensure safe construction practices.								

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	Basics: Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends.	**8**	Gain an understanding of the historical background, composition, strength mechanisms, recent practices, and future trends in concrete technology.	1,2
II	Constituent of Concrete: 1. Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, testing of cement as per Indian standard. 2. Aggregates - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements, sampling & testing as per Indian Standards. 3. Water - General Requirements & limiting values of impurities. 4. Admixtures - Additives and admixtures, types, necessity and benefit Mineral	**8**	Learn about the properties, testing, and roles of cement, aggregates, water, and admixtures in concrete production.	1,2

	admixture - Fly ash, silica fume, blast furnace slag, and other pozzolanic materials. Chemical admixtures - Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and usage			
III	Fresh concrete: Methods of mixing, transporting and placing of concrete. Workability – Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, re-tempering. Curing: necessity and various methods, micro-cracking.	**7**	Understand the methods of mixing, transporting, placing, and curing concrete, along with the factors affecting workability and methods to measure it.	1,2
IV	Hardened concrete: Compressive and tensile strength and their relationship, various tests as per IS and ASTM. Factors affecting strength – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage and creep. Tests for strength of concrete: Destructive, semi destructive and non-destructive tests with their limitations, test methods as per IS and ASTM. 5 Durability and permeability of concrete: Definitions, causes, carbonation, cracking.	**9**	Develop knowledge of the strength properties of hardened concrete, factors affecting its strength, and various destructive and non-destructive testing methods.	1,2
V	Concrete in aggressive environment: Alkali – aggregate reaction, sulphate attack, chloride attack, acid attack, effect of sea water, special coating for water proofing, sulphate chloride and acid attack, concrete for hot liquids.	**8**	Explore the definitions, causes, and impacts of durability and permeability, including the effects of aggressive environments on concrete structures.	1,2

Text Books:

1. M S Shetty; Concrete Technology, S.Chand Publication New Delhi 2. P Kumar Mehta, Monteiro;
2. Concrete Technology, Indian Concrete Institute

Reference Books:

1. A.M.Neville ; Properties of Concrete , Pearson Education
2. M L Gambhir; Concrete Technology , Tata McGraw Hill
3. IS 456-2000 7.
4. IS 269-1989
5. IS 516-1959 9
6. IS 1786-1985 10
7. IS 1893-2002
8. IS 12269-1987
9. IS 9103-1999
10. IS 8112-1989

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn the constituents and their roles in concrete, including cement, aggregates, water, and admixtures.	**1,3 & 4**
2	Develop proficiency in proportioning concrete ingredients for desired properties like strength, workability, and durability.	**1,2**
3	Develop practical skills in conducting tests to assess fresh and hardened concrete properties.	**7.9,10**
4	Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.	**5,7**
5	Learn to conduct tests to maintain industry standards and ensure safe construction practices.	**5,8**

SEMESTER – VII									
Course Title	**Professional Elective IV Surface Hydrology**								
Course code	**22BTCM413E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 45T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	4. Understand Hydrological Processes and Modeling: Gain knowledge in hydrology, including precipitation, stream flow measurement, hydrograph analysis, storm runoff, flood estimation, and modeling techniques. 5. Explore the Hydrologic Cycle: Examine how components like precipitation and runoff affect water availability across different regions over time. 6. Apply Hydrological Principles in Decision Support: Learn to use hydrological data and models for effective water and environmental management decisions, such as watershed management and flood control.								
CO1	Explain the different concepts in hydro-metrology.								

CO2	Discuss the key aspects of hydrology, along with a more applied appreciation of monitoring and modelling hydrological processes.
CO3	Generalize knowledge on topics ranging from climatology, atmospheric circulation and meteorological measurements, as well as more detailed investigations into precipitation, stream flow measurement, hydrograph analysis, storm runoff and concepts in flood estimation and routing.
CO4	Explain the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal distribution of water availability in any region.
CO5	Develop students' in-depth understanding on how hydrologic principles can be applied to supplement decision support system for water and environmental management.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Hydrometeorology:** Hydrologic cycle – Global water budget – Practical applications – Hydrometeorology – Constituents of atmosphere – Vertical structure of the atmosphere – general circulation,– Air mass – Air front – cyclones – Formation of precipitation – Types and forms of precipitation – Climate and Weather – Meteorological Observations.	**10**	Students will demonstrate a comprehensive understanding of the hydrologic cycle and global water budget, including its practical applications in various contexts. They will be able to analyze the constituents and vertical structure of the atmosphere, interpret general circulation patterns, and differentiate between air masses, air fronts, and cyclones. Additionally, students will identify the processes involved in the formation of precipitation, recognize different types and forms of precipitation, and comprehend the relationships between climate and weather. They will also be proficient in conducting and interpreting meteorological observations essential for understanding and predicting weather patterns and phenomena.	1, 2
II	**Precipitation:** Measurement of rainfall – Rain gauges – Radar Measurement of rainfall - Rainfall Hyetograph – Intensity Duration and Frequency analysis – Consistency – Missing data – Rain gauge network – Average depth of rainfall analysis.	**10**	By the end of this unit on precipitation, students will be able to effectively measure rainfall using both traditional rain gauges and radar technology. They will learn to analyze rainfall data using techniques such as creating rainfall hyetographs, conducting Intensity Duration Frequency (IDF) analysis, assessing data consistency, and handling missing data. Students will also gain proficiency in designing and managing rain gauge networks to collect accurate precipitation data and perform analysis to determine average depths of rainfall over specified periods.	2, 3, 4
III	**Abstractions:** Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrometers – Infiltration Equations - Infiltration Indices.	**10**	Upon completion of this unit, students will demonstrate proficiency in understanding and applying concepts related to water losses and abstractions in hydrology. They will be able to analyze initial losses including interception and	1, 2, 3, 4

			depression storage, evaluate methods of measuring evaporation using evaporimeters, and estimate evapotranspiration through empirical equations and field measurement techniques. Additionally, students will gain practical skills in assessing infiltration using infiltrometers and interpreting infiltration equations and indices, thereby developing a comprehensive understanding of the factors influencing water movement and losses in natural and engineered environments.	
IV	**Streamflow Measurement:** Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site. .	**10**	Upon completion of this unit on Streamflow Measurement, students will be able to demonstrate a comprehensive understanding of various methods and technologies used in the measurement of streamflow. They will proficiently describe and apply principles related to stage and velocity measurement using gauges, current meters, and Doppler flow velocity meters. Additionally, students will be able to calculate discharge using both the Area Velocity method and the Area Slope method, and identify appropriate Discharge Measuring Structures for different scenarios. They will also gain competence in applying the Dilution Technique and establishing Stage Discharge relationships. Furthermore, students will be capable of evaluating and selecting suitable stream gauging sites based on specific criteria and considerations relevant to hydrological studies and water resource management.	1, 2
V	**Runoff and Water Conservation:** Concept of catchment – Linear, Areal and Relief Aspects – Detailed study of Runoff process – Factors affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation - Strange and SCS methods – Water Conservation – Rain water and Runoff Harvesting in Rural and Urban Areas - Reservoir Sedimentation.	**5**	By the end of this unit on Runoff and Water Conservation, students will be able to comprehensively understand the concept of catchment areas, including their linear, areal, and relief aspects. They will have detailed knowledge of the runoff process and the factors influencing it, as well as the ability to analyze hydrographs and apply methods such as Unit Hydrograph and Synthetic Hydrograph for runoff estimation. Furthermore, students will gain practical insights into water conservation strategies, including rainwater and runoff harvesting techniques applicable to both rural and	2, 3, 4, 5

			urban environments, and grasp the challenges and methods related to reservoir sedimentation management.	

Text Books:

1 Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, New York, 1995.

2 Subramanya K., "Hydrology,Tata McGraw Hill Co., New Delhi, 1994.

3 Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2nd Edition, New Delhi.

Reference Books:

1 Jeya Rami Reddy.P, "Hydrology, Laxmi Publications, New Delhi, 2004".

2 Larry W. Mays, "Water Resources Engineering", Wiley Publication"

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Explain the different concepts in hydro-metrology.	3,2
2	Discuss the key aspects of hydrology, along with a more applied appreciation of monitoring and modelling hydrological processes.	1,2
3	Generalize knowledge on topics ranging from climatology, atmospheric circulation and meteorological measurements, as well as more detailed investigations into precipitation, stream flow measurement, hydrograph analysis, storm runoff and concepts in flood estimation and routing.	1,4
4	Explain the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal distribution of water availability in any region.	7.9,10
5	Develop students' in-depth understanding on how hydrologic principles can be applied to supplement decision support system for water and environmental management.	5,7

SEMESTER – VII									
Course Title	**Generic Elective II Nano-science & Technology**								
Course code	**22BTCM414E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 40T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**B.Tech Civil Emgineering**								
Semester	**Fall/ VII semester of fourth year of the programme**								
Course Objectives **(Minimum 3)**	1. Gain understanding of the core principles and concepts behind manipulating matter at the nanoscale. 2. Learn about the unique and unexpected properties that emerge when materials are engineered at the nanoscale level. 3. Dive into the methods for creating nanomaterials and explore their diverse applications across various fields								
CO1	Learn about the basics of Nanotechnology.								
CO2	Understand the concepts of extraordinary properties exhibit at nanoscale.								
CO3	Learn different synthesis/ fabrication techniques of nanomaterials.								
CO4	Learn about different characterization methods of nanomaterials.								
CO5	Learn the software used for analysis of characterized data.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Basics of Nanotechnology: Importance of Nano-technology, History of Nano-Technology, Properties of Nano materials,Difference between Bulk and Nanomaterial, Molecular building blocks for nanostructure systems, Forces between atoms and molecules - Particles and grain boundaries – strong Intermolecular forces – Electrostatic and Vander Waals forces between surfaces.	**8**	Gain foundational knowledge of nanotechnology, including its history, significance, unique properties of nanomaterials, and the distinction between bulk and nanoscale materials.	1,2
II	Physics of nanomaterials: Atomic scale structure of nanoparticles, nanotubes, nanowires, nanodots etc.; electronic and optical characteristic properties of quantum dots, quantum wires and quantum wells; concept of quantum confinement: 0D, 1D and 2D nanostructures; Size effects – Fraction of Surface Atoms – specific Surface Energy and Surface Stress. Nanofluidics, Nanophotonics, Nanothermodynamics, Plasmonics – plasmons and surface plasmons, SPR, Core-shell quantum dots and quantum-dot-quantum wells.	**8**	Understand the atomic structure of various nanomaterials like nanoparticles, nanotubes, and quantum dots. Explore their electronic and optical properties, grasp the concept of quantum confinement, and analyze size effects on nanostructures.	1,2
III	Synthesis/fabrication techniques of nanomaterials: Top down approach, Lithography – electron beam	**7**	Learn about the top-down and bottom-up approaches for	1,2

	and ion beam techniques, Etching – wet and dry etching, Bottom up approach - Solvent based and template based synthesis, other important synthesis methods like CVD, PVD etc.; Doping, Nucleation, Growth and Stability of colloidal nanoparticles, concept of self assembly.		nanomaterial synthesis/fabrication. Explore techniques like lithography, etching, self-assembly, and methods like CVD and PVD.	
IV	Characterization methods: Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), Atomic force microscopy (AFM) and X-ray diffraction Spectroscopy (XRD).	**9**	Master characterization methods for nanomaterials such as TEM, SEM, AFM, and XRD.	1,2
V	Applications: Nanosensors and nanoelectronics, Micro & Nano electromechanical systems, Photonic crystals, Nano pizotronics, Nanomedicine.	**8**	Discover applications of nanotechnology in various fields like sensors, electronics, MEMS/NEMS, photonics, pieztronics, and nanomedicine.	1,2

Text Books:

1. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanoscience, CRC Press.
2. G. L. Hornyak, J. Dutta, H. H. Tibbals, A. Rao, Introduction to Nanotechnology, CRC Press.

Reference Books:

1. T. Pradeep, Nano: The essentials, McGraw Hill.
2. D. Maclurcan & N. Radywyl (Eds.), Nanotechnology and global sustainability, CRC Press.
3. E. Lichtfouse, J. Shwarzbauer, D. Robert, Environmental chemistry for sustainable world, vol.2, Springer verlag.

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Learn about the basics of Nanotechnology.	1,3 & 4
2	Understand the concepts of extraordinary properties exhibit at nanoscale.	1,2
3	Learn different synthesis/ fabrication techniques of nanomaterials.	7.9,10
4	Learn about different characterization methods of nanomaterials.	5,7

5	Learn the software used for analysis of characterized data.	5,8

MAPPING TABLE (7th Semester)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM411E	Design of Steel Structure	3	2	2	2	1		2					1
22BTCM412E	Concrete Technology	2	2	2	2	2		2					3
22BTCM413E	Surface Hydrology	3	2	2	2	1		2					1
22BTCM414E	Nano-science & Technology	2	2	2	3	2							1

SEMESTER – VIII										
Course Title	**Professional Elective V- Soil Mechanics**									
Course code	**22BTCM421R**	**Total credits: 2**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 30T	**2**	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VIII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. To Develop an advanced understanding of soil behavior, encompassing exploration methods, laboratory testing, and hydraulic characteristics, with a focus on stress distribution, consolidation theory, and shear strength analysis. 2. Attain proficiency in geotechnical design, including foundations, slopes, and retaining structures, applying principles such as bearing capacity, settlement analysis, and limit equilibrium methods. 3. Apply advanced geotechnical concepts by integrating geosynthetics in reinforced structures, exploring ground improvement techniques, and addressing environmental challenges through the application of soil mechanics principles.									
CO1	To Conduct advanced soil exploration and characterization, employing laboratory-testing techniques to determine soil properties accurately.									
CO2	To Analyze stress distribution in soils in three dimensions, predicting settlements through consolidation theory and assessing shear strength using critical state soil mechanics.									
CO3	To Design shallow and deep foundations, applying principles of bearing capacity and settlement analysis, while also demonstrating competence in slope stability analysis and design.									
CO4	To Apply earth pressure theories to design effective retaining walls and bulkheads, incorporating reinforced soil structures into geotechnical solutions.									
CO5	To Demonstrate proficiency in incorporating geosynthetics into soil engineering practices, utilizing them in the design and construction of reinforced structures, and applying ground improvement techniques effectively									

Unit-No.	**Content**	**Contact Hour**	**Learning Outcome**	**KL**
I	**UNIT 1: INTRODCUTION Overview of Geotechnical Engineering:** • Definition, scope, and importance of geotechnical engineering. • Historical developments and key contributors in the field. • Interrelation between geology and geotechnical engineering. **Basic Soil Mechanics Concepts:** • Fundamental properties of soils (particle size, soil classification, moisture content). • Soil phases: solids, water, and air. • Basic soil behavior and stress-strain relationships. **Role of Geotechnical Engineer:** • Professional responsibilities and ethical considerations. • Case studies highlighting the significance of geotechnical	**5**	Students will have a comprehensive understanding of geotechnical engineering, including its definition, scope, and significance. They will be familiar with the historical context and key contributors to the field, as well as the essential relationship between geology and geotechnical engineering. Students will grasp fundamental soil mechanics concepts, such as soil properties, classification, moisture content, and the composition of soil phases (solids, water, and air). Additionally, they will understand basic soil behavior and stress-strain relationships. The unit will also cover the role and responsibilities of a geotechnical engineer, emphasizing professional ethics through case studies that demonstrate the critical impact of geotechnical engineering on civil engineering projects.	1, 2

	engineering in civil projects.			
II	**UNIT 2: SHALLOW FOUNDATION AND BEARING CAPACITY** **Types of Shallow Foundations:** • Overview of different types of shallow foundations (spread footings, mat foundations). • Selection criteria based on soil conditions and structural requirements. **Bearing Capacity Basics:** • Definition of bearing capacity. • Factors influencing bearing capacity: soil strength, foundation geometry, and loading conditions. • Ultimate and allowable bearing capacity. **Terzaghi's Bearing Capacity Equation:** • Derivation and application of Terzaghi's bearing capacity equation. • Practical considerations and limitations of the equation.	**10**	Upon completing this unit, students will have a comprehensive understanding of shallow foundations, including an overview of various types such as spread footings and mat foundations, along with criteria for selecting appropriate foundation types based on soil conditions and structural requirements. They will grasp the concept of bearing capacity, factors influencing it, and the differentiation between ultimate and allowable bearing capacity. Additionally, students will learn the derivation and application of Terzaghi's bearing capacity equation, recognizing its practical considerations and limitations, thus equipping them with essential knowledge for assessing and designing shallow foundations in civil engineering projects.	1, 2, 3, 4
III	**UNIT 3: BEARING CAPACITY THEORIES AND APPLICATION** **Other Bearing Capacity Theories:** • Introduction to other bearing capacity theories (Meyerhof, Hansen). • Comparative analysis of different bearing capacity theories. **Influence of Water Table:** • Effect of the water table on bearing capacity. • Application of correction factors in bearing capacity analysis. **Foundation Settlement:** • Causes and types of foundation settlement. • Methods for predicting and mitigating settlement.	**5**	Upon completing Unit 3: Bearing Capacity Theories and Application, students will gain a comprehensive understanding of various bearing capacity theories, including those proposed by Meyerhof and Hansen, and will be able to conduct comparative analyses of these theories. They will learn how the presence of a water table influences bearing capacity and how to apply correction factors in such scenarios. Additionally, students will explore the causes and types of foundation settlement, and develop skills in predicting and mitigating settlement issues, enabling them to make informed decisions in geotechnical engineering practice.	1, 2, 3, 4, 5
IV	**UNIT 4: SETTLEMENT OF FOOTING** **Immediate and Consolidation Settlement:** • Distinction between immediate and consolidation settlement.	**5**	Upon completing Unit 4: Settlement of Footing, students will be able to distinguish between immediate and consolidation settlement, understanding the respective calculation methods for each. They will grasp the time-rate of settlement and its implications, predicting	2, 3, 4

	• Calculation methods for each type of settlement. **Time-Settlement Behavior:** • Time-rate of settlement and its implications. • Settlement prediction using empirical and analytical methods. **Practical Applications and Case Studies:** • Real-world examples of footing settlement in various construction projects. • Analysis of lessons learned from case studies.		settlement behavior using both empirical and analytical methods. Through practical applications and case studies, students will analyze real-world examples of footing settlement in various construction projects, extracting valuable lessons from these case studies to enhance their understanding and application of settlement principles in geotechnical engineering.	
V	**UNIT 5: SOIL EXPLORATION AND STABILITY ANALYSIS** **Methods of Soil Exploration:** • Overview of geotechnical site investigation techniques (boring, sampling, in-situ tests). • Selection of exploration methods based on site conditions. **Stability Analysis of Slopes:** • Slope stability analysis methods (infinite slope, circular failure). • Factors affecting slope stability. **Case Studies in Soil Exploration and Stability:** • Application of soil exploration data in slope stability analysis. • Review of case studies demonstrating the importance of thorough soil investigation in stability assessments.	**5**	Upon completing Unit 5: Soil Exploration and Stability Analysis, students will be able to proficiently conduct geotechnical site investigations using various methods such as boring, sampling, and in-situ tests, selecting appropriate techniques based on specific site conditions. They will gain a comprehensive understanding of slope stability analysis methods, including infinite slope and circular failure, and will be able to identify and evaluate the factors affecting slope stability. Additionally, students will apply soil exploration data to practical slope stability assessments and critically review case studies that highlight the critical role of detailed soil investigation in ensuring stability and safety.	2, 3, 4, 5

Text Books:

1 "Principles of Geotechnical Engineering" by Braja M. Das,1994

2 "Foundation Design: Principles and Practices" by Donald P. Coduto, William A. Kitch, and Man-chu Ronald Yeung, 2001

Reference Books:

1 "Soil Mechanics and Foundations" by Muni Budhu: 1999

2 "Geotechnical Engineering: Principles and Practices" by Donald P. Coduto, Man-chu Ronald Yeung, and William A. Kitch: 2005

3 "Introduction to Geotechnical Engineering" by Robert D. Holtz, William D. Kovacs, and Thomas C. Sheahan, 1981

OTHER LEARNING RESOURCES:

https://archive.nptel.ac.in/courses/105/101/105101084/

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	To Conduct advanced soil exploration and characterization, employing laboratory-testing techniques to determine soil properties accurately.	1,3 & 4
2	To Analyze stress distribution in soils in three dimensions, predicting settlements through consolidation theory and assessing shear strength using critical state soil mechanics.	1,2
3	To Design shallow and deep foundations, applying principles of bearing capacity and settlement analysis, while also demonstrating competence in slope stability analysis and design.	7.9,10
4	To Apply earth pressure theories to design effective retaining walls and bulkheads, incorporating reinforced soil structures into geotechnical solutions.	5,7
5	To Demonstrate proficiency in incorporating geosynthetics into soil engineering practices, utilizing them in the design and construction of reinforced structures, and applying ground improvement techniques effectively	5,8

SEMESTER – VIII									
Course Title	**Professional Elective V - Earthquake Engineering**								
Course code	**22BTCM422R**	**Total credits: 2** **Total hours: 30T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			2	**0**	**0**	**0**	**0**	**0**	**2**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VIII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	1. This course explores the behavior of structures under seismic loads. 2. Students analyze SDOF and MDOF systems' response to vibration and earthquakes, study stiffness, damping, and lateral forces generated during seismic events. 3. They also learn ductile detailing for RC structures and earthquake-resistant design principles, essential for creating resilient structures in seismic regions.								
CO1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.								
CO2	Discuss the concept of stiffness and damping.								
CO3	Determine the lateral forces generated in the structure due to earthquake.								
CO4	Apply the concept of ductile detailing in RC structures.								
CO5	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	**Introduction:** Scope of seismology; Interior of Earth, plate tectonics, faults, consequences of earthquake, Basic parameters of earthquake, magnitude & intensity, scales, Seismic zones of India, damages caused during past earthquakes (worldwide).	**5**	By the end of this unit, students will have a comprehensive understanding of seismology, including its scope and significance in studying the Earth's interior and tectonic activities. They will be able to explain the concept of plate tectonics, the nature and types of faults, and the consequences of earthquakes. Students will learn to distinguish between the basic parameters of earthquakes, such as magnitude and intensity, and understand the various scales used to measure them. Additionally, they will gain knowledge about the seismic zones in India and analyze the damages caused by past earthquakes worldwide, enhancing their ability to assess and mitigate earthquake-related risks.	1, 2
II	**Fundamentals of Earthquake Vibrations of buildings** Static load v/s Dynamic load (force control and displacement control), simplified single degree of freedom system, mathematical modelling of buildings, natural frequency, resonance v/s increased response, responses of buildings to different types of vibrations like free and forced, damped and un-damped vibration, response of building to earthquake ground motion, Response to multi degree (maximum three) of freedom systems up to mode shapes.	**10**	Upon completing the unit on Fundamentals of Earthquake Vibrations of Buildings, students will be able to understand and distinguish between static and dynamic loads, including force and displacement control mechanisms. They will gain proficiency in simplifying complex structures into single degree of freedom (SDOF) systems and mathematically modeling buildings to analyze their vibrational characteristics. Students will be able to determine natural frequencies and recognize the phenomena of resonance and increased response. They will learn to evaluate the responses of buildings to various types of vibrations, including free, forced, damped, and undamped vibrations. Additionally, they will be capable of analyzing the response of buildings to earthquake ground motions and understand the behavior of multi-degree (up to three degrees) of freedom systems, including determining mode shapes.	1, 2, 3, 4

III	**Design Philosophy:** Philosophy of earthquake resistant design, earthquake proof v/s earthquake resistant design, four virtues of earthquake resistant structures (strength, stiffness, ductility and configuration), seismic structural configuration, Introduction to IS: 1893 (Part I), IS: 875(Part V). Seismic load: **Seismic Coefficient Method** – base shear and its distribution along height. Introduction to Response spectrum, IS code provisions.	**5**	By the end of this unit, students will have a comprehensive understanding of the philosophy behind earthquake-resistant design, distinguishing it from earthquake-proof design. They will learn the critical attributes of earthquake-resistant structures, namely strength, stiffness, ductility, and configuration, and how these contribute to a building's resilience. The unit will cover the principles of seismic structural configuration and introduce key Indian Standards (IS: 1893 Part I and IS: 875 Part V) relevant to seismic design. Students will gain practical knowledge of calculating seismic loads using the Seismic Coefficient Method, including determining base shear and its vertical distribution. Additionally, they will be introduced to the concept of the response spectrum and the associated IS code provisions, equipping them with the necessary skills to design structures that can withstand seismic forces effectively.	1, 2, 3, 4, 5
IV	**Lateral Loads on Buildings:** **Lateral Load Distribution (SDOF):** Rigid diaphragm effect, centers of mass and stiffness, torsionally coupled and uncoupled system. **Lateral Load Analysis:** Analysis of frames using approximate methods like portal & cantilever methodsdrawing of small residential buildings.	**5**	By the end of this unit on "Lateral Loads on Buildings," students will be able to analyze the behavior of buildings under lateral loads. They will understand the principles of lateral load distribution in structures with rigid diaphragms, including the effects of centers of mass and stiffness. Students will be proficient in distinguishing between torsionally coupled and uncoupled systems and will be capable of conducting lateral load analysis of frames using approximate methods such as portal and cantilever methods. Additionally, they will be able to apply these concepts to draw preliminary designs for small residential buildings.	2, 3, 4
V	**Ductile Detailing:** Concepts of Detailing of various structural components as per IS: 13920 provisions.	**5**	By the end of this unit on Ductile Detailing, students will demonstrate a proficient understanding of detailing principles for structural components based on IS: 13920 specifications. They will be able to apply these concepts effectively to ensure ductile behavior and enhance the structural integrity of reinforced concrete elements. Students will be capable of interpreting and implementing the guidelines for detailing reinforcement in beams, columns, slabs, and other structural elements, thereby contributing to safer and more resilient structural designs in accordance with established standards.	2, 3, 4, 5

Text Books:

1. Manish Shrikhande & Pankaj Agrawal; Earthquake resistant design of structures, PHI Publication, New Delhi.

Reference Books:

1. A.K.Chopra; Dynamics of structures , Pearson, New Delhi
2. Clough & Penzin; Dynamics of structures

3. C V R Murthy - Earthquake Tips, NICEE

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.	1,2 & 4
2	Discuss the concept of stiffness and damping.	1,3
3	Determine the lateral forces generated in the structure due to earthquake.	7.9,10
4	Apply the concept of ductile detailing in RC structures.	5,6
5	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.	5,7

SEMESTER – VIII									
Course Title	**Railway and Airport Engineering**								
Course code	**22BTCM423R**	**Total credits: 3** **Total hours: 45T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**Fall: Winter/ VIII semester of fourth year of the programme**								
Course Objectives (Minimum 3)	5. The course "Railway and Airport Engineering" aims to provide students with a comprehensive understanding of the design, construction, and maintenance of railway and airport infrastructure. 6. It focuses on equipping students with the technical skills and knowledge needed to address the challenges and innovations in transportation engineering.								
CO1	Describe different components of the rail track, their functions and its operation system with respect to construction and engineering applications.								
CO2	Identify different failures of rails and explain different wheel and axis arrangements.								
CO3	Design different geometric features of railway track								
CO4	Design different types of Railway Point and Crossing								
CO5	Explain essential features and requirements of different types of signaling and interlocking system.								

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	RAILWAY ENGINEEIRNG: General: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, Functions of various Components - Rails, Sleepers and Ballast, Rails - types of rails, rail sections, defects in rails, creep of rails, rail fixtures and fastenings, rail joints and welding of rails, sleepers – types, spacing and density, Ballast – types, advantages and disadvantages, Subgrade – Requirement, embankment.	**10**	By the end of this unit, students will demonstrate a comprehensive understanding of the development of railways in India, including the evolution of permanent way and railway track components. They will be able to explain the significance of different gauges used in India and the process of conning wheels. Students will identify and describe the functions and characteristics of key components such as rails, sleepers, and ballast, detailing their types, spacing, and densities. They will analyze the advantages and disadvantages of various types of ballast and understand the requirements for subgrade and embankment construction. Additionally, students will be able to identify common rail defects, understand rail creep, and explain the principles behind rail joints and welding techniques.	1, 2
II	Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. Track layouts, Switches, Tongue Rails, Crossings, Layout of Turnout – Double Turnout, Diamond crossing, Scissors crossing. Railway station and Yard: Railway traction and track resistance, stresses in railway track – rails, sleepers, ballast. Points and crossings – turnouts, switches, crossings. Track junctions – types, splits, diamond, gauntlet, scissor crossovers. Railway stations - requirements, facilities, classifications, platforms, loops, sidings. Railway yards – types, required equipment in yards. Signaling and control system – objectives, classification, Interlocking of	**10**	Upon completing this unit on the geometric design of railway tracks, students will be able to analyze and design railway track layouts incorporating gradients, grade compensation, speed considerations for curves, and principles of super elevation to enhance safety and efficiency. They will understand the concepts of cant deficiency and negative super elevation, applying them appropriately to track design. Furthermore, students will gain proficiency in designing and implementing various track layouts including switches, crossings (such as diamond and scissors crossings), and turnouts (including double turnouts). They will comprehend the operational requirements and design considerations for railway stations and yards, including traction and track resistance, stress analysis on track components (rails, sleepers,	1, 2, 3, 4

	signals and points.		ballast), and the equipment necessary in yards. Additionally, students will grasp the fundamentals of signaling and control systems, their objectives, classifications, and the principles of interlocking signals and points to ensure safe railway operations.	
III	AIRPORT ENGINEERING: General: History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, airport classifications as per ICAO. Airport Planning: Regional planning-concepts and advantages, location and planning of airport as per ICAO and FAA. Airport Master plan, Airport site selection, Zoning laws, Airport Elements - airfield, terminal area, zoning laws, classification of obstructions, approach zone, turning zone, airport capacity, runway capacity, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	**10**	The learning outcome of the unit on air transport and airport planning encompasses a comprehensive understanding of the historical evolution, regulatory frameworks, and operational aspects of air transport systems worldwide. Students will gain knowledge of aircraft types and their characteristics, aerodrome classifications, and the roles of air transport authorities. They will develop proficiency in airport planning principles according to international standards (ICAO and FAA), covering regional planning concepts, airport master planning, site selection criteria, zoning laws, and the design and classification of airport elements such as airfields and terminals. Additionally, students will learn to assess airport and runway capacities, estimate future air traffic demands, and apply principles for developing new airports, culminating in the ability to conceptualize ideal airport layouts.	1, 2, 3, 4, 5
IV	Run Way Design: Wind rose and orientation of runway, wind coverage and crosswind component, factors affecting runway length, basic runway length and corrections to runway length, runway geometrics and runway patterns (configurations), Runway marking, threshold limits cross section of runway. Taxiway Design: Controlling factors, taxiway geometric elements, layout, exit taxiway, location and geometrics, holding apron, turnaround facility. Aprons - locations, size, gate positions, aircraft parking configurations and parking systems, hanger-site selection, planning and design considerations, Fuel storage area, blast pads. Wind direction indicator. LCN system of Pavement Design, Airfield Pavement – Failures, Maintenance and Rehabilitation	**10**	Upon completion of this unit on Airfield Design and Planning, students will be able to demonstrate comprehensive knowledge and skills in various critical aspects of airfield infrastructure. They will understand the principles of runway design, including the influence of wind orientation and coverage on runway orientation and length requirements, as well as factors affecting runway length determination and geometric configurations. Students will be proficient in designing taxiways, considering geometric elements, layout, and exit strategies, as well as planning apron locations, sizes, and configurations for efficient aircraft parking and turnaround operations. Additionally, they will grasp the essentials of pavement design using the LCN system, comprehend common airfield pavement failures, and formulate strategies for maintenance and rehabilitation. This unit will equip students with the necessary expertise to contribute effectively to the planning, design, and operational efficiency of airfield facilities.	2, 3, 4
V	Terminal Area: Elements and requirements, terminal building functions, space requirements, location planning concepts, vehicular parking area and circulation network, Grading and Drainage: Airport grading-importance, operations, airport drainage aims, functions, special	**5**	By the end of this unit, learners will demonstrate a comprehensive understanding of terminal area planning and design within an airport context. They will be able to analyze and apply the fundamental elements and requirements of terminal buildings, including functional spaces and spatial requirements.	2, 3, 4, 5

	characteristics, basic requirements, Deign of drainage - surface and subsurface drainage systems, Air Traffic Control and Visual Aids: Need of Air traffic control, Air traffic control network, Air traffic control aids - landing information system, airport markings and lighting.		Students will also grasp essential concepts in vehicular parking area design and circulation networks, incorporating considerations for efficient operations and user experience. Furthermore, they will comprehend the significance of airport grading and drainage systems, understanding their roles in ensuring operational safety and efficiency.	

Books:

1. A text book of railway engineering , By S.C.Saxena and M.G.Arora

2. Railway Engineering by Satish Chandra & MM Agrawal, Oxford University Press.

3. Transportation Engineering, Volume-II- Railways, Airports, Docks and Harbours, Bridges and Tunnels by C. venkatramaih, Universities Press

4. Air-port Engineering by S.K.Khanna and M.G.Arora

RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAM OUTCOMES

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Describe different components of the rail track, their functions and its operation system with respect to construction and engineering applications.	1,3 & 5
2	Identify different failures of rails and explain different wheel and axis arrangements.	1,4
3	Design different geometric features of railway track	7.9,10
4	Design different types of Railway Point and Crossing	5,8
5	Explain essential features and requirements of different types of signaling and interlocking system.	5,7

SEMESTER – VIII									
Course Title	**Economics for Engineers**								
Course code	**22BTCM424E**	**Total credits: 3** **Total hours: 36T**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
			3	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**VII**								
Course Objectives (Minimum 3)	1. To understand the basics of Economics 2. To Apply the concepts of Economics in Engineering 3. To understand the Industrial Laws								
CO1	Understand the principles of economics								
CO2	Apply the concepts of Economics in Engineering problems								
CO3	Explain the rights to comprehend the working hour and over duty								
CO4	Illustrate the ways to mitigate the hurdles to Indian Economy								
CO5	Appraise the financial aspects of projects								

Unit-No.	Content	Contact Hour	Learning Outcome
I	**Introductory Macroeconomics**: What is Macroeconomics, Basic concepts in macroeconomics: significance of economics, LPG meaning, demand and supply. Law of demand, law of supply. Difference of macroeconomics and microeconomics	**5**	Understand the principles of economics
II	**Economic Indexes**: Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross Domestic Product (GDP) and Net Domestic Product (NDP). Fixed, Variable, Marginal & Average Costs, Recurring and Nonrecurring Costs, Break Even Analysis, ROI, Payback period	**5**	Apply the concepts of Economics in Engineering problems
III	**Industrial Statistics**: Measures of central tendency, Relation between mean, median and mode, Measure of dispersion, moments, skewness, Kurtosis, Probability distribution, Binomial distribution, Poisson distribution, Test of hypothesis, Chi-square distribution, application of chi square test, ANOVA test, Level of confidence, Regression model, Simple linear regression analysis, coefficient of correlation, correlation coefficient, Mean absolute deviation (MAD), Mean squared error(MSE)	**10**	Explain the rights to comprehend the working hour and over duty
IV	**Industrial laws:** Laws related to Industrial Relations and Industrial Disputes: Industrial disputes act, 1947: definition and authorities, awards, settlement, strike lockouts, lay off, retrenchment and closure. **The Trade Union Act, 1926, Laws related to health, safety and welfare:** The Workmen's Compensation Act, 1923 Provisions, and Social Legislation: Employee State Insurance Act 1948: Definition, employees'	**8**	Illustrate the ways to mitigate the hurdles to Indian Economy

	provident fund. Miscellaneous Provision Act 1948: Schemes, Administration and determination of dues, Laws related to compensation management: The payment of Wages Act 1948: Objectives, Definition, and Authorised Deductions.		
V	**Challenges in Indian Economy:** Poverty- Main programmes for poverty alleviation, Human Capital Formation: How people become resource; Role of human capital in economic development; alternative farming - organic farming Employment: Growth and changes in work force participation rate in formal and informal sectors; Energy and Health: Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming.	**8**	Appraise the financial aspects of projects

TEXT BOOKS:

1 Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia

2 V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill

REFERENCE BOOKS:

1: M Chakravarty, Estimating, Costing Specifications & Valuation

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Understand the principles of economics	1,3
2	Apply the concepts of Economics in Engineering problems	1,2
3	Explain the rights to comprehend the working hour and over duty	7,9
4	Illustrate the ways to mitigate the hurdles to Indian Economy	6,7
5	Appraise the financial aspects of projects	8.10

SEMESTER – VIII									
Course Title	**History of Science and Engineering**								
Course code	**22BTCM425E**	**Total credits: 3**	**L**	**T**	**P**	**S**	**R**	**O/F**	**C**
		Total hours: 36T	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Pre-requisite	**Nil**	**Co-requisite**	**Nil**						
Programme	**Bachelor of Technology in Civil Engineering**								
Semester	**VIII**								

Course Objectives (Minimum 3)	1. Develop a culture of critical reflection, intellectual curiosity, tolerance of ambiguity, scholarly engagement, and learning together 2. Identify and understand tools to inquire into the history and philosophy of engineering education, and develop skills for using these tools 3. Make use of these tools to problematize different perspectives as well as synthesize perspectives to form arguments for both oneself and others about the nature of engineering, education, and engineering education
CO1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period
CO2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.
CO3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.
CO4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)
CO5	It explores how science and technology have been used to make sense of the world, and to control it.

Unit-No.	Content	Contact Hour	Learning Outcome	KL
I	Historical Perspective: The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.	**5**	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	1,2
II	Science and Technology- The Beginning: Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine 2. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. 3. Development of Geography: Geography in Ancient Indian Literature	**5**	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	1,2
III	Developments in Science and Technology in Medieval India: 1. Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up. 2. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. 3. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.	**10**	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	1,2
IV	Developments in Science and Technology in Colonial India: 1. Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company‘s Service. 2. Indian Response to new Scientific Knowledge, Science	**8**	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	1,2

	and Technology in Modern India 3. Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.			
V	Prominent scientist of India since beginning and their achievement: 1. Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna 2. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga & Patanjali 3. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, Homi Jehangir Bhabha and Dr. Vikram Sarabhai.	**8**	It explores how science and technology have been used to make sense of the world, and to control it.	1,2

TEXT BOOKS:

1 Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58

2 Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.

REFERENCE BOOKS:

1: Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Developlemnt, K., Nayudamma Memorial Science Foundation, Chennai – 8

CO PO Mapping		
SN	**Course Outcome (CO)**	**Mapped Program Outcome**
1	Students will understand the Beginning and Development in different field of science in ancient, medieval, and in modern period	1,3 & 4
2	Students will study the biography of different scientist like Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna etc.	1,2
3	Student will study the various research organization like DRDO, CSIR, IRC, ISRO etc.	7.9,10
4	Students will be able to study the Medical Science of Ancient India (Ayurveda & Yoga)	5,7
5	It explores how science and technology have been used to make sense of the world, and to control it.	5,8

MAPPING TABLE (8th Semester)

Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
22BTCM421E	Soil Mechanics-II	3	3	1	1	1		1					1
22BTCM422E	Earthquake Engineering	2	3	2	1	1	1	1					1
22BTCM423R	Railway and Airport Engineering	3	3	1	1	1		1					1
22BTCM424E	Economics for Engineers											2	1
22BTCM425E	History of Science and Engineering		1										2