

## Assam down town University

# **Curriculum and Syllabus**

# Bachelor of Technology in Civil Engineering

OUTCOME BASED EDUCATION FRAMEWORK CHOICE BASED CREDIT SYSTEM Version: 2.2

## FACULTY OF ENGINEERING

July, 2024

## 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 Board of Studies (BOS) meeting of the Faculty of Engineering held on dated 16/07/2024 and approved by the  $51^{st}$  Academic Council (AC) meeting held on dated 26/07/2024.

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Chairperson, Board of Studies

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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:**

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 Programme 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. Programme 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. Programme 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. Programme Outcome (PO):

- **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: 172

#### 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.

## A. INTERNAL ASSESSMENT:

The teacher who offers the course shall be responsible for internal assessment by conducting insemester (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 programme coordinators should upload the in-semester marks to the ERP and forward acknowledgement of all the courses of the programme 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

<b>S.</b> 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 programme follows a unique pattern and the total marks is 60

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

Table 1: Question paper pattern for End semester examination

#### **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 Programme 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 unfairmeans. 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,  $CP = GP \times CR$ 

#### 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.

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

**Table 2: Letter Grades and Grade Points** 

#### 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.

$$SGPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$
(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<sup>th</sup> 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.

$$CGPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i}$$
(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, 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.

#### 2. 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 Flipped Classroom approach Cooperative learning approach	05% 10% 05%

#### 3. 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.

## **Breakdown of Credits**

Sl. No	Category		Total number of Credits
		Skill Enhancement Course (SEC)	14
		Ability Enhancement Course (AEC)	12
1	University Core (UC)	Field Training	3
		Discipline Specific Elective (DSE)	4
		Value Added Course (VAC)	4
2	University Fleeting (UE)	Multidisciplinary Course (MDC)	12
L	University Elective (UE)	Value Added Course (VAC)	6
		Discipline Specific Core (DSC)	22
3	Dragramma Cara (DC)	Field Training	15
5	Programme Core (PC)	Research /Industry Internship	16
		Summer Internship	10
4	Programme Elective (PE)	Discipline Specific Elective (DSE)	36
4	Flogramme Elective (FE)	Value Added Course (VAC)	11
5	Faculty Core (FC)	Skill Enhancement Course (SEC)	4
Э	raculty Cole (FC)	Ability Enhancement Course (AEC)	3
		Total	172

## Breakdown by categories of courses

Sl. No	Category	Credits	%
1	Engineering	142	82.56%
2	Science	20	11.63%
3	Computer Technology	4	2.33%
4	Humanities	5	2.91%
5	Commerce and Management	1	0.57%
	Total	172	100%

	<b>S.</b>			Course	F	Eng	ag	em	en	t	M	laxin	num N	larks	s for	
	No	Course Code	Course Title	Course Category	L	Т	P	s	R	0	С	IA*	SEE*	PE*	Tota 1	
	1	24BTCE111R	Calculus and Linear Algebra	DSC	3	0	0	0	0	0	3	40	60	0	100	
	2	24BTCE112R	Introduction to Basic Mathematics, Logic and Coding	DSC	3	0	0	0	0	0	3	40	60	0	100	
<del>.</del>	3	24BTCE113R	Physics for Engineers	DSC	2	0	2	0	0	0	3	40	60	100	200	
Semester	4	24BTCE114R	DSE	0	0	2	0	0	0	1	0	0	100	200		
Š	5 24MOCE112R		MOOCS Mechanics: Motion, Forces, Energy and Gravity, from Particles to Planets	DSE	0	0	0	0	0	0	1	100	0	0	100	
	6	24BTCE115R	Field-based Training	MDC	0	0	0	0	0	16	1	100	0	100	100	
	7	24UBPD114R	PDP	AEC/SEC	0	0	4	0	0	0	2	0	0	100	100	
	8	24UBEC111	Extra-curricular	VAC	0	0	0	4	0	0	1	100	0	000	100	
			Total	8		8 0 8 4 0 16			16	15	420	180	400	1000		
	S. No				Course		Eı	ıga	ige	me	nt	for				
	•			Category	L	T	Р	S	R	0	C	IA*	SEE*	PE*	Tota 1	
	1	24BTCE121R	Elements of Probability & Statistics for Civil Engineering Application	DSC	4	0	0	0	0	0	4	40	60	0	100	
	2	24BTCE122R	Chemistry for Engineers	DSC	2	0	2	0	0	0	3	40	60	100	200	
L L	3	24BTCE123R	Engineering Drawing	DSC	0	0	4	0	0	0	2	40	60	100	200	
Semester	4	24BTCE124R	Problem solving and Python Programming	DSC	3	0	0	0	0	0	3	40	60	0	100	
Ň	5	24UBEC121	Extra-Curricular	VAC	0	0	0	4	0	0	1	100	0	0	100	
		24MOCE122R	Ethics, Technology and Engineering	DSE	0	0	0	0	0	0	1	100	0	0	100	
	7	24UBES101R	Environmental Science	MDC	2	0	0	0	0	0	2	40	60	0	100	
		24BTCE125R	Field-based Training	AEC	0	0	0	0	0	1 6	1	100	0	0	100	
	9	24UBPD123R	PDP	AEC	0	0	4	0	0	0		0	0	100	100	
			Total		11	0	10	4	0	1 6		400	300	300	1100	

#### SEMESTER WISE COURSE DISTRIBUTION

	S. No.	Course Code	Course Title	Course Category		ŀ	Eng	age	me	nt		M	aximu fo		arks
	110.			Category	L	T	P	S	R	0	C	IA*	SEE*	PE*	Total
	1	24BTCE211R	Elements of Surveying & Geomatics	DSC	3	0	2	0	0	0	4	40	60	0	100
	2	24BTCE212R	Introduction to Solid Mechanics	DSC	3	0	2	0	0	0	4	40	60	100	200
	3 24BTCE215R		Building Information Modelling in Construction	AEC	3	0	0	0	0	0	3	40	60	0	100
	4	24BTCE216R	Biology for Engineers	DSC	2	1	0	0	0	0	3	0	0	100	100
r III	5	24BTCE217R	Basic Electronics for Civil Engineering Application	DSC	1	0	2	0	0	0	2	40	60	0	100
Semester III	6	24BTCE214R	Building Materials & Construction Practice	DSC	2	0	0	0	0	0	2	40	60	0	100
Š	7	24MOCE212R	Computational Thinking for Problem Solving	DSC	0	0	0	0	0	0	1	0	0	100	100
	8	24BTCE218R	Field-based Training	DSC	0	0	0	0	16	0	1	40	60	100	200
	9	24UBPD213R	PDP & DL/FL COURSES	MDC	0	0	3	0	0	0	2	0	0	100	100
	10	24UBCC211	PDP & DL/FL COURSES	AEC	0	0	3	0	0	0	1	0	0	100	100
	11	24UBEC211	Basic Life Saving Skills	AEC	0	0	4	0	0	0	1	0	0	100	100
	12	24UULS212R	Introduction to Psychology	VAC	0	0	0	0	0	0	1	0	0	100	100
	13	24UUFL213R	EXTRA- CURRICULAR	SEC	0	0	0	4	0	0	1	0	0	100	100
			Total		14	1	16	4	16	0	26	240	360	900	1500
	S.	Comme Conta	Comment T'41	Course		Engagemer					Ma	ximum	Mar	ks for	
	No.	<b>Course Code</b>	Course Title	Category	L	Т	P	S	R	0	C	IA*	SEE*	PE*	Total
	1	24BTCE221R	Transportation Engineering	DSC	3	0	2	0	0	0	4	40	60	100	200
	2	24BTCE213R	Fluid Mechanics & Hydraulics Engineering	DSC	3	0	2	0	0	0	4	40	60	100	200
Λ	3	24BTCE222R	Soil Mechanics & Geotechnical Engineering	DSC	3	0	2	0	0	0	4	40	60	100	200
r I	4	24BTCE223R	Structural Analysis I	DSC	3	0	0	0	0	0	3	40	60	0	100
Semester IV	5	24BTME225R	Instrumentation and Control	DSC	2	0	2	0	0	0	3	40	60	100	100
Ser	6	24BTCE226R	Construction Equipments and Techniques	DSC	3	0	0	0	0	0	3	40	60	0	100
	7 8	24BTCE227R	•	Field Training		0	0	0	16	0	1	100	0	0	100
		24UBPD224R	PDP	AEC	0	0	4	0	0	0	2	0	0	100	100
	10	24UULS221R	BAS	VAC	0	0	4	0	0	0	1	0	0	100	100
	12	24MOCE221R	Entrepreneurship Strategy: From Ideation to Exit	MDC	0	0	0	0	0	0	2	100	0	0	100
	14	24MOCE222R	Contemporary India	VAC	0	0	0	0	0	0	1	100	0	0	100
			Total		17	0	11	0	16	0	28	540	360	600	1400

	S.			Course			En	ıgaş	gem	ent	-	Max	imum 🛛	Mark	s for
	No.	Course Code	Course Title	Category	L	Т	Р	s	R	0	C	IA*	SEE*	PE*	Tota l
	1	24BTCE311R	Structural Analysis II	DSC (Major)	3	0	0	0	0	0	3	40	60	0	100
	2	24BTCE312R	Environmental Engineering	DSC (Major)	2	0	2	0	0	0	3	40	60	100	200
	3	24BTCE224R	Engineering Geology	DSC (Major)	1	0	2	0	0	0	2	40	60	100	200
7	4	24BTCE225R	Sustainable Construction Method/Concrete Technology/GIS & Remote Sensing	DSC (Minor)	3	0	0	0	0	0	3	40	60	0	100
ter V	5	24BTCE316R	Deep excavations, Foundations and Tunnels	DSC (Minor)	3	0	0	0	0	0	3	40	60	0	100
Semester	6	24BTCE316R	Formwork Engineering Practices	DSC (Minor)	3	0	0	0	0	0	3	40	60	0	100
	7	24MOCE311R	Recovering the humankind's past and saving the universal heritage	DSC (Minor)	0	0	0	0	0	0	1	100	0	0	100
	8	24BTCE317R	Field-based Training	Field Training	0	0	0	0	0	16	1	100	0	0	100
	9	24BTCE318R	Summer Internship	Internship	0	0	0	0	0	48	3	100	0	0	100
	10	24UBPD314R	PDP	SEC	0	0	4	0	0	0	2	0	0	100	100
	11	24MOCE312R	Foundations of Project Management	MDC	0	0	0	0	0	0	1	100	0	0	100
	12	24UBEC311	EXTRA CURRICULAR ACTIVITY	VAC	0	0	0	0	4	0	1	100	0	0	100
		I	Total		15	0	9	0	4	62	26	740	360		1400
	s.	Course Code	Course Title	Course		En	iga	gen	nent				laximu Iarks f		
	No.			Category	L	ſ	r I			0	С	IA*	SEE*	PE*	Tota l
	1	24BTCE321R	Hydrology & Water Resource Engineering	DSC	3	C	) 2	2 0	0	0	4	40	60	100	200
	2	24BTCE322R	Design of RC Structures	DSC	3	3	3 (	0 0	0	0	3	40	60	0	100
ster VI	3	24BTCE323R	Irrigation Engineering/Solid & Hazardous Waste Management/ Environmental Impact Assessment	DSE	3	C	) (	0 0	0	0	3	40	60	0	100
Semester	4	2BTCE324R	Geospatial Techniques in Practice	DSE	3	3	3 (	0 0	0	0	3	40	60	0	100
	4 5	2BTCE327R	Career Readiness in Digital era	DSE	3	3	3 (	0 0	0	0	3	40	60	0	100
	6	24BTCE326R	Building Planning & Drawing	DSE	2	0	) 2	2 0	0	0	3	40	60	100	200
	6 7	24MOCE321R	Technical support Fundamental	DSE	0	0				0	1	100	0	0	100
	8	24UBPD324R	PDP	AEC/SEC	0	0	_	_	_	0	2	0	0	100	100
	9	24MOCE322R	Build Personal Resilience	MDC	0	0			_	0	1	100	0	0	100
	10	24UBEC311	Extra-Curricular Activity	VAC	0				-	0	1	100	0	0	100
	1		Total		17	9	4	4 8	0	0	24	540	360	300	1200

Curriculum and Syllabus, 2024-25, B. Tech in Civil Engineering, FoE, AdtU

	S.	Course Code	Course Title	Course		En	gag	gem	ent	ţ		Max	imum I for	Marks	
	No.			Category	L	T	Р	S	R	0	С	IA*	SEE*	PE*	Total
		24BTCE411R	Design of Steel Structures	DSC	4	0	0	0	0	0	4	40	60	0	100
	2	24BTCE412R	DPR	DSC	0	0	2	0	0	0	1	0	0	100	100
VII	3	24BTCE413R	Estimation & Costing	DSC	0	0	2	0	0	0	1	0	0	100	100
Semester	4	24BTCE414R	Heavy Lifting Techniques & Machinery	DSC	3	0	0	0	0	0	3	40	60	0	100
Sen	6	24BTCE415R	Elementary Statistical Analysis	Compulsory	0	0	0	0	0	24	3	100	0	0	100
	7	24BTCE416R	Literature Review	Compulsory	0	0	0	0	0	24	3	100	0	0	100
	8	24MOCE411R	Mindfulness and Wellbeing: Living with Balance and Ease	DSE	0	0	0	0	0	0	2	100	0	0	100
			Total	1	7	0	4	0	0	48	17	380	120	200	700
	S. No.	Course Code	Course Title	Course Category		En						Max			
	1.00			Category	L	T	P	S	R	0	С	IA*	SEE*	PE*	Total
r VIII	1	24BTCE421R	Construction Practice & Management	Compulsory	4	0	0	0	0	0	4	40	60	0	100
ite	2	24BTCE422R	Foundation Engineering	Compulsory	4	0	0	0	0	0	4	40	60	0	100
Semester		24BTCE423R	Application of AI in Engineering	DSC	3	0	0	0	0	0	3	40	60	0	100
	4	24BTCE424R	Research Based Course III	Compulsory	0	0	0	0	0	64	6	100	0	0	100
		]	Fotal		11	0	0	0	0	64	17	220	180	0	400

			SEMEST	ER – I										
Cours	e Title		Calculus	s and Li	near	Algeb	ra							
Cours	e code	24BTCE111R	Total credits	L	L	Т	Р	S	R	O/F	C			
			<b>Total hours:</b> 4		3	0	0	0	0	0	3			
	quisite	Nil	Co-requisite Nil											
Progr	amme		B. Tech		0		0							
Sem	ester		Fall/ I semester o	ĩ			0							
		1. To understand an		-	-	-					natics			
	urse	2. To develop the a	• •	-					-					
Obje	ctives	3. To become conf			s, logi	c, reas	oning	and co	ding t	to analy	yze			
		-	ms in real-life situ											
CO		Enabling solving skills of definite and improper integrals.												
CO		Familiarize with the techniques of calculus												
CO		Understand the application of differential and integral calculus.												
CO	)4	Understand the concept of convergence and divergence of sequence and series.												
CO	)5	Understand the concepts of matrices to solve systems of linear equations and a							d applie	cation				
		problems requiring	them.											
Unit-		Content		Conta		L	earni	ng Ou	tcome	e	KI			
No.	Intogr	al Calaulus and its	annliastions .	Hou		To ma								
	-	al Calculus and its test and involutes; Evaluates Evaluates and involutes; Evaluates and involutes a				evalua								
		e and improper integ								4				
Ι		a functions and their		6			nproper integrals. Apart com these some special							
1		a functions and then ations of definite int		U				1,2						
		te surface areas and	egrais to			functions like Beta and Gamma function has to be								
		es of revolutions.				introdu								
		cation of Differentia	l Coloulus .					ne info	rmatic	<b></b> 11				
		s Theorem, Mean val												
		's and Maclaurin the				second								
		iders; indeterminate				the gra								
П		oital's rule; Maxima		5		when t				<i>,</i>	1, 2			
	Linos					negativ					3, 4			
						concav		•						
						when t			<i>,</i>	sign				
						there i				-				
	Seque	nce and series Conv	ergence of			Learn			-					
	-	nce and series, tests f	-			sequer		-			1, 2			
III	Power	series, Taylor's serie	s, series for	7		-					3,4			
		ential, trigonometric									5			
	and log	garithm functions.												
	Matri					To pro	vide a	n esse	ntial t	ool				
IV	Defini	tion; Types of matric	es; Operation of	<u>د</u>		of mat	rices a	nd lin	ear alg	gebra	2, 3			
1 V	matric	es; Symmetric, skew	-symmetric,	6		in a co	mprel	nensive	e mani	ner.	4			
	Invers	e and rank of a matri	x, Determinants											
	Appli	cation and algebra o	of Matrices :	Learn the concept of										
	System	n of linear equations;	Eigen values			applica	ation o	of matr	rices		<b>)</b> ) )			
V	and Ei	genvectors; Diagona	lization of	6							2, 3 4, 5			
	matric	es; Cayley-Hamilton	Theorem and								ч, Э			
	it's ap	plication.												

- T1: Calculus and Analytic geometryG.B. Thomas and R.L. Finney9th Edition, Pearson,Reprint, 2002
- T2: Advanced Engineering Mathematics Erwin kreyszig9thEdition,John Wiley & Sons, 2006
- T3: Higher Engineering Mathematics Ramana B.V.TataMcGrawHill New Delhi, 11<sup>th</sup>. Reprint, 2010.

#### **REFERENCE BOOKS:**

- R1: Higher Engineering Mathematics B.S. Grewal Khanna Publishers, 36th Edition, 2010
- R2: A text book of Engineering Mathematics N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008
- R3: Linear Algebra: A Modern Introduction D. Poole 2nd Edition. Brooks/Cole, 2005

#### **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

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	The students will be able to develop a strong foundation in differential and integral calculus, including limits, continuity, derivatives, and integrals, as well as key concepts in linear algebra such as matrices, determinants, and vector spaces	1,8					
2	Students will be able to apply calculus techniques to solve real-world problems involving rates of change, optimization, and area under curves, and use linear algebra methods to solve systems of linear equations and perform vector transformations	3,7					
3	Enhance logical and analytical thinking by interpreting mathematical results, proving theorems, and understanding the geometric and algebraic interpretations of calculus and linear algebra concepts.	6,9,10					
4	Utilize calculus and linear algebra in various fields such as physics, engineering, computer science, economics, and data science, particularly in modeling and simulation.	5,9					
5	Develop the ability to use software tools like MATLAB, Python, or other computational platforms to perform complex calculations, visualize mathematical functions, and analyze data.	7,1,12					

			SEMES	TER – I							
Cours	e Title	Int	troduction to Ba	sic Mather	matics	s, Logi	ic and	Codi	ng		
Cours	e code	24BTCE112R	Total credi		L	Т	Р	S	R	O/F	C
			Total hours		3	0	0	0	0	0	3
	quisite	Nil	Co-requis					Nil			
Programme B. Tech in Civil Engineering											
Semester         Fall/ I semester of first year of the programme           1.To understand and be able to use the language, symbols and notation of mathematical symbols.											
~											atics
Course2. To develop the ability to create a programmemable modelObjectives3. To become confident in using mathematics, logic, reasonir							-	-			
Obje	ctives		-		logic,	reason	nıng a	nd coo	ding t	o analy	ze
C	01	-	ems in real-life si			oundo	rator	1 tha a	010.001	ts of	
U	01	The students will b mathematics, logic			biiity t	o unde	erstand	i the c	oncep	DIS OI	
		Students will be ab	-		fcon	ponte in	n othe	r disci	inling	s such	
C	02	as engineering, con				cpts II			ipine	s such	
		Solve and devise s		-		real-wo	orld p	robler	ns in 1	mathen	natics
C	03	and programming	orations to a rang		intur y i		oria p		115 111 1	mamen	laties
C	<b>D4</b>	Explore and apply	key concepts in 1	ogical thin	king to	o busir	iess p	roblen	ns.		
		Enable students to		-	-		_			ce and	
C	05	construct reasoned									
Unit-		Contont	Content Contact Learning Outcome					KL			
No.		Content		Hour		Lea	rning	Oute	ome		ĸL
	Basics	of Set Theory and	Functions:		Stud	lents w	vill gai	in a fu	ndam	ental	
		•	understanding of set theory,								
		nciple of exclusion a			iding b						
	-	ation of sets: union		cardinality, and operations on							
		nce, complement etc		sets such as union, intersection,				-			
		enn Diagram	, 8		difference, and complement. They will learn the principle of						
		ian Products and <b>F</b>	Relations:		-			-	-		
	Basic I	Definitions, binary r	elations		exclusion and inclusion, De						
	- comp	osition and inverse,	binary relation		Morgan's laws, and how to represent sets using Venn diagrams. The unit covers Cartesian products, basic						
	on a set	: properties – refle	xive,								
		ive, symmetric, ant	•								
		ve, equivalence rela	tions, partial			nitions					
Ι		elations		5		erties			<i>,</i>		1, 2
		ons: Basic definitio		-		ıding r					,
		ain, image and rang	•			lexivit			у,		
		n, one-to-one and on			antis	symme	try, tr	ansitiv	vity,		
	-	ns, characteristic fu			equi	valenc	e rela	tions,	and p	artial	
	-	sition of functions, i			orde	r relati	ions. A	Additi	onally	Ι,	
		· •	operations on sets: unary – idempotence, binary operators				sics				
	-	iativity, commutativ	• •			inction		-			
		er systems: Natural	-			omain,	•			-	
		numbers, integers, r				tion, ir	e			re,	
		s, real numbers, op				bijectiv					
		rs: addition, subtrac				acteris					
		ication and division				positio					
	-				func	tions, a	and of	peratio	ons or	n sets	

			involving unary and binary operators.	
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 <b>Propositional Logic:</b> 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 <b>Mathematical Induction:</b> 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	<b>Introduction to Logic and Reasoning:</b> Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order , Puzzle, Blood Relations , Analogy, Cube and Dice, Coding-Decoding	10	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' Programme, Executing and Debugging a 'C' Programme, 'C' Tokens: Keywords and Identifiers, Operators, Constants, Variables, Data Types, Precedence of Operators, Scope and	10	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 programme, and how to execute and debug it. The unit covers C tokens such as	2, 3, 4

	Lifetime of Variables, Arithmetic Expressions, Evaluation of Expressions. <b>Control Statements:</b> Decision Making using if statement, Types of ifelse block, Switch case Block, GOTO statement. <b>Looping:</b> Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement		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 ifelse blocks, switch case blocks, and the GOTO statement. Students will delve deeper into C programming, focusing on	
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	control structures such as loops (for, while, do-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.	2, 3, 4, 5

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

#### **REFERENCE BOOKS:**

- R1: A Modern Approach To Verbal & Non Verbal Reasoning by R S Agarwal, Revised Edition
- R2: Analytical and Logical Reasoning by Sijwali B S, Revised Edition
- R3: The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie, Second Edition
- R4: 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

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme 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				

			S	EMESTER	- I							
Cours	e Title			Physics for	Civi	l Eng	inee	rs				
Course code		24BTCE113R	Total c	redits: 3		L	Т	P	S	R	O/F	С
Cours	Total			ours: 30T+	30P	2	0	2	0	0	0	3
	quisite	Nil		o-requisite					Ν	Nil		
	amme			B. Tech in (		-		-				
Sem	ester			nester of fi	rst ye	ar of	the <b>j</b>	orogi	amm	e		
Course Objectives		1. To understand the theories of physics										
		<ul><li>2. To apply the concepts in practical problems</li><li>3. To understand the physics of any process</li></ul>										
			-	• •			h n n	~~~1~			ation of	6 6
C	<b>D1</b>	Develop a foundationa and nature of forces.	a under	standing of	the ve	ectors	and	scala	r repr	esem	ation o	liorces
		Illustrate conservative	and no	n_conservati	ve fo	rces	anau	lar m	omen	tum (	and ene	rav
CO	02	equations	and no.			1003,	ungu		omen	unn a		igy
		Explain basics of non-	inertial	frames and	accel	eratic	on and	d its a	applic	ation	in engi	neering
CO	)3	field						- •	11		8	0
C	)4	Comprehend on oscilla	ations a	nd its applic	ation	in th	e fiel	dof	engine	eering	g kinem	atics
CO	)5	Understand the three-d							-	-	-	
C	5	inertia.										
Unit-		Content		Contact			Lear	nino	Outc	ome		KL
No.		Electrostatics in Vacu		Hour							ts will	
Ι	intensi applica potenti electro	nb's law, electric field ty, Gauss's law and its itions, electric potential al energy, conductors in static equilibrium, capac pacitance calculations.	ı	10	unde railv evol railv be a diffe proc will func com and spac anal disa balla requ emb Add iden unde	erstan ways i ution way tr ble to erent i cess o ident trions ballas ballas ing, a yze th dvant ast an iremo- ankm litiona tify c	ding in Inc of per- gauge f con ify and ify and and st, de and d ages d unc ents f ally, s omm d rai s beh	of th lia, in erma: comp lain t es us ning nd de chara ich a: tailin ensit vanta of va dersta for su consti stude on ra l cree ind ra	ncludi nent w onents he sig ed in l wheel escribe escribe escribe s rails g thei ies. Th ages an arious and the bgrad ruction nts wi uil def ep, and ail join	elopr ng th vay a s. Th nifica india s. St e the tics c r typ ney v nd type: e e anon n. Il be ects, d exp	ment of ne nd ey will ance of and the udents of key of key of key pers, es, vill s of d able to	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	Upo geon stud desi inco	netric ents v gn rai orpora	nplet c desi will b ilway ting	ing the gn of e able tracing gradi	nis uni f railw e to an k layo ents, g	vay tr nalyz uts grade	acks, e and	1, 2, 3, 4

			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.	
	Unit III. Foredoy's Low		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. The learning outcome of the unit on	
111	Unit III: Faraday's Law Electromagnetic induction, Faraday's law (integral and differential forms), magnetic flux, induced electromotive force (emf), practical applications.	10	The fearing 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

	Unit IV: Displacement Current		Upon completion of this unit on	
	and Maxwell's Equations		Airfield Design and Planning,	
	Displacement current, magnetic		students will be able to demonstrate	
	field due to time-dependent electric		comprehensive knowledge and skills	
	field, Maxwell's equations in		in various critical aspects of airfield	
	integral and differential forms,		infrastructure. They will understand	
	boundary conditions for		the principles of runway design,	
	electromagnetic fields.		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,	
		10	considering geometric elements,	2, 3,
IV		10	layout, and exit strategies, as well as	4
			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.	
	Unit V: Electromagnetic Waves		By the end of this unit, learners will	
	Wave equation for electromagnetic		demonstrate a comprehensive	
	fields, propagation of		understanding of terminal area	
	electromagnetic waves in free space		planning and design within an airport	
	and in materials, energy and		context. They will be able to analyze	
	momentum of electromagnetic		and apply the fundamental elements	
	waves, reflection and refraction,		and requirements of terminal	
	polarization, electromagnetic wave		buildings, including functional spaces	
	applications		and spatial requirements. Students	2, 3,
V		5	will also grasp essential concepts in	4, 5
			vehicular parking area design and	., 5
			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.	
	1			

- T1: Introduction to Electrodynamics. David Griffiths. Prentice Hall, Upper Saddle River, New Jersey, 07458
- T2: Basic Laws of Electromagnetism. IE IRODOV

#### **REFERENCE BOOKS:**

R1: Principles of physics. Halliday Resnick

#### **OTHER LEARNING RESOURCES:**

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

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme 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									
Cours	e Title			Workshop for	Engin	eers							
Cours	e code	24BTCE114	L	Τ	P	S	R	O/F	C				
			Total	hours: 30P	0	0	2	0	0	0	1		
Pre-re	-	Nil		Co-requisite	<u> </u>			Ni	1				
Programme         B. Tech in Civil Engineering													
Semester Fall/ I semester of first y													
~				ill lead you to underst	and ba	sic c	oncep	ts of v	vorksł	nop and	1		
Course Objectives		manufacturing 2. Apply fundamental knowledge of workshop and manufacturing in day-to-day life.									0		
						anuta	acturin	ig in c	lay-to-	-day lif	ie.		
~				using different mater									
CO				acturing methods like		-	-	, mac	hining	etc			
CO			•	d power tools in man		•		<u> </u>					
CO			÷ •	& fitting operations a		~ ~							
CO				ng operations like ma			-				uld etc		
CO	05	Critique the dif		s of welding, metal ca	assting	and	its fiel	d of a	pplica	ation.			
Unit-		Content	Contact	Le	arnin	g Ou	tcome				KL		
No.			Hour			<u> </u>							
				Students will gain a	-					-			
				traditional manufact	•				•	•			
				forming, machining	-				-				
	Manuf	Manufacturing		explore the fundame						•			
	Methods       Casting, forming,       machining, joining,       advanced		Mathada			about the materials			-		-	and	
			assemble components. The unit also introduces										
Ι			10	advanced manufacturing methods, focusing on CNC					1, 2				
-			10	(Computer Numerical Control) machining and									
		nufacturing		additive manufacturing. Students will gain an									
	method	e		overview of the CNC machining process, including									
				the programming, so	•								
				machines. They will									
				manufacturing, cove	-	-	-		-	gies,			
				and applications in t									
				This unit covers ess					•				
	CNC r	nachining,		carpentry and fitting									
	Additi	U,		familiar with variou	-	-							
		facturing	eturing well as common carpentry operations such as cutting,										
II		ew of CNC	10	shaping, and assemb	-			-		he	2, 3,		
	machir	ning process,		unit also includes fi	-		-			1	4		
	overvie	ew of additive		teaching students ho									
	manufa	acturing		assemble metal com	-		-						
				skills are fundament		-	-			ning			
				high-quality mechan							<u> </u>		
				Students will delve						xx;11			
	Carpe	ntry & Fitting		focusing on turning learn the principles						w111			
	operat	ions					-			tting			
III	Carper	try tools,	10	turning, such as setting up the lathe, selecting cutting tools, and executing turning operations to produce					1, 2,				
111	-	try operations,	10	cylindrical parts. Th				-			3, 4		
	fitting	tools, fitting		processes, including					-				
	operati	ons		milling machines, a	-	-	-			e			
				milling tools. Stude					-				
					nis wl	u gal	n prac	ucal S	KIIIS I	u			

			producing components with complex shapes and	
			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	1, 2
V	Welding Arc welding & gas welding, brazing	5	applications. 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

T1: 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.

	CO PO Mapping				
SN	Course Outcome (CO)	Mapped Programme 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			

				SEMESTE									
Course	Title	MOOCS-Mechai			Energy		1	-		1			
Course code		24MOCE112R	dits: 1		L 0	T 0	P	S	R	O/F		<u>C</u>	
		Total hou		irs: 151	rs: 15T			0	0	0	0		1
Pre- requisite		Nil	Co-requisite						]	Nil			
Progra				B. Tech in	Civil E	 Cngine	erin	g					
Seme			Fall/ I se	emester of fi		-		-	amm	e			
Cour Object		<ol> <li>Introduce fundar</li> <li>Develop problem</li> <li>Explore the print motion.</li> </ol>	n-solving s ciples of gr	kills in classi avity and the	ical me eir appl	chani icatio	cs. ns fr	om p	articl	es to j	planetar		
C0		Demonstrate an une kinematics problem Analyze forces and	IS.	-	-					-			
CO2 CO3		Apply the concepts	-	-				-				stem	S
C0		Explain the gravitat			-				-		-		
		Utilize conservation			_							er	
CO	5	interactions in meel	nanics.										
Unit-		Content Contact Learning Outcome		1	KL								
No.	<b>T T T T</b>	1: Kinematics and I		Hour									
Ι	Intro and I two, Disp acce Dyna Law New and I Rota force	articles duction to Mechanic history, Kinematics and three dimension lacement, velocity, a leration. Projectile n amics of particles: N s of Motion. Applica ton's Laws. Friction kinetic. Circular Mo tional Dynamics. Ca e. Angular velocity a leration	3	By the end of this unit, students will be able to describe the motion of particles in one, two, and three dimensions using concepts of displacement, velocity, and acceleration. They will apply Newton's Laws of Motion to analyze and predict the behavior of particles under various forces, including friction. Additionally, students will understand circular motion and rotational dynamics, enabling them to solve problems involving centripetal force and angular motion.					g 1 s , on n	1, 2			
II	Unit 2: Work, Energy, and Power Work done by a constant and variable force. Kinetic and Potential Energy. Work-Energy Theorem. Conservative and non- conservative forces. Power and its calculation in mechanical systems. Conservation of Mechanical Energy: Energy diagrams. Applications in mechanical systems.		3	under const be ab and p Work mech stude mech princ: unit v energ conce	ents will gain a thorough estanding of work done by both ant and variable forces. They will le to distinguish between kinetic otential energy, applying the t-Energy Theorem to solve anical problems. Furthermore, nts will calculate power in anical systems and understand the iples of energy conservation. This will enhance their ability to analyze ty diagrams and apply these epts to real-world scenarios ving mechanical energy.				2	2, 3, 4			
III		3: Systems of Partic	cles and	3	By co	omple	ting	this v	ınit, s	tuden	ts will of mass		1, 2, 3, 4

	Center of Mass and Motion of the		of a system of particles and describe its		
	Center of Mass and Motion of the Center of Mass. Linear		motion. They will understand and apply		
	Momentum and Impulse.		the concepts of linear momentum and		
	Conservation of Linear Momentum. Collisions: Elastic		impulse, utilizing the conservation of		
			linear momentum to analyze elastic and		
	and inelastic collisions.		inelastic collisions. Students will also		
			explore the dynamics of variable mass		
	Analysis of collisions in one and				
	two dimensions.Rocket		systems, such as rocket propulsion, and		
	propulsion and variable mass		solve complex problems involving		
	systems.		collisions in multiple dimensions.		
	Unit 4: Rotational Motion and		Students will develop a solid		
	Dynamics		understanding of rotational kinematics		
	Rotational Kinematics and	3	and the concept of moment of inertia.	1, 2	
	Energy. Moment of inertia and		They will analyze the dynamics of		
	rotational kinetic energy.		rotational motion, including torque and		
	Dynamics of Rotational Motion.		angular momentum, and apply these		
IV	Torque and angular momentum.		principles to solve equilibrium		
1,	Equilibrium of Rigid Bodies.		problems involving rigid bodies.	1, 2	
	Conditions for equilibrium.		Additionally, students will explore		
	Center of gravity. Rolling Motion		rolling motion, the conditions for		
	and Angular Momentum. Rolling		rolling without slipping, and the		
	without slipping. Conservation of		conservation of angular momentum,		
	angular momentum.		preparing them to tackle advanced		
			problems in rotational dynamics.		
	Unit 5: Gravitation and Planetary		In this unit, students will learn		
	Motion		Newton's Law of Universal Gravitation		
	Newton's Law of Universal		and its applications to planetary and		
	Gravitation. Gravitational		satellite motion. They will understand		
	Potential Energy. Orbits of	3	gravitational potential energy and	2, 3, 4, 5	
	Planets and Satellites. Kepler's		analyze orbits using Kepler's Laws of		
	Laws of Planetary Motion.		Planetary Motion. Students will explore		
V	Orbital mechanics and escape		gravitational fields and potentials,		
	velocity. Gravitational Fields and		enhancing their ability to solve		
	Potential. Gravitational field		problems related to gravitational		
	strength. Gravitational potential and energy. Applications of Gravitation: Tidal forces. Black holes and General Relativity		interactions. Additionally, they will		
			apply concepts of gravitation to		
			phenomena such as tidal forces and		
			black holes, gaining an introductory		
	basics.		understanding of general relativity.		
	0.000		understanding of general relativity.		

- T1: Classical Mechanics by Herbert Goldstein, 2002, Addison-Wesley, DOI: 10.1063/1.3069576.
- T2: An Introduction to Mechanics by Daniel Kleppner and Robert Kolenkow, 2014, Cambridge University Press, DOI: 10.1119/1.4947436.
- T3: Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker, 2013, Wiley, DOI: 10.1002/9781118981245.
- T4: Mechanics by L.D. Landau and E.M. Lifshitz, 1976, Butterworth-Heinemann, DOI: 10.1016/B978-0-08-029139-6.50010-4.
- T5: Physics for Scientists and Engineers by Raymond A. Serway and John W. Jewett, 2018, Cengage Learning, DOI: 10.1136/978-1-305-47398-2.

#### **REFERENCE BOOKS**

- R1: Analytical Mechanics by Grant R. Fowles and George L. Cassiday, 2004, Cengage Learning, DOI: 10.1088/0031-9120/40/2/001.
- R2: Introduction to Classical Mechanics by David Morin, 2008, Cambridge University Press, DOI: 10.1017/CBO9781139174533.
- R3: Mechanics: Volume 1 by Charles Kittel, Walter D. Knight, Malvin A. Ruderman, and A. Carl Helmholz, 1973, McGraw-Hill, DOI: 10.1063/1.3127498.
- R4: Classical Dynamics of Particles and Systems by Stephen T. Thornton and Jerry B. Marion, 2003, Brooks Cole, DOI: 10.1136/978-0-534-40896-1.
- R5: Principles of Dynamics by Donald T. Greenwood, 1988, Prentice Hall, DOI: 10.2307/2323459.

CO PO Mapping				
SN	Course Outcome (CO)	Mapped Programme Outcome		
1	Demonstrate an understanding of the principles of motion and the ability to solve kinematics problems.	1,3,5		
2	Analyze forces and predict the resulting motion of objects using Newton's laws.	2,4		
3	Apply the concepts of work and energy to solve problems involving mechanical systems.	6,8		
4	Explain the gravitational interactions between particles and celestial bodies.	7,10,12		
5	Utilize conservation laws to analyze and predict the outcomes of collisions and other interactions in mechanics.	8,9		

			SEMESTER – I										
			Field Based Traini										
Cours	e code	24BTCE115R	Total credits: 1	L	Т	Р	S	R	O/F	C			
Cours	e coue	24DICEII3N	Total hours: 30P	0	0	0	0	0	16	1			
	equisite	Nil	<b>Co-requisite</b>				N	lil					
-	amme		<b>B.Tech</b> Civil	-		-							
Sem	ester		II semester of secon	-			-						
		1. Equip students with advanced AutoCAD skills necessary for civil engineering											
Car	ırse	<ul><li>projects, enhancing their technical proficiency and professional competency.</li><li>2.Develop students' ability to create precise engineering drawings and detailed designs,</li></ul>											
	urse ctives	fostering attention to detail and accuracy in their work.											
Obje	cuves	3.Enhance problem-solving and critical thinking abilities through practical AutoCAD											
		applications, preparing students for real-world engineering challenges.											
CC	D1	Demonstrate proficience							vil				
		engineering drawings.					- 1						
CO	)2	Apply advanced AutoC	CAD techniques to de	sign det	tailed	stru	ctural	plans a	nd layo	outs.			
CC	)3		Develop the ability to interpret and convert conceptual sketches into precise digital										
		drawings.											
CC	94	Integrate AutoCAD skills with other engineering tools and software for comprehensive											
60	-	project development.	1 1 1 1 111	1. 1 .	1.1	1	1 .	1 1		1			
CO	95	Exhibit improved prob	-	d technı	cal k	nowl	edge t	hrough	practic	al			
Unit-		AutoCAD applications		Conta	ot		Loo	rning					
No.		Content		Hour				come		KL**			
1.00	Introd	uction to Advanced Au	toCAD Features:	mour		Aaste	r adva						
<b>.</b>		verview of advanced drawing tools,						ls and		1.2			
Ι		nization options, and productivity features.			c	ustor	nizati	on feati	ıres	1, 2			
					i	n Au	toCAI	).					
		ng Detailed Civil Engir	0 0			Create precise and							
		ques for creating detaile					ed civ						
II		ctural drawings, includir	4		•	•	drawin	ngs	2, 3				
	dimens	ioning, and annotation.				dvanc	ed						
	3D M-	deling and Visualization	n. Introduction to				ques.	model	<u> </u>				
		deling, rendering, and vi					-	e civil	.o				
III		jues in AutoCAD for civ		4				design	s	3, 4			
	applica	-	6 6			-	Auto(	-					
	~ ~	ation with Other Tools	: Methods for					ıtoCAI	)				
	integra	ting AutoCAD with othe	er engineering		s	kills	with c	other to	ols				
IV		re and tools, including in		4			-	nensive		4, 5			
	files an	d collaborative project v	workflows.			-	-	project	t				
	<b>D</b>	1.4.14	• • • • •				opmen						
		cal Applications and Pi	•					CAD sl					
		s and case studies to app	•	А		-		cal projects, trating problem- 5					
V	in real-	world civil engineering	scenarios,	4				ng prot technic		5			
		•	entation				-		Jai				
L	project	presentation and docum	ientation.		p	rofic	iency.						

- T1: "Field Research: A Sourcebook and Field Manual" Robert G. Burgess
- T2: "Methods in Field Biology" Robert H. Giles
- T3: "Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Earth Sciences" Sara E. Vero
- T4: "Research Methods in Education" Louis Cohen, Lawrence Manion, and Keith Morrison (For Education Field Training)

#### **REFERENCE BOOKS:**

- R1: "The Field Guide to Fieldwork" Bruce L. Berg
- R2:"Handbook of Field Experiments" Abhijit V. Banerjee and Esther Duflo
- R3:"Doing Fieldwork in Areas of International Intervention" Berit Bliesemann de Guevara
- R4:"Practical Field Ecology: A Project Guide" C. Philip Wheater, James R. Bell, Penny A. Cook
- R5:"Field and Laboratory Methods for General Ecology" James E. Brower, Jerrold H. Zar

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Program Outcome						
	Demonstrate proficiency in using AutoCAD tools for							
1	creating complex civil engineering drawings.	5, 7						
	Apply advanced AutoCAD techniques to design detailed							
2	structural plans and layouts.	8						
	Develop the ability to interpret and convert conceptual							
3	sketches into precise digital drawings.	7,9,10						
	Integrate AutoCAD skills with other engineering tools							
4	and software for comprehensive project development.	11,12						
	Exhibit improved problem-solving skills and technical							
5	knowledge through practical AutoCAD applications.	10						

		1		ESTER – I						
Cou	rse Title		Introductory	-	-					
Cou	rse code	241 RPD114R	otal credits: 1 otal hours: 15T+(	60P 0	T 0	P 4	<u>S</u>	R 0	0/F 0	C 2
Pre-	requisite	Nil	Co-requisite	•	U	4	Nil	U	U	2
	gramme		chelor of Technol		nanica	l Engi		ng		
	mester		Winter/ I semest					-		
	ourse jectives	<ol> <li>To capacitate th</li> <li>To enable the s speaking skills.</li> </ol>	e students with m tudents to commu- of the basics of P	astery over I unicate confi	Basic I idently	English v with	gram a focu	mar. s on l		•
(	CO1	Understand and con articles, auxiliary ve types of sentences.	rrectly use variou	•						
(	CO2 Analyze and comprehend written texts through comprehension exercise demonstrating an understanding of sentence construction and types.									
(	<ul><li>CO3 Understand the process and purpose of listening, differentiate between listening an hearing, identify factors affecting listening, and implement strategies to improve the listening skills.</li></ul>									e their
(	C <b>O</b> 4	4 Develop speaking skills by introducing themselves, practicing self-discover improving pronunciation through phonetics, delivering extempore speeches, and using video recordings for self-reflection.								using
(	C <b>O</b> 5	Understand the ful barriers, and impor skills in both formation	tance, and apply	this knowled			•	• •	· •	•
Unit-		Content	Contact	I	Learni	ng Ou	tcome	9		KL
No.			Hour							
I	ii. Article iii. Auxili	of Speech	re and <b>6</b>	In this mod foundationa will explore including n adjectives, conjunction Understand indefinite) be emphasi about auxil forming ter module will of affirmati helping stu correct and	al elem e the p ouns, j advert ns, and ling ar and the zed. S iary ve nses, ve 1 also ive and dents t	nents o arts of pronou os, prep interja ticles ( eir corr tudent: erbs an oices, a cover t l negat to build	f gram speec ons, ve cositions definit rect us s will l d their and me he cor ive ser l gram	imar. 7 h, rbs, ns, s. te and age will learn r role i pods. 7 nstruct ntence imatica	Гhey ill п Гhe ion s,	1, 2
Π	iii. Types Imper iv. Degre	niners nee Construction of Sentences (Assert ative, etc.) e of Comparison rehension Exercises	ive, 7	Building or delve into c functions in learn senter and the diff (assertive, i exclamator of comparis	n the b leterm n sente nce con ferent t impera y). The	asics, f iners a nces. S nstruct types c tive, in e conce	this mo nd the Studen ion teo of sento nterrog ept of	odule v ir ts will chniqu ences gative, the deg	es and gree	2, 3, 4

III	Listening Skills i. What is listening? ii. The Process of Listening iii. Factors that adversely affect Listening iv. Difference between Listening and Hearing, v. Purpose and Importance of	6	<ul> <li>and superlative) will be explored. The module will also</li> <li>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</li> </ul>	1, 2, 3, 4
	Effective Listening vi. How to Improve Listening Process.		understanding these concepts, students will enhance their ability to comprehend and retain spoken information.	
IV	<ul> <li>Speaking Skills</li> <li>i. Introducing yourself</li> <li>ii. Self-discovery</li> <li>iii. Basics of Phonetics, pronunciation</li> <li>iv. Extempore speech</li> <li>v. Video Recording for Self- reflection</li> </ul>	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	<ul> <li>Communication Skills</li> <li>i. Introduction to Communication,</li> <li>ii. Importance of Communication Skills.</li> <li>iii. Purpose of Communication.</li> <li>iv. Types of Communication.</li> <li>v. Formal and informal communication</li> <li>vi. Importance of Communication.</li> <li>vii. Barriers to Communication.</li> <li>viii. How to improve/ tips to improve Communication skills.</li> <li>ix. Responding to different questions in various situations (formal/informal)</li> </ul>	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

- T1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida
- T2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & amp; Company Ltd.: New Delhi.

### **REFERENCE BOOKS:**

- R1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India
- R2. 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. <u>https://youtu.be/-zZau\_dttRY</u>

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.	1, 4,11

~ ~ ~		SEMES	STER – I								
<b>Course Title</b>		EXTRA-C	URRICU	JLAR	ACTI	VITIF	ES				
Course code	24UBEC111	Total credit	s: 1	L	Т	Р	S	R	O/F	С	
		Total hours	: 10T	0	0	0	4	0	0	1	
Pre- requisite	Nil	Co-ree	quisite				Nil				
Programme		B.Te	ch in Civ	'il Eng	ineerin	ıg					
Semester	F	all/ I semeste	er of first	year o	of the p	orogra	amme				
Course	1. To develop soft	and social sk	ills								
Objectives	2. To promote a ho	olistic develop	oment of	the lear	mers						
	3. To enhance the	learning expe	rience in	differe	nt stag	es etc.					
	Participants will deve	elop personal	skills, su	ch as le	eadersh	ip, co	mmuni	cation	, time		
<b>CO1</b>	management, and tea	mwork, contr	ibuting to	o their	overall	chara	cter de	velopi	nent an	d	
	self-confidence.										
	Engagement in Community service and outreach activities will cultivate a sense of										
CO2	social responsibility,	empathy, and	l civic aw	arenes	s, enco	uragin	ng stude	ents to	activel	у	
	contribute to society										
<b>CO</b> 2	Express their ideas, v	views, In-dept	h evaluat	ion and	l analy	sis cle	arly in	the to	pic of the	heir	
CO3	interest.	-									
CO4	The students will be	given a platfo	rm to ear	n from	invite	d expe	erts in tl	heir re	spectiv	e	
004	fields.										
CO5	Demonstrate and pra-	ctices differer	nt activiti	es, by l	ntegra	ting le	arning	exper	iences b	уу	
05	demonstrating transfe	erable skills.									
Unit-	Content	Contact			Lea	rning	Outco	me		KL	
No.		Hour									
	ent types of activities e regular curriculum	10	outs inter Thes the s a l learn 2. Keep learn are head Dan- liters 3. The parti worl	ide t aded to se activ social a nolistic ners. oing i ning n engage led un ce, mu ary etc. stude cipate	he r o mee vities a und sof dev n mir nethod ed in ider d usic, p ents a in reg comp	egular t learn re aim t skills elopm d the ology differ ifferer hotogr re er ular c etition	ge of ac curr ner's i hed to c s and p eent c the s rent ac nt club raphy, ncourag	ricului nteres levelo romoto of th -degree tuden etivitie os viz drama ged t tivitie	m t. pp te	2,3,4, 5	

	CO PO Mapping							
	Course Outcome (CO)	Mapped Program Outcome						
	Participants will develop personal skills, such as							
1	leadership, communication, time management, and	1,3						
	teamwork, contributing to their overall character	1,5						
	development and self-confidence.							
	Engagement in Community service and outreach activities							
2	will cultivate a sense of social responsibility, empathy, and	3,4,7						
	civic awareness, encouraging students to actively	5,4,7						
	contribute to society							
3	Express their ideas, views, In-depth evaluation and	6,8						
5	analysis clearly in the topic of their interest.	0,8						
4	The students will be given a platform to earn from invited	4,6						
4	experts in their respective fields.	4,0						
	Demonstrate and practices different activities, by							
5	Integrating learning experiences by demonstrating	7,11						
	transferable skills.							

			SEMEST	ER – II									
Cour	rse Title	Elements of P	robability & S	Statistics	for C	ivil F	Ingi	inee	ering	g App	olicatior	1	
Cour	rse code	24BTCE121R	Total credi		L	T	_	P	S	R	O/F	C	
			Total hours:		4	0		0	0	0	0	4	
	requisite	Nil	Co-requis						N	il			
-	gramme			B. Tech in Civil Engineering									
Sen	nester			I semester of first year of the programmef first order differential equation and apply them in									
		1. Describe the concep understanding comp		differenti	ial equ	latior	i an	d ar	oply	them	111		
C	ourse	2. Apply the concept o	*	arantial a	austio	ns of	hio	hor	ord	arc			
	ectives	3. Analyze: To develop	-		-		-				ncludin	a the	
Obj	ectives				-		-					-	
		analysis of probability distributions, measures of central tendency, and statistical parameters, and to apply these concepts to real-world data and hypothesis testing.											
(	C <b>O</b> 1	Solve first-order ordin		-								-	
		equations, and those s	•	-		-					, <u>,</u>		
											e coeffic	eients	
C	C <b>O2</b>	•	Analyze and solve second-order linear differential equations with variable coefficients using variation of parameters and the Cauchy-Euler equation.										
			Evaluate complex functions through differentiation, using Cauchy-Riemann equations										
C	CO3	-	for analyticity, and identify harmonic functions and their conjugates.										
-		Understand and analy	ze basic proba	bility cond	cepts,	inclu	ıdin	g pi	oba	bility	spaces,		
C	CO4	conditional probability	y, independenc	e, and var	rious	distri	buti	ons	•				
6	CO5	Evaluate statistical me	ethods for mea	sures of c	entral	tend	enc	y, n	nome	ents, s	skewnes	s,	
C	.03	kurtosis, probability d	istributions, ar	nd conduc	t sign	ificar	ice	test	s for	large	e sample	s.	
Unit-		Content	Contact		Le	earni	ng (	Out	com	e		KL	
No.	First and	er ordinary differential	Hour	First-ord	ler or	linar	u di	ffor	ontic		ations		
	equation	• ••								-			
	-	ear and Bernoulli's			include understanding and solving exact, linear, and Bernoulli equations, as well as Euler's equations for rigid body dynamics.								
	· · ·	, Euler's equations,											
	-	s not of first degree:		Students will also learn to h									
Ι	· ·	s solvable for p,	7	equation	quations not of the first degree, including nose solvable for <i>pp</i> , <i>yy</i> , or <i>xx</i> , and						1,2		
	equations	s solvable for y,		those so									
	equations	solvable for x and		Clairaut's type equations. These our					tcomes				
	Clairaut's	s type.		focus on	1 enha	ncing	ng analytical and						
				problem	i-solvi	ng sk	tills	in o	diffe	rentia	al		
				equation	ıs.								
	-	differential equations			~	•							
	of higher			Method				-			1 4		
		rder linear differential		Students									
II	equations	with variable	9	Cauchy-	-Euler	equa	t101	1, W	hich	is a s		1,2	
				C C		1 1	1.		1.0	r	. 1		
	coefficien	nts, method of variation		type of s									
	coefficien of parame	eters, Cauchy-Euler		type of s equation									
	coefficien of parame equation.	eters, Cauchy-Euler		equation	n usefi	ul in v	vari	ous	app	licatio	ons.		
	coefficien of paramo equation.	eters, Cauchy-Euler variable-		equation	n usefi	ul in v	vari y in	ous	app lving	licatio	ons. ond-		
	coefficien of paramo equation. <i>Complex</i> <i>Different</i>	eters, Cauchy-Euler variable- iation:		equation Gaining order lin	n usefo g profi near d	ul in v cienc iffere	vari y in ntia	ous 1 sol 11 ec	app lving luati	licatio g secc ons w	ons. ond- vith		
	coefficien of parama equation. <i>Complex</i> <i>Different</i> Different	eters, Cauchy-Euler <i>variable-</i> <i>tiation:</i> iation, Cauchy-Riemann	1	equation Gaining order lin variable	n usefi g profi near d coeff	ul in v cienc iffere ìcien	vari y in ntia ts u	ous i sol il ec sing	app lving luati g tec	licatio g secc ons w hniqu	ons. ond- vith les like		
III	coefficien of parame equation. <i>Complex</i> <i>Different</i> equations	eters, Cauchy-Euler variable- iation:		equation Gaining order lin	n usef g profi near d coeff ation o	ul in v cienc iffere icien	vari y in ntia ts u am	ous sol l ec sing eter	app lving luati g tec s. A	licatio g secc ons w hniqu dditic	ons. ond- vith ues like onally,	1,2	
III	coefficient of parama equation. <i>Complex</i> <i>Different</i> equations harmonic	eters, Cauchy-Euler <i>variable-</i> <i>iation:</i> iation, Cauchy-Riemann , analytic functions,	1	equation Gaining order lin variable the varia	y profinear d coeff ation of will	ul in v cienc iffere icien of par	vari y in ntia ts u am to s	ous sol sing eter	app lving luati g tec s. A e the	licatio g secco ons w hniqu dditic	ons. ond- vith ues like onally, chy-	1,2	
III	coefficient of parama equation. <i>Complex</i> <i>Different</i> equations harmonic harmonic	eters, Cauchy-Euler <i>variable-</i> <i>tiation:</i> iation, Cauchy-Riemann analytic functions, functions, finding	1	equation Gaining order lin variable the varia students	y usefu y profinear d coeff ation of will 1 quatio	ul in v cienc iffere icien of par learn n, a p	y in ntia ts u cam to s arti	ous sol sing eter solv cula	app lving luati g tec s. A e the ar typ	lication g seccions w hniqu dditice e Cau pe of	ons. ond- vith ues like onally, chy-	1,2	

	their properties.		methods. This expertise prepares students to tackle complex differential equations found in various scientific and engineering contexts	
IV	<i>Basic probability:</i> 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 centraltendency: Moments, skewnessand Kurtosis- Probabilitydistributions: Binomial, Poissonand Normal-evaluation ofstatistical parameters for thesethree distributions, Correlationand regression.Applied: Test of significance:Large sample test for singleproportion. Difference ofproportions, single mean,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

- T1: Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- T2: N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

# **REFERENCE BOOKS:**

- R1: S. Ross, A First Course in Probability, 6<sup>th</sup> Ed., Pearson Education India, 2002. R2: S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed. Wiley India, 1984.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	Solve first-order ordinary differential equations using exact, linear, Bernoulli's, Euler's equations, and those solvable for ppp, yyy, xxx, and Clairaut's type.	1,2					
2	Analyze and solve second-order linear differential equations with variable coefficients using variation of parameters and the Cauchy-Euler equation.	1,2,3					
3	Evaluate complex functions through differentiation, using Cauchy-Riemann equations for analyticity, and identify harmonic functions and their conjugates.	2,4,5					
4	Understand and analyze basic probability concepts, including probability spaces, conditional probability, independence, and various distributions.	1,3,5					
5	Evaluate statistical methods for measures of central tendency, moments, skewness, kurtosis, probability distributions, and conduct significance tests for large samples.	1,2,3,4,5					

			SEMESTER – II									
Cour	se Title		Chemistry for	Civil E	ngine	ers						
Cour	se code	24BTCE122R	Total credits: 3	L	Т	P	S	R	O/F	С		
			Total hours: 30T+30P	2	0	2	0	0	0	3		
	equisite	Nil	Co-requisite				Nil					
	ramme		B. Tech in Civ									
Sen	nester		Winter/ II semester of fir									
	ourse ectives	<ol> <li>To develop a deep understanding of atomic and molecular structures, including the application of quantum mechanics to solve complex problems.</li> <li>To apply theoretical concepts to real-world scenarios, such as predicting molecular properties and understanding spectroscopic techniques.</li> <li>To foster critical thinking and analytical skills necessary for interpreting complex chemical phenomena.</li> </ol>										
C	201	their implications	inger equation to predict th for conjugated molecules a al variations of hydrogen a	and nar	noparti	cles.			-	e		
С	02							ign gra	apinear			
		representations and interpret their significance in atomic structure. Analyze molecular orbitals of diatomic molecules and multicenter orbitals using										
С	03	quantum mechanical equations and visualize these orbitals through plots.										
~	0.4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene										
С	04		g molecular orbital theory.	1								
C	05		gy level diagrams for transi	ition m	etal io	ns us	ing cry	stal fi	eld theo	ry		
C	05	and analyze their	magnetic properties									
Unit- No.		С	ontent		Conta Hou		Learni	ng O	utcome	KL		
I	machine Differen corrosio choice o protectio impresse protectiv PVD and Alloying Eutectic	Dry and wet corrosion - detrimental effects to buildings, nachines, devices & decorative art forms, emphasizing Differential aeration, Pitting, Galvanic and Stress corrosion cracking; Factors that enhance corrosion and choice of parameters to mitigate corrosion. Corrosion protection - cathodic protection – sacrificial anodic and mpressed current protection methods; Advanced protective coatings: electroplating and electroless plating, PVD and CVD. Alloying for corrosion protection – Basic concepts of Eutectic composition and Eutectic mixtures - Selected					6 Demonstrate proficiency in solving quantum mechanical problems related to atomic and molecular structures.					
П	<ul> <li>examples – Ferrous and non-ferrous alloys.</li> <li>Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Difference between thermoplastics and thermosetting plastics; Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and poly dispersity index; Engineering application of plastics - PE, PVC, PC, PTFE, PP, Nylon 6, Nylon 66 Bakelite, Epoxy: Compounding of plastics;</li> </ul>						Analyz spectro to dedu molecu structu dynam	scopio ice ilar res ano		2		

	cleaning windows)			
Ш	Brief introduction to conventional primary and secondary batteries; High energy electrochemical energy systems: Lithium batteries – Primary and secondary, its Chemistry, advantages and applications. Fuel cells – Polymer membrane fuel cells, Solid-oxide fuel cells- working principles, advantages, applications. Solar cells – Types – Importance of silicon single crystal, polycrystalline and amorphoussiliconsolar cells, dye sensitized solar cells - working principles, characteristics and applications. Explosives – classification, examples: TNT, RDX, Dynamite	6	Evaluate the impact of intermolecular forces on the physical and chemical properties of substances.	3
IV	Calorific value - Definition of LCV, HCV. Measurement of calorific value using bomb calorimeter and Boy's calorimeter including numerical problems. Controlled combustion of fuels - Air fuel ratio – minimum quantity of air by volume and by weight Numerical problems-three way catalytic converter- selective catalytic reduction of NOX; Knocking in ICengines-Octane and Cetane number - Antiknocking agents	6	Apply thermodynamic principles to chemical equilibria and electrochemical systems.	4
V	Water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, causticembrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, Calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchangedemineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).	6	Interpret periodic trends and their implications on chemical behavior and reactivity.	5

- T1: University chemistry, by B. H. Mahan
- T2: Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
- T3: Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- T4: 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

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Apply the Schrödinger equation to predict the particle in a box solutions and analyze their implications for conjugated molecules and nanoparticles.	1,2,3
2	Evaluate the spatial variations of hydrogen atom wave functions through graphical representations and interpret their significance in atomic structure.	1,2,5
3	Analyze molecular orbitals of diatomic molecules and multicenter orbitals using quantum mechanical equations and visualize these orbitals through plots.	2,3,5
4	Explain the concept of aromaticity and predict the pi-molecular orbitals of butadiene and benzene using molecular orbital theory.	1,2,3,4
5	Illustrate the energy level diagrams for transition metal ions using crystal field theory and analyze their magnetic properties	4,5

			SEMES	TER – II											
Cours	se Title		Problem So	lving & Pyt	hon Prog	ramr	ning								
Cour	se code	24BTCE124R	Total credits:	: 3	L	Τ	P	S	R	O/F	(	С			
		24DICEI24K	Total hours:	30T+30P	2	0	2	0	0	0		3			
Pre-re	equisite	Nil		quisite				Ni	1						
Prog	ramme			Fech in Civil Engineering											
Sem	nester		Vinter/ II semes		year of the	e pro	ograi	nme							
Co	urse	1. To learn the fundamentals of computers.													
	ectives	2. To understand the various steps in programme development.													
- ~j-		3. To learn the syntax and semantics of C programming language.													
С	01	Apply programming concepts such as flowcharts and pseudo code to design algorithms													
		for solving computational problems. Analyze and synthesize variables and data types to construct arithmetic expressions													
C	02			nd data type	s to constr	uct a	rithn	netic	expre	ssions					
		with appropriate precedence rules. Evaluate conditional statements and loops to control programme flow and optimize													
C	03			d loops to co	ontrol prog	ramr	ne fl	ow ai	nd op	tımıze					
		algorithm efficiency.													
C	04	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.													
		strings to manipulate and store data effectively. Design and develop solutions using functions and recursion, including advanced													
C	05		examples such as Quick Sort and the Ackermann function.												
Unit-		Champles such as Q	Zuick Soft and th	Contact		1.									
No.		Content		Hour	L	earn	ing (	Jutco	ome		K	L			
110.	History	of Programming Lar	onages	IIUUI											
	-	w of Programming L		Demons	trate	prof	iciend	ev in							
_		Basic Syntax of a few programming			construc		-		•	z l		_			
Ι		languages, Advantages and disadvantages			flowcha	-		_	-		1,	,2			
	0.0	on, Real-life example		algorithm design.											
	-	ion of Python				c									
	Introduc	tion to Python Progr	amming		Apply k	nowl	edge	of va	ariable	es,					
	Introduc	tion to Python Lang	uage, Writing		data type	es, ar	nd ari	thme	tic						
II	and Con	npiling Python Progr	ammes, Basic	10	expressions with appropriate						1,2	,2			
		e of a Python Progra	mme, Data		preceder	nce in	1 pro	gram	ming						
		nd Constants.			tasks.										
	••	es and Variables													
		es, Variable declarat			Impleme										
111		ting in Python, Oper		10	branchin	•					1	2			
III	-	Assignment, Logica		10	structure			-	•		1,	,2			
		onal statements: If sta	,		flow and		mıze	algo	rithm						
		ement, Python Collegets and Dictionary	cuons: List,		efficienc	ey.									
	r upie, S	ets and Dictionary.			Develop	nraf	iniar	ov in							
	Loops a	nd Functions : Loops	s in Python:		manipula	•		•		er					
IV		p, While Loop and N	lested Loops,	7	arrays, a	-		-			1,2				
	User De	fined functions			and proc		-		-						
					-				-						
					Analyze and evaluate algorithm efficiency through the										
	Lambda Functions: Types of functions,					-	-				1.0				
	Lambda	Functions: Types of	functions.	_	applicati	on o	f bas	ic sea	ırchin	g	-	~			
V		Functions: Types of functions	functions,	7	applicati and sorti					g	1,	,2			
V		• •	functions,	7	applicati and sorti understa	ing te	echni	ques,		-	1,	,2			

- T1: Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- T2: E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

## **REFERENCE BOOKS**:

R1: Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme Outcome						
1	Apply programming concepts such as flowcharts and pseudo code to design algorithms for solving computational problems.	1,2,3,8						
2	Analyze and synthesize variables and data types to construct arithmetic expressions with appropriate precedence rules.	1,3,5						
3	Evaluate conditional statements and loops to control programme flow and optimize algorithm efficiency.	2,3,8						
4	Create and implement algorithms using arrays (1-D and 2-D), character arrays, and strings to manipulate and store data effectively.	1,3,5						
5	Design and develop solutions using functions and recursion, including advanced examples such as Quick Sort and the Ackermann function.	1,2,3,4,5,11						

			SEMES	TER – II									
Course	Title		E	ngineering	Drawing								
Course	code	24BTCE123R	Total credits:		L	Т	P	S	R	O/F	С		
			Total hours:		0	0	4		0	0	2		
Pre-req		Nil		quisite									
Program			B. Tech in Civil Engineering										
Semes	ter	Winter/ II semester of first year of the programme											
		1. To introduce students to the principles and techniques of traditional and computer- based engineering graphics											
Cour	50	-	based engineering graphics.										
Object			2. To equip students with the skills necessary to interpret, create, and analyze technical drawings and models.										
Object	1105	3.To familiarize stu		ern enginee	ering gran	hics s	oftwa	e and	its				
		applications in de		-	anig grupi	ines s	Jitwa	e und	105				
CO	1	Determine the varie			t affect flu	id be	navio	•					
CO2		Explain the fluid pr				nu ou	14 101	•					
CO3													
CO4			Summarize the various fluid flow. Apply the conservation laws for fluids in fluid dynamics.										
		Discuss various not											
Unit-	,			Contact									
No.		Content		Hour	I	learn	ing O	utcon	ne		KL		
	Unit	1: Traditional Engine		Upon completion of the course,									
		hics: Principles of E		students will be able to									
Ι	Grap	hics; Orthographic P	3	demonst	rate tl	ie app	licati	on of		1,2			
	Desc	riptive Geometry; Di		orthogra									
	Princ	piples.		Descript	Descriptive Geometry principles.								
	Unit	2: Isometric Projecti	on; Surface		Students will be able to interpret and create technical drawings incorporating isometric projection,					at			
	Deve	lopment; Perspective	e; Reading a										
Π		ving; Sectional Views		2						tion	1,2		
11	Dime	ensioning & Tolerand		-	-	vs, and accurate				1,2			
	Leng	th, Angle; intersection		dimensio			i accu	late					
	Dista												
		3: Computer Graphic			Students			· ·		-			
	-	neering Graphics Sof	tware; -		in utilizi	•	•	ring g	raphi	cs			
III	-	al Transformations;		2	software	-					1,2		
		ographic Projections;	Model		transform					g,			
	View	/ing.			and orth		-	-		.			
					Upon co								
17.7	Unit	4: Co-ordinate Syste	ms; Multi-	-	understa		-	-			1.0		
IV		Projection; Explode		2	ordinate	•				W	1,2		
		- •	-		projectio		• •	•					
					effective	-				gs.			
	Init	5. Surface Medalling	r Salid		Students will be able to utilize surface and solid modelling								
V		5: Surface Modelling elling; Introduction to	-	1	techniqu				-	h	1,2		
v		mation Modelling (E	1	-				-		1,2			
	mor	mation widdening (E		visualize structure		piex e	ngme	ering					
					suucture	<i>.</i>							

T1: Bhatt, N.D., Engineering Drawing, Charotar Publishing House Pvt. Ltd. T2: John, K.C. Engineering Graphics, Prentice Hall India Publishers.

## **REFERENCE BOOKS:**

R1: Anil kumar, K.N., Engineering Graphics, Adhyuth Narayan Publishers

R2: Agrawal, B. And Agrawal, C.M., Engineering Darwing, Tata McGraw Hill

R3: Varghese, P.I., Engineering Graphics, V I P Publishers

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme Outcome						
1	Introduction to engineering design and its place in society.	1,2,3						
2	Exposure to the visual aspects of engineering design.	1,3,5						
3	Exposure to engineering graphics standards.	2,5,10						
4	Exposure to solid modelling.	2,3,5,7						
5	Exposure to computer-aided geometric design	1,3,5,8						

-			SEMESTER -								
Cours	e Title		Ethics, Technol	ogy And l	Engin	eerii	ng				
Cours	e code	24MOCE122R	Total credits:1	L	Т	P	S		R	O/F	C
			Total hours: 20P	0	0	0	0		0	0	1
	equisite	Nil	Co-requisite				]	Nil			
Progr	amme		B.Tech Ci	-		-					
Sem	ester		inter/II semester of	÷			-				
Cour			nd the moral values t	•	•	de th	ne Ei	ngiı	neerii	ng profe	ssior
Object	ives		he moral issues in th	•							
			ne moral judgment co	-	he pro	ofess	ion				
C	D1		onalism in an organiz								
C	<b>י</b> ר	-	the does and don'ts	for the bet	terme	ent of	f the	so	ciety	and	
C	52	environment.									
CO	<b>D3</b>	Classify Various typ	bes of contract and th	eir feature	s.						
C	D4	Discuss the measure	es of Alternative Disp	oute Resolu	ution.						
C	D5	Categorize different	types of Intellectual	property r	ights.						
Unit-		Conten	t	Contact		Loo	min	<u> </u>	lutes	me	K
No.				Hour				g U	outco		*:
Ι		sional Practice – Re						veloj	pa 🗌	1, 2	
	variou	s stakeholders: Gover	rnment		com	npreh	ensi	ive			
		tuting regulatory bod					-		roles		
		rdization organization			-			ties c	of		
		to ensure safety of th	·			cehol					
		rdization Bodies (ex.							lustry	7,	
		ormulating standards	- ·			uding		-	-		
	-	sional bodies (ex. Ins				,			lizati	on	
		ers(India), Indian Ro		-	aniza						
		OA, ECI, Local Bodi		-	fessio						
		rities) (certifying prot		4		nts, c		-			
		g platforms for intera	,						tract	ors,	
		s (role governed by c	,		and	man	ufac	ctur	ers.		
		opers (role governed)									
		s RERA); Consultant									
	-	lies such as CEAI); C	·								
	- U	ed by contracts and r andards); Manufactur	• •								
		e agencies (role gove									
		gulatory	filed by contracts								
		nd Standards)									
II		sional Ethics – Defin	nition of Ethics	4	Stu	dents	wil	1 de	velo	na	2, 3
11		sional Ethics, Busine				npreh			, 510]	r <b>~</b>	<b>_</b> , J
		Engineering Ethics,	· •			ersta			f		
		of Ethics as defined in				fessio		-			
		tion of Engineers (Ind			· •				ersoi	nal,	
		sionalism, Profession	·			-				ering	
		sional Ethics; Conflic							-	odes	
	Vs.	,	,			ondu			0		
		y, Environmental bre	aches						towa	rds	
		-		· ^	cal d						
III	Gener	al Principles	of Contracts	4	Part	ticipa	ints	will	l dev	elop	3, 4
111											

	1972, Characteristics of a Simple Contract, Various types of contract and their features, Valid & Voidable Contracts, Prime and sub- contracts, Joint Ventures, Tenders & Request For Proposals, Bids & Proposals, Bid Evaluation, Contract Conditions & Specifications, Contract award & Notice To Proceed, Variations & Changes in Contracts, Differing site conditions, cost escalation, Contract documentation, Contract Notices, Wrong practices in contracting (Bid shopping).		of contract management principles, including contract types, conditions, bid evaluation, and legal considerations under the Indian Contract Act, 1972.	
IV	Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope, distinction between laws of 1940 and 1996; UNCITRAL model law; International Commercial Arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Distinction between conciliation, mediation and arbitration; Dispute Resolution Boards; LokAdalats.	4	Students will develop comprehensive knowledge of arbitration, conciliation, and ADR systems, including the distinctions between arbitration laws, types of arbitration agreements, and alternative dispute resolution methods like mediation and LokAdalats.	4, 5
V	Engagement of Labour and Labour & other construction and Law relating to Intellectual property: Role of Labour in Civil Engineering; Methods of engaging labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017; meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India; Meaning of copyright; Ownership of copyrights and assignment; Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India.	4	Students will develop a comprehensive understanding of labor engagement methods, industrial dispute resolution frameworks, and intellectual property laws pertinent to civil engineering projects.	5

- T1: B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
- T2: The National Building Code, BIS, 2017

T3: T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

#### **REFERENCE BOOKS:**

- R1: Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India .
- R2: UNCITRAL Model Law on Arbitration, Indian Council of Arbitration

R3: Bare text (2005), Right to Information Act

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Recognize professionalism in an organization.	5, 7
2	Distinguish between the does and don'ts for the	
	betterment of the society and environment.	8
3	Classify Various types of contract and their features.	7,9
4	Discuss the measures of Alternative Dispute Resolution.	11,12
5	Categorize different types of Intellectual property rights.	10

			SEN	MESTEI	R – II						]	
Course	e Title				RICULAR	ACTI	VITI	ES				
Course	e code	24UBEC121	Total cree	dits: 1	L	Τ	P	S	R	O/F	C	
			Total hou		0	0	0	4	0	0	1	
Pre- ree	-	Nil		requisit				Ν	il			
Progra					Civil Engir		-					
Seme			Fall/ II sen		first year	of the	prog	ramn	ne			
Cou		1.To develop soft			.1 1							
Objec	etives	2.To promote a h	•				ta					
		3To enhance the Participants will				-		mmii	nicatio	on time		
CC	)1	Participants will develop personal skills, such as leadership, communication, time management, and teamwork, contributing to their overall character development and self-										
CC	/1	confidence.										
		Engagement in C	ommunity ser	vice and	outreach ac	tivitie	s will	culti	vate a	sense of	social	
CC	)2		•									
		responsibility, empathy, and civic awareness, encouraging students to actively contribute to society										
CC	13	Express their idea	us, views, In-d	epth eva	luation and	analys	sis cle	early i	in the	topic of t	their	
	5	interest. The students will be given a platform to earn from invited experts in their respective										
CC	)4		be given a pla	tform to	earn from	nvited	l expe	erts in	their	respectiv	/e	
		fields. Demonstrate and practices different activities, by Integrating learning experiences by										
CC	)5				vities, by Ir	itegrat	ing le	earnin	ig expo	eriences	by	
TT \$4		demonstrating tra		ls.							VI	
Unit- No.		Content	Contact Hour		Lea	rning	Outo	come			KL **	
	Differe	nt types of	10	6	AdtU encou	irages	a ran	ge of	activi	ties	1,2,3,4,	
		es outside regular	10		outside the	-		-				
	curricu	-			meet learne	-						
				:	are aimed to	o deve	lop th	ne soc	ial and	d soft		
				:	skills and p	romot	e a ho	olistic	devel	opment		
					of the learn							
					Keeping in				-	-		
					methodolog				-	-		
					different ac							
					clubs viz. E drama, liter			c, ph	olograj	pny,		
					The student	•		raged	to na	rticinate		
					in regular c			-	-	-		
					competition				-	-		
					hobbies.	1						
				9. '	The student	mem	bers c	of the	club a	ire		
				1	trained repr	esent	AdtU	in va	rious	inter		
					University		t and	natio	nal lev	vel		
					competition				• •			
					Renewed p							
					conduct wo	-						
1					members ar				-			
				-	platform to respective f		nom	слрег	13 III U	ΠC		
					respective I	icius.						

	CO PO Mapping						
	Course Outcome (CO)	Mapped Programme 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					

			SEMESTER -	- II											
Cour	se Title		Environ	mental So	cience										
Cour	se code	24UBES101R	Total credits: 2	L	Т	P	S	R	O/F	С					
		240 DESIVIN	Total hours: 30T	2	0	0	0	0	0	2					
	equisite	Nil	Co-requisite				N	lil							
-	ramme		B. Tech in (	8		0									
	nester		inter/ II semester of												
	ourse	-	les students with a co	-											
Obj	ectives		les, environmental ch	-	010d1ve	ersity	cons	ervati	on, and th	e					
		-	activities on the envi			1			. 1	1					
		-	f theoretical knowled												
		-	ies of pollution, resound isizes the interconnect		-				-	jinent.					
		<b>^</b>	standing of the delica			•	•		•	mony					
			onmental chemistry, b		•					•					
			cally analyze and prop		-	-				-					
		challenges.	-,, una prop		- 115 0	2.511	P	, , ,							
C	201	-	onships between natu	iral and m	an-ma	ide sv	ystem	ıs.							
		Develop critical thin	king for shaping strat	egies (sci	entific	, soci	ial, eo	conom	ic,						
C	202	-	Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity,												
		environmental equity, and sustainable development.													
ſ	203	Understand the consequences of human actions on the web of life, global economy, and													
C	.05	quality of human life	quality of human life. Understand about Environment Pollution, Global Environment issues, Impact of Human												
C	<b>CO4</b>					ment	tissu	es, Imj	pact of Hi	ıman					
		· ·	ern civilization on the												
C	205		ects of human populat	tion, and t	the imp	pact o	of the	popul	lation gro	wth on					
TI <b>*</b> 4	1	the environment.	4	Cartar	_					IZI					
Unit- No.		Conten	C IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Contact Hour		Lea	rnin	g Out	come	KL **					
110.	To Deve	lon a comprehensive	understanding of the	IIUUI											
		ents of the environme	-		Deve	lon a	holis	tic							
	-	ere, hydrosphere, lith	-												
_	-	e. Gain knowledge of	-	_	under		•		nents and						
Ι	· ·	tion of these systems,		6	principles governing life					1,2					
	principle	s governing life syste	ems, metabolic		system	ns, n	netab	olic pr	ocesses,						
	processe	s, and the diversity of	f plant and animal		and b	iodiv	rersity	/.							
	life.														
	-	ire proficiency in eco	•		-	-		ency i							
	-	g terminology, ecosys				-		inolog	•						
		, mineral cycling, ene		-	-				energy						
II		nd the development a		6		-		ains, a		1,2					
	-	ms. Understand the ro	-						nships						
		components of ecosy	stems and their				•		omponent	s					
	ecologic To Deve	lop the ability to anal	vze environmental					gical re	analyze						
		by examining its source	•			-		polluti	-						
	-	ent, effects, and meth							ts, and						
III		rol. Explore strategie	-	6	preve				,	1,2					
		erent types of pollution, emphasizing the		-	<b>^</b>				bility and						
		of sustainability and	· ·		-		-		energy,						
	-	energy, environment	-			-	-	nd hun							
	1	6,,	,		1		-, -,								

	activities.		activities.	
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

- T1: H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International.
- T2: J. G. Henry and G.H. Heinke, Environmental Science and Engineering, Prentice Hall International.

#### **REFERENCE BOOKS:**

R1: G.M. Masters, Introduction to Environmental Engineering and Science, Pearson Education.R2: R.T. Wright and D.F. Boorse, Environmental Science Towards a Sustainable Future, PHI Learning.R3: P.A. Vesilind and S.M. Morgan, Introduction to Environmental Engineering, Thomson Books.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme 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 –	· II							
Cours	e Title	EFFECTIVE	ENGLISH FOR ENG	GINEER	S (Co	mmı	inica	tive E	nglish &	Soft	
		Skills)									
Cours	e code	24UBPD123R	Total credits: 2	L	Τ	P	S	R	O/F	С	
		24001 D125K	Total hours: 15T+601	P 0	0	4	0	0	0	2	
Pre- re	quisite	Nil	Co-requisite				]	Nil			
Progra	amme		<b>Bachelor of Techno</b>	logy in C	'ivil I	Engir	neeri	ng			
Semo	ester		Winter/ II semester of	-			-				
Cou	irse		ll enable the students to	acquire	the ir	nport	ant k	nowle	edge on g	rammar	
Objec	ctives		ion of sentences.								
		2. To enable the	ne students to use	vocabula	ry n	neani	ngfu	lly fo	or a su	ccessful	
		conversation.									
			eputation and Rapport,								
CO	)1		to understand gramma						speak fla	wlessly,	
		e e	usage of tenses and rect								
CO	02		uire the technique of e	expanding	g voc	abula	ary an	nd cre	ating nev	v words	
	_	and use them in c									
CO	)3		helping them to sharp	pen their	lister	nıng	skills	s and	to becon	ne good	
		listeners. To make them prepare for various public and private sector exams & placement drives.									
<u> </u>		*								t drives.	
<u>C(</u>	)5		nalytical skill and probl		. –	ill of	the s	studen	ts		
Unit-		Conte	ent	Contact		Lear	ning	g Outo	come	KL **	
No.	Tutouch		we and Associations	Hour	Ctra	1		be abl	a <b>4</b> a		
		ange of Interrogati es, Interchange of		12					rm the	1,2	
Ι		-	lysis of Sentences,	12		-			entences.	1,2	
		of Tenses, Exercise			cient	type	5 01 50	mences.			
		ms, Antonyms, Ho			Helpful in integrating t				ng the		
	Synony	1115, 7 411011y1115, 110	Jiionyiiis					ng and	•	3,4	
II				8	1			ofess		5,1	
				U		mun			lonui		
	Technie	ues of Effective. I	Reading, Gathering					/zing	the		
		· ·	m a text, The SQ3R	8	-		-	effect			
III		que, Interpret the to				-			deas and	3,4	
					1	-	-	om a			
	Introdu	ction to Dress Cod	e Ethics, ii. Purpose		Dre	ss co	de eti	iquette	e will		
		portance, iii. How	-					nfider			
IV	-	SSION iv. What to		6						21	
	Intervie	ws or Any Other I							3,4		
		5									
		Female Activity:	_								
	Male &	Female Activity:	Management Purpose		Stuc	lents	will	learn	to utilize		
V	Male & Introdu	Female Activity: ction To Time	Management Purpose Management, Basic	6		lents e effe			to utilize	3,4	

- 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

## REFERENCES

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

	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	e Title		Field B	ased Trai	ining					
Course	e code	24BTCE125R	L	Т	P	S R	O/F	С		
			Total hours: 30P	0	0	0	0 0	16	1	
Pre- re	-	Nil	Co-requisite				Nil			
Progra	amme		B.Tech Ci	-		-				
Seme			Winter/ II semester o	-						
Cou			with advanced AutoCa			-		-	-	
Objec	ctives		ncing their technical pro	-	-					
		· ·	nts' ability to create pre	•	-	-	•	d detailed		
		-	ing attention to detail a em-solving and critical		-			notical Au		
		-	reparing students for re	-					IOCAD	
			ficiency in using AutoO					-		
CC	<b>)</b> 1	engineering draw				cating	compi			
CC	)2		AutoCAD techniques t	o design o	letaile	d stru	ctural p	lans and la	avouts.	
			ity to interpret and conv	-			-		-	
CC	)3	drawings.	5 1		1			1 .		
00		Integrate AutoCAD skills with other engineering tools and software for comprehensive								
CC	J4	project development.								
CC	)5	Exhibit improved problem-solving skills and technical knowledge through practical								
		AutoCAD applic								
Unit-		Conte	ent	Contact	I	earn	ing Ou	tcome	KL	
No.				Hour			-		**	
		oduction to Advanced AutoCAD tures: Overview of advanced drawing tools			Mast					
Ι		ization options, an	4			ustomiz		1, 2		
	feature	-		features in AutoCAD.						
		ng Detailed Civil		Creat	te pre	cise and	l detailed			
	Drawi	0			civil engineering drawings					
Π		ques for creating d	4		-	-	hniques.	2, 3		
		ctural drawings, in								
	dimens	ioning, and annota	tion.							
		0	ization: Introduction		Deve	elop 3	D mode	els and		
III		•	g, and visualization	4			-	ineering	3,4	
	-		or civil engineering	·	desig	gns us	ing Aut	oCAD.	5,1	
	applica				т.					
			<b>Fools:</b> Methods for		-			D skills		
<b>IV</b>	-	-	h other engineering	4			tools fo		1 5	
IV		e and tools, includ ng/exporting files	-	4	-		velopme	gineering	4, 5	
	-	workflows.		proje		ciopine				
	- •		nd Projects: Hands-		Appl	y Aut	oCAD	skills in		
			es to apply AutoCAD		~ ~	-	rojects,			
V			ngineering scenarios,	4	-	-	ting pro		5	
	1					$\sim$ 1		i i		
·	includi	ng project presenta	tion and		solvi	ng an	d techni	ical		

- T1: "Field Research: A Sourcebook and Field Manual" Robert G. Burgess
- T2: "Methods in Field Biology" Robert H. Giles
- T3: "Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Earth Sciences" Sara E. Vero
- T4: "Research Methods in Education" Louis Cohen, Lawrence Manion, and Keith Morrison (For Education Field Training)

#### **REFERENCE BOOKS:**

- R1: "The Field Guide to Fieldwork" Bruce L. Berg
- R2:"Handbook of Field Experiments" Abhijit V. Banerjee and Esther Duflo
- R3:"Doing Fieldwork in Areas of International Intervention" Berit Bliesemann de Guevara
- R4:"Practical Field Ecology: A Project Guide" C. Philip Wheater, James R. Bell, Penny A. Cook
- R5:"Field and Laboratory Methods for General Ecology" James E. Brower, Jerrold H. Zar

	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 – II										
Cours	se Title		<b>Elements of Survey</b>	ving &	k Ge	omati	ics						
Course code		24BTCE125R Total credits: 4				P	S	R	O/F	С			
			Total hours: 45T+30P	3	0	2	0	0	0	4			
Pre- re	equisite	Nil	Co-requisite			II		Nil					
Progr	amme		B. Tech in Civi	l Eng	ineer	ring							
Sem	ester	]	Fall/ III semester of secon	d year	r of t	he pr	ogra	amm	e				
Co	urse	1. Know the princ	ciple and methods of survey	ing.			-						
Obje	ectives	2. Measure horizo	ontal and vertical- distances	and a	ingles	S							
		3. Recording of o	bservation accurately										
С	01	Identify various	surveying instruments used	for m	appi	ng top	oogr	aphic	al drawin	gs			
С	02	Explain Methods	s of Leveling and setting Le	vels v	vith c	liffere	ent i	nstrur	nents				
<u> </u>	01		ple and working of theodoli							and			
C	03	horizontal planes	5.			-							
C	0.4	Understand the r	nethods of radiation and int	ersect	tion f	or obt	taini	ng an	area enc	osed			
C	<b>O</b> 4	with in the traver						C					
С	05	Discuss the conc	ept and principle of modern	n surv	eying	g.							
Unit-			ntent		ntact					K			
No.				H	our	Le	arn	ing U	utcome	**			
	Introdu	ction and Basic C	Concepts: Introduction,			Und	lerst	and tł	ne				
	Objectiv	ves, classification a	nd principles of surveying,			func	lame	ental					
	Scales, S	s, Shrinkage of Map, Conventional symbols and				prin	ciple	es,					
	Code of	e of Signals, Surveying accessories, phases of				classifications, and							
т	surveyin	eying.			11	objectives of			1,1				
Ι	Measur	surement of Distances and Directions			11	surv	veyir	ng, ino	cluding	1,.			
	Linear	<b>distances-</b> Approximate methods, Direct ds- Chains- Tapes, ranging, Tape corrections. <b>natic Compass-</b> Bearings, included angles,				the u	use o	of sca	les,				
	Methods					conv	vent	ional	symbols,				
	Prisma					and	vari	ous s	urveying				
	Local A	Attraction, Magnet	ic Declination and dip.			acce	essoi	ries.					
	Levelin	g-				Aca	uiro	والزالة	in				
	Types of	f levels and levelli	ng staves, temporary			Acquire skills in measuring linear							
	-		velling, booking and					s and					
		nination of levels, Effect of Curvature of Earth effaction.											
						directions usir chains, tapes,		-					
П		uring- Characteristics and uses of Contours,						-	npasses,	1,2			
		ods of contour surveying.				-		prehe	-	1,2			
		-Determination of areas consisting of irregular						-	or tape				
		y and regular bour						s and the					
			of volume of earth work in			imp	act o	of mag	gnetic				
	-		for level section, volume			decl			0				
		ow pits, capacity o	t reservoirs.					1:00					
		lite Surveying:	1 . 1					liffer					
	• -		damental Lines, temporary				-		niques,				
	-		of horizontal angle by					-	use of				
177		n method and reite			10				of levels	1 <i>.</i>			
III			ngle, Trigonometrical		10			-	staves,	1,2			
	-	evelling when base is accessible and inaccessible.							nd the				
		•	traversing, traverse					and	£				
	-	tations and adjustn	nents, Omitted						of contour	our			
<b>TX</b> 7		rements.			-	surv	-	-	-1-4	1.			
IV	Curves	: Types of curves	and their necessity,		7	Lea	rn to	calcu	ulate	1,			

	elements of simple, compound, reverse, transition and vertical curves. <b>Tachometric Surveying:</b> Principles of Tacheometry, stadia and tangential methods of Tacheometry, <b>Modern Surveying Methods:</b> 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.		areas with irregular and regular boundaries and determine the volumes of earthwork in different contexts, such as cutting, embankments, borrow pits, and reservoir capacities.	
V	<b>Photogrammetry Surveying:</b> 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	<ol> <li>To range a line more than one chain length and recording the details in a field book.</li> <li>Profile leveling and cross section leveling with Dumpy level.</li> <li>Trigonometric Constant</li> <li>Close Compass Traversing to plot the existing layout or built up area</li> <li>Measurement of horizontal and angles with Theodolite</li> <li>Measurement of vertical angles with Theodolite Contouring of a given area by method of grid and prepare the contour map of that area.</li> </ol>	30	Describe, illustrate and explain and apply the concepts of surveying in engineering prospect.	1,2,3,4

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Identify various surveying instruments used for mapping topographical drawings	1,2,4				
2	Explain Methods of Leveling and setting Levels with different instruments	5,7				
3	Apply the principle and working of theodolite for measuring angles in vertical and horizontal planes.	2,6,10				
4	Understand the methods of radiation and intersection for obtaining an area enclosed with in the traverse	8,10,12				
5	Discuss the concept and principle of modern surveying.	1,2,3,4,6				

			SEMESTER – III							
Cours	e Title		Building Materials & C	Const	ructi	on Pr	actice			
Course code		24BTCE214R         Total credits: 2         L         T         P         S					S R	O/F	С	
		24DICE214K	Total hours: 30T	2	0	0	0 0	0	2	
Pre- re	equisite	Nil	Co-requisite				Nil			
Progr	amme		B. Tech in Civil	Eng	inee	ring				
Sem	ester	1	Fall/ III semester of second	l yea	r of t	he pro	ogramr	ne		
Co	urse	-	ledge of material science and	d beh	navio	r of va	rious b	uilding mat	erials	
Obje	ctives	used in constru								
		-	nstruction materials required			•				
		<u>^</u>	ural knowledge of the simpl	le tes	sting	metho	ds of ce	ement, lime	and	
		concrete etc.								
C	01	-	rious phases associated with	n sim	ple r	esident	tial and	commercia	al	
	-	construction.								
C	02		correctly a wide variety of h	and a	and p	ower t	cools as	sociated wi	th the	
		construction indu		1	1.1		<u> </u>	•.•	1 1	
C	03		ent construction industry tren				tamilia	r with stand	lards	
			uction and trends in buildin	-						
C	04		truction procedure of differe				. 1:rr	nt marta 1	1.00-1	
C	05	construction.	roperty, use, advantage and	aisad	avant	age of	amere	nt material	used if	
Unit-			ntent	Ca	ntact				KL	
No.		Co	птепт		our	Lea	arning	Outcome	NL **	
110.				11	oui	Stude	nte will	be able to		
								bjectives		
						-		ents of		
							-	dations		
							e aim c			
	Introdu	ction- Objectives,	Requirements of					es. They		
			structure, Types Of		-	lso gair	•			
Ι		ction, Aim Of Site	e 9	9		iency in		1, 2		
		g Plan At Site For I				r	-	lanning,		
					-	e proce	-			
							-	aying out a		
						buildi	ng plan	at the site,		
						ensuri	ing accu	urate		
						found	ation pl	acement.		
	CONST	<b>TRUCTION PRAC</b>	CTICES					learn to		
			sequence of activities and					sequence		
	~		– Site Clearance – Marking			constr	ruction	activities,		
			one masonry – Bond in				ng prop			
		-	block masonry – flooring –					on-site.		
	-		truction joints – movement			-		derstand		
Π			cast pavements – Building	.	9	-	ication		2, 3, 4	
	-	• •	temporary shed – centering				s for sit		, -,	
			- scaffoldings - de-					rthwork,		
			ion and erection of steel				nry, con			
		-	omes – laying brick —				mason	•		
			roof finishes – acoustic and				ng, dan	-		
				1		menoti		TIOMOIIC		
	fire prote	ection.				<u>^</u>	onstruc	l various		

Additionally, they we be able to manage	V 111
temporary structure steel fabrication, an	
the installation of	u
weatherproof and fi	ra
protection systems.	
SUB STRUCTURE CONSTRUCTION         Students will acquire	
SUB STRUCTURE CONSTRUCTION         Students will acquire           Fechniques of Box jacking – Pipe Jacking - under         knowledge of advantage	
water construction of diaphragm walls and basement-	iceu
Funneling techniques – Piling techniques - well and     substructure	
construction techniques – r ming techniques – wen and construction techniques – a sinking cofferdam - cable anchoring and including box and p	
	•
grouting-driving diaphragm walls, sheet piles - shoring jacking, underwater	
for deep cutting - well points -Dewatering and stand diaphragm walls,	
by Plant equipment for underground open excavation. basement construct	
III 9 tunneling, and pilin	-
They will be skilled	in 4
handling deep excavations,	
dewatering, and	
installing well poin	. <b>.</b>
well as using stand-	
equipment for	by
underground	
excavations.	
SUPERSTRUCTURE CONSTRUCTION         Students will developed	n
Launching girders, bridge decks, off shore platforms – the ability to overse	-
special forms for shells - techniques for heavy decks – the construction and	
in-situ pre-stressing in high rise structures, Material erection of	
handling - erecting light weight components on tall superstructures,	
structures - Support structure for heavy Equipment including launching	
and conveyors -Erection of articulated structures, girders, bridge deck	
braced domes and space decks. offshore platforms,	
special forms for sh	
IV 9 They will be profic	
in techniques for	
handling and erecting	ng
heavy decks and	
lightweight	
components, suppo	ting
high-rise structures	-
assembling articula	ed
and braced dome	
structures.	
CONSTRUCTION EQUIPMENT         Students will be ab	e to
Selection of equipment for earth work - earth moving identify and select	
operations - types of earthwork equipment - tractors, appropriate constru	2, 3, 4,
V motor graders, scrapers, front end waders, earth 9 equipment for diver	se $\begin{bmatrix} 2, 5, 4, \\ 5 \end{bmatrix}$
movers – Equipment for foundation and pile driving. activities such as	_
Equipment for compaction, batching and mixing and earthwork, foundation	
concreting - Equipment for material handling and work, pile driving,	ind

erection of structures - Equipment for dredging,	concreting. They will
trenching, tunnelling.	also learn about
	equipment for
	compaction, batching,
	mixing, material
	handling, structure
	erection, dredging,
	trenching, and
	tunneling.

- T1: Building construction: metric volume 1 by WR McKay.
- T2: Fundamentals of building construction: materials and methods by Edward Allen and Joseph Iano.

## **REFERENCE BOOKS:**

R1: Building materials and construction book with reference to B.C.Rangawala, Sushil Kumar, B.P.Bindra, A.Kamala.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Recognize the various phases associated with simple residential and commercial construction.	1,2,3,4,5,6				
2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.	2,4,5,6				
3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.	2,6,7,8				
4	Understand construction procedure of different components	1,4				
5	Understand the property, use, advantage and disadvantage of different material used in construction.	2,3,6,7				

		SEMESTER –	III							
Course Ti	tle	<b>Basic Electronics for C</b> i	ivil Engin	eering	g Appl	icatio	n			
Course co	de 24BTCE217R	24PTCE217P Total credits: 2		T P	S	R	O/F	С		
		Total hours: 15T+30P	1	0 2	0	0	0	2		
Pre-requis		Co-requisite				Nil				
Program	me	B. Tech in C	-		-					
Semeste		Fall/ III semester of sec	-							
		1. Understand the principles of electronic components, circuits, and semiconductor								
		devices relevant to civil engineering applications.								
Course	-	2. Analyze electronic applications in civil engineering for designing, constructing, and								
Objectiv										
		3. Acquire proficiency in digital electronics, including the understanding and application								
		for civil engineering app								
CO1		al knowledge in electron	ic compoi	nents,	circuits	s, and	semicon	iducto	r	
	devices.	1	• •	<u> </u>			. ·	1		
<b>CO2</b>	-	Analyze electronic applications in civil engineering for infrastructure design and								
		maintenance Attain digital electronics expertise, including logic gates, for civil engineering								
CO3	e	cironics expertise, includi	ng logic g	gates, f	or civi	i engi	neering			
		applications.								
<b>CO4</b>	-	Enhance problem-solving with hands-on application of electronic principles in civil								
		projects								
CO5	skills.	Apply knowledge in projects, design tailored electronic systems, fostering practical								
	3K1113.	SKIIIS.			Contact					
Unit-No.	Co	ontent	Hour		Learr	ning (	Outcome	9	K L	
	Introduction to Elec	tronics and Circuit								
	Fundamentals	Fundamentals			lerstan	d basi	c electro	onic		
	• Overview of electr		components and fundamental circuit analysis							
	to civil engineering									
Ι	• Basic electronic co	7	techniques using Ohm's Law and Kirchhoff's Laws in the					$\begin{vmatrix} 1,\\2 \end{vmatrix}$		
	capacitors, inducto									
		Ohm's Law, Kirchhoff's Laws, and circuit			context of civil engineering					
	analysis		applications.							
	• Series and parallel	circuits		Car	annal-	nd +1-	d the properties			
	Semiconductor Devi	ces and Diodes			•			108		
	• Introduction to sen			and applications of semiconductor materials an						
II	• Diodes and their ap	oplications in civil	7		les, inc			anu	1,	
11	engineering						g voltage		2	
		Zener diodes and voltage regulation					-			
	<ul> <li>Rectifiers and pow</li> </ul>	er supply basics		-	regulation in civil engineering.					
	Transistors and Am	olifiers								
	-	ransistors (BJTs) and				-	tion and			
	Field Effect Transi		applications of BJTs, FETs,					1		
III		<ul> <li>Transistor amplifiers and amplifier configurations</li> <li>Operational amplifiers (Op-amps) and</li> </ul>			and operational amplifiers, and their use in designing transistor amplifiers and				$\begin{vmatrix} 1, \\ 2 \end{vmatrix}$	
	configurations								2	
	Operational amplif					-				
	their applications			amp			igurations.			
	Sensors and Instrum	entation in Civil		Gai	Gain knowled		of vario	ous	1	
			7			d transducers,			1, 2	
IV	Engineering		7						2	
IV	<ul><li><i>Engineering</i></li><li>Overview of senso</li></ul>	rs and transducers	7				sducers, s in civi			

	<ul> <li>Types of sensors relevant to civil engineering</li> <li>Data acquisition systems and instrumentation</li> </ul>		engineering, and the principles of data acquisition systems and instrumentation.	
V	<ul> <li>Digital Electronics and Control Systems</li> <li>Basics of digital electronics</li> <li>Logic gates and digital circuits</li> <li>Introduction to control systems in civil engineering applications</li> </ul>	7	Understand the basics of digital electronics, logic gates, digital circuits, and the introduction of control systems for civil engineering applications.	1, 2
Practical	<ol> <li>To study about the components used in electronics laboratory</li> <li>To Study the V-I characteristics of Forward Biased PN junction diode.</li> <li>To Study the Reverse characteristics of Zener diode.</li> <li>To Study the working of a diode as half wave rectifier with and without filter</li> <li>To Study the working of a diode as full wave rectifier with and without filter.</li> <li>To study the input and output characteristic of in CE configuration.</li> <li>To study and verify the truth table of logic gates.</li> <li>Practical Implementation of Electronic circuit based 35 projects in real world</li> </ol>	30	Describe, illustrate and explain and apply the concepts of electronics engineering in engineering prospect.	1, 2, 3, 4

T1: Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis NashelskyT2: Introduction to Control System Technology" by Robert N. Bateson

### **REFERENCE BOOKS:**

- R1: Basic Electronics, Santiram Kal, Prentice Hall
- R2: Basic Electronics, BL Thareja, S.Chand Publishing

R3: All-in-One Electronics Simplified, A.K. Maini, Khanna Book Publishing

CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme 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				

			SEM	ESTER –	III						
Cours	se Title			Biology f	or En	gineers	5				
Course code		24BTCE216R	Total credit		L	Т	P	S	R	O/F	
			Total hours		2	1	0	0	0	0	3
	equisite	Nil	Co-req					Nil			
-	ramme		Bachelor								
Sem	lester		Fall/ III seme				-	-	me		
Obje	urse ectives O1	<ol> <li>To make com</li> <li>To identify ar living things.</li> <li>Biology for E concepts in bi Discuss biologica</li> </ol>	nd define the b ingineers is do iology and the l sciences, its	basic life p esigned to i eir applicat scope and	ntrodu ions in perspo	es, the uce eng n engine ectives.	basic ineering	needs a ng stude discipl	ents to ines.	fundai	nenta
C	02	Discuss regarding organisms.	; the ecologic	al energetio	es, its v	workin	g mec	hanism,	identi	ficatio	n of
С	03	Analyse the mech	anism of tran	sfer of cha	racter	from pa	arent t	o next g	generat	tion.	
С	04	Explain the genet				-					
С	05	Interprets the rela	tion between	various ph	ysiolo	gical pi	ocess	es of ou	r body	r	
Unit- No.		Content	Contact Hour	Learning Outcome							
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	
Π	<ul> <li>Classification &amp; Ecology Classification</li> <li>of organisms, Basis of classification:</li> <li>Morphological, biochemical or</li> <li>ecological, level of organization,</li> <li>symmetry, germ layer organization,</li> <li>segmentation, notochord Concept of</li> <li>unicellular and multicellular organisms;</li> <li>prokaryotes and eukaryotes; Habitat &amp;</li> <li>Adaptations Concept of Ecosystem:</li> <li>Structure &amp; Function Energy flow in an</li> <li>ecosystem: Lindemann ten percent law</li> <li>Types of excretion: Ammonotelism,</li> <li>Ureotelism and Uricotelism Animal</li> <li>Kingdom:</li> <li>Characters of phylum with examples</li> <li>Model organisms for the study of</li> <li>biology come from different groups.</li> <li>E. coli, S. cerevisiae, D. Melanogaster,</li> <li>C. elegans, A. thaliana, M. musculus</li> </ul>			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).					y and nit	2, 3 4	

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	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	action 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	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

- 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.

## **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

	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

Course	Titla		SEMESTER - G INFORMATION				ONG	трии	TION	
Course	e i iue	BUILDIN					-	1	1	
Course	e code	24BTCE215R	Total credits: 3 Total hours: 45T	L 3	<u>Т</u> 0	P 0	<b>S</b> 0	R 0	0/F 0	3
Pre-rec	nuisite	Nil	Co-requisite		U	U	N		U	
Progra			B. Tech in	Civil En	gine	ering				
Seme		Fa	lll/ III semester of se		0	0	rogra	mme		
			ilding Information M				0			
Cou	rse	2The workflow foll	owed in industry dur	ing creat	ion of	BIM	3D m	odel w	hich incl	udes
Objec	tives	building the discipli	ne-based model and	create th	e fede	erated	mode	s.		
		3The Discipline bas	ed modeling of a bui	lding usi	ng Re	evit to	ol.			
CC	)1	Interpret the basic p project	rinciples of BIM evo	lution ar	nd cor	icept o	of BIM	I in lif	ecycle of	
CO	02	3Dmodel.	kflows of Design aut	-				-	-	on of
CO	3	Create the discipline	e-based model of the	building	using	g Revi	t Softv	ware to	ool	
CO	94		ped model for Clashe		•		-		e tool.	
CO	95	Illustrate the variou	s emerging trends of			pt of d	ligital	twin		
Unit- No.		Content		Contac Hour	t	Le	arnin	g Outo	come	K
I	Engine Isomet Buildir & Proc Design Introdu process Introdu Archite Annota	ng Information Mode eering from 2D drawin ric view – Examples ng Information Mode cess, Application. A Authoring – Concep action to stages of BII s as per ISO 19650. action to Revit, User I ecture, Structure, Syst ate, View, Manage, M	ngs to BIM Model, and Limitation, ling – Introduction ts and workflow, M Modeling Interface in Revit - tems, Insert, Iodify.	6	un en an sy	nderst nviron nd prin vstems	ment's nciples s, meta	g of the comp gover bolic	e onents rning life versity.	1,
Π	Revit A and gri Schedu Paramo Revit S grids, r and Ar creatio Revit S grids, J and spi and par Federa benefit links ir	Authoring in Revit Architecture – File set ids, Modeling Archite ales and Annotation, S eter creation. Structure - File setup, modeling structural el motation, Sheet creat n, Remove warnings. Systems - File setup, of HVAC, plumbing and rinklers, Electrical lig rametric creation. ted model – Concept, ts, Linking of Revit fi n Revit, exporting file ring and Animation	tup, creating levels octural elements, Sheet creation, creating levels and ements, Schedules ion, Parameter creating levels and l piping, Fire line htings, Cable trays Strategy and les and reload of	6	ec ec fl un be cc	cologi cosyst ow, tr nderst etween	cal ter em str ophic and th n ecos	chains e relat ystem nd the	ogy, , energy , and ionships	1,
Ш	Visual	ization, Clash check in BIM Model, Visua		6		-	p the a envir	bility onmen		1,

	Walkthrough of the Model, Fly through the model, Layers & Properties, Concept of viewpoints, Sectioning and Visualization through Tablet and Mobile, Concept of BIM Kiosk & BIM Rooms, Visualization through Augment Reality (AR), Virtual Reality (VR) & Mixed Reality (MR) Clash Check – Types, Clash avoidance process, Clash Detection Process, Clash Detection Priority Matrix and Report generation, Clash Detection Rules, Report, Grouping, Clash Detection using software tool. Documentation and CDE (Common Data Environment) - Concept of Cloud Computing, Concept and Application of CDE, Setting up the workflow and process for CDE. Concept of LOD (Level of Development), preparation of LOD matrix and Progression matrix, LOD- Chart, Matrix, and Model Progression Matrix		pollution sources, causes, effects, and prevention methods, emphasizing sustainability and the interplay between energy, environment, and human activities.	
IV	<b>4D</b> / Field BIM & Its Applications         Introduction to 4D / Field BIM - Concept of         4D, Project scheduling using Gantt Chart and         its limitation, Demo - Synchronization of 4D         BIM Model with project schedule, reviewing         project progress w.r.t planned dates and actual         dates, Generation of Reports         Application of Field BIM/ 4D BIM -         Understanding concept and usage of BIM in         field for coordination- 3D Coordination and         Visual Communication, Site utilization         planning and Construction analysis,         Application of wearables in coordination. 3D         Control and planning         Other Applications of Field BIM / 4D BIM -         Concept and usages of BIM in field for safety,         disaster and risk analysis, digital fabrication         and scan to BIM, Existing Condition         Modelling, Phase Planning, As-built/ Record         Models	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	<ul> <li><b>5D BIM and Beyond BIM</b> - Emerging Trends</li> <li><b>5D BIM - Introduction concepts of 5D BIM</b>, BIM Maturity LOD and General Practice of QTO, Cost Breakup structures, 5D BIM and cost control</li> <li>AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset requirement- Discipline wise Infrastructure</li> </ul>	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	1,2

System, Classification code and Information	Environmental Impact
Exchange, Information Exchange with Facility	Assessment processes.
Management Beyond BIM - Concepts of	
Industrialization, IoT, Big Data, Data	
Analytics and their applications in BIM:	
Industrialization of Construction through BIM-	
DfMA, IoT in BIM BIM and Big data, Data	
Analytics using AI & MLFuture scope of BIM	
Applications: Smart Infrastructure and the need	
for connected infrastructure, Digital twins-	
Concepts and benefits, National Digital Twin	
or a City level Digital Twin in a Smart City,	
Fundamental requirements for the success of a	
Digital Twin and its uses, Digital Twin	
applications in diverse industries.	

## T1: IM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers

*Authors:* Charles M. Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston *Overview:* This comprehensive guide covers BIM concepts, technologies, and practical applications across various disciplines in the construction industry.

Publisher: John Wiley & Sons

*ISBN:* 978-0470541371.

## T2: BIM and Construction Management: Proven Tools, Methods, and Workflows

*Author:* Brad Hardin *Overview:* This practical resource offers tools, methods, and workflows for integrating BIM into construction management processes, enhancing project delivery and collaboration. *Publisher:* Sybex

ISBN: 978-0470402351

## **REFERENCE BOOKS:**

## R1: Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations

## Author: Willem Kymmell

*Overview:* Focuses on the planning and management aspects of BIM, emphasizing 4D CAD and simulations to improve project scheduling and visualization.

Publisher: McGraw-Hill Professional

ISBN: 978-0071494533

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Gain fundamental knowledge of Building Information Modeling, its importance, and its role in modern construction.	1,3 & 4
2	Develop proficiency in using industry-standard BIM software like Autodesk Revit, Navisworks, and other relevant tools	1,2
3	Create 3D models to visualize construction projects, improving design understanding and communication.	7.9,10
4	Utilize BIM to facilitate interdisciplinary collaboration among architects, engineers, and contractors	5,7
5	Use BIM tools to identify and resolve design conflicts before construction begins	5,8

			SEMESTE	R – III							
Cour	se Title		<b>Computational T</b>	hinking	for	r Prot	olem	Solvi	ng		
Cour	se code	24MOCE212R	Total credits:		_	Т	Р	S	R	O/F	C
			Total hours: 1	-		0	0	0	0	0	1
	equisite	Nil	Co-requisite					N	lil		
-	ramme		B. Tech			-	-				
Sen	nester		all/ III semester of								
Objo	ourse ectives	fundamental tool 2.To develop Proble manageable com 3.To promote innov approaches to de	bstraction, pattern s for solving problem-Solving Strateg ponents and devise ation and creativit signing computation	recognit lems. gies by Bi e structur y by enco onal solu	ion, reak red, oura tion	, and a king d step-l aging ns for	algori lown by-ste innov	ithm c comp ep sol vative	lesign lex pro utions. thinkin	as oblems in ng and c	reative
	01	To apply computati	-	-							
	02	To understand and a	· · ·		ig c	oncep	ots.				
	03	To analyze and solv	· ·	-							
	04	To use computation		-							
	05	To develop critical	thinking and Innov								
Unit-		Content		Contac	t	]	Lear	ning (	Outcor	ne	KL
No.	<b>D G b d</b>	ion and importance		Hour							
Ι	Core con pattern r Problem approach computa Problem (algorith flowchan Basic alg selection algorith	ational thinking incepts: Decomposition recognition, and algor in-solving frameworks ines. Real-world appli- ational thinking and d analysis and breaking s. Designing step-by- ims). Representing al- rts and pseudocode gorithmic constructs: in, and iteration. Case nic problem- solving	ithm design s and systematic cation iscipline. g down complex step solutions gorithms using Sequencing, studies in	6		of cor Identi proble comp Devel algori proble reason soluti	nputa fy rea ems s utatic lop ar thms ems. ning t ons	al-wor uitabl onal ap nd rep for g Apply to des	e for pproact resent iven / logica ign stru	ing. hes. al uctured	1,2
п	Variable Writing Control Functior Debuggi Understa organizi	ction to programmines, data types, operator basic programs for prestructures: Condition as and modular programs and and testing solution anding and and data: Arrays, lists	rs. coblem- solving. als, loops. amming. ons.	6		progra comp Under struct Use c manip Autor optim tasks.	ams t utatic rstand ures i ompu oulate nate p ize p	o solv onal p l and n pro- itation and a proces robler	roblem apply o gramm nal tool analyze sses to n- solv	us. control iing. ls to e data. ving	1,2
ш	fields: A Science, techniqu efficience	tational thinking in our artificial Intelligence, Robotics. Optimization and evaluating solicy. Ethical consideration tional problem-solvin	Data ion ution ions in	6	1 5 1 1	to solve proble	intere ems. ate a	discip nd opt	ional tl linary timize	ninking	1,2

	Preparing for advanced studies in computational sciences. Capstone project: Solving a real-world problem using computational thinking principles		performance and scalability.	
IV	<b>Data Structures and Their Role in Problem</b> <b>Solving</b> Lists, Arrays, and Strings, Stacks and Queues, Linked Lists, Trees and Graphs (Introduction), Searching and Sorting Algorithms	6	Understand the fundamental differences and applications of lists, arrays, and strings. Implement arrays and lists in programming to store and manipulate data efficiently.Perform basic operations on strings (concatenation, searching, pattern matching, etc. Analyze the time and space complexity of operations on arrays, lists, and strings.	1,2
V	Case Studies and Applications Computational Thinking in Science, Engineering, and BusinessReal-world Problems and Their SolutionsTeam-Based Problem-Solving Projects	6	Understand how computational thinking is applied in various disciplines such as science, engineering, and business. Analyze real- world problems in these fields and identify computational approaches to solve them. Apply decomposition, pattern recognition, abstraction, and algorithm design to industry- specific challenges. Develop efficient models and simulations to optimize processes in scientific research, engineering design, and business decision- making.national environmental policies and laws, including Environmental Impact Assessment processes.	1,2

## **Text Books:**

**T1** David D. Riley and Kenny A. Hunt "Computational thinking for the Modern problem solver".

T2 Jane Krauss and Kiki Prottsman "Computational thinking and coding for every student: The Teacher guide"

**T3** Mark J. Guzdial and Barbara Ericson, ""Introduction to Computing and Programming in Python: A Approach"

## **Reference Books:**

R1 Peter J.Denning and Matti Tedre "Computational Thinking".

R2 Daniel Zingaro 'The art of Computational Tninking".

**R3** Paolo Ferragina and Fabrizio Luccio "Computational Thinking: A Problem-Based Introduction".ent aspects of BIM, emphasizing 4D CAD and simulations to improve project scheduling and visualization.

Publisher: McGraw-Hill Professional ISBN: 978-0071494533

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	To apply computational thinking across disciplines.	1,3 & 5
2	To understand and apply computational thinking concepts	1,2,4
3	To analyze and solve problems systematically.	1,4,5
4	To use computational tools and programming basics.	2,4
5	To develop critical thinking and innovation skills.	5,8

			SEMESTER	– III						
Cours	e Title		Field	Based Tr	ainig					
Cours	e code	24BTCE217R	Total credits: 1	L	Τ	P	S	R	O/F	C
			Total hours: 30P	0	0	0	0	16	0	1
	quisite	Nil	Co-requisite					Nil		
	amme			Civil Eng		-				
Sem	ester		Fall/ III semester of s	-			-			
	urse ctives	projects, enhancin 2.Develop studen fostering attention 3.Enhance proble	with advanced AutoC. In their technical profi- ts' ability to create pre- in to detail and accurace m-solving and critical paring students for real	iciency an ecise engin y in their thinking	d prof neering work. abilitie	ession g drav	nal co vings ough	ompeter and de practica	ncy. tailed de	
	01	drawings.	iciency in using Auto					-		
CO	52	11 7	AutoCAD techniques	Į.				•		
CO	03	drawings.	ty to interpret and con		•			•	C	
CO	04	project developm							-	
CO	05	Exhibit improved AutoCAD applica	problem-solving skill tions.	ls and tech	nnical	know	ledge	throug	h practio	al
Unit- No.		Conten	t	Contact Hour		Lea	rninş	g Outco	ome	KI
Ι	<b>Featu</b> tools, o	<b>luction to Advance</b> res: Overview of ad customization option ctivity features.	vanced drawing	4	too	ols an	d cus	nced dra tomizat utoCAI	tion	1, 2
II	Drawi Techn and are layerir	iques for creating de chitectural drawings	etailed structural	4	de dra	tailed	civil gs wit	e and engine h advar	-	2, 3
Ш	<b>3D M</b> Introdu visuali	odeling and Visual action to 3D modeli zation techniques ir ngineering applicati	ization: ng, rendering, and AutoCAD for	4	vis	sualiz	e civi	models il engin g AutoC	eering	3,
IV	integra softwa import	ation with Other T ating AutoCAD with are and tools, include ing/exporting and collaborative pro	n other engineering ng	4	wi co	th oth	ner to hensi	toCAD ols for ve engi opment	neering	4, 5
V	Practi Hands AutoC engine	cal Applications and on projects and cas AD skills in real-we beering scenarios, inc t presentation and de	nd Projects: e studies to apply orld civil luding	4	pra de so	actica mons	l proj tratin and t	CAD ski jects, g probl echnica	em-	5

## **Textbooks:**

T1: "Field Research: A Sourcebook and Field Manual" - Robert G. Burgess

- T2: "Methods in Field Biology" Robert H. Giles
- T3: "Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Earth Sciences" Sara E. Vero
- T4: "Research Methods in Education" Louis Cohen, Lawrence Manion, and Keith Morrison
- (For Education Field Training)

## **Reference Books:**

R1: "The Field Guide to Fieldwork" - Bruce L. Berg

R2:"Handbook of Field Experiments" - Abhijit V. Banerjee and Esther Duflo

R3:"Doing Fieldwork in Areas of International Intervention" – Berit Bliesemann de Guevara R4:"Practical Field Ecology: A Project Guide" – C. Philip Wheater, James R. Bell, Penny A. Cook

R5:"Field and Laboratory Methods for General Ecology" – James E. Brower, Jerrold H. Zar

	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

			SEI	MESTER	- III							
Cours	se Title			<b>Basic</b> Lif	e Saving	g Skil	s					
Cours	se code	24UULS212R	Total cred	lits: 1	L	Т	Р	S	R	O/F		С
			Total hour	rs: 60P	0	0	4	0	0	0		1
Pre-re	equisite	Nil	Co-requisi	ite	Nil				•			
Progr	amme	<b>Bachelor of Techno</b>	ology in Ci	ivil Engine	ering							
Sem	ester	Fall / III semester	of second y	year of the	program	mme						
Cou	urse	1. Equip students wit	th essential	knowledg	e and ski	ills in	basic	life-sa	aving	; techni	ques	,
Obje	ectives	including CPR and f	irst aid.									
		2. Develop the ability	y to assess	emergency	situatio	ns and	l respo	ond ef	ffecti	vely to	vario	ous
		types of injuries and	medical co	onditions.								
		<ol><li>Foster an understa</li></ol>	inding of pi	reventive n	neasures	and sa	afety j	protoc	ols to	o minir	nize	the
		occurrence of emerg	encies and	enhance ov	verall con	mmun	ity sa	fety.				
C	01	Demonstrate proficie	ency in per	forming CI	PR, admi	inister	ing fi	rst aid	l, and	l using	autor	mated
		external defibrillator	rs (AEDs).									
CO	02	Exhibit the ability to	quickly as	sess emerg	ency situ	uation	s and	make	info	rmed d	ecisi	ons to
		provide immediate c		-								
CO	03	Understand and appl	ly basic saf	ety protoco	ols to pre	event a	accide	ents ar	1d ha	ndle er	nerge	encies
		efficiently.			_						-	
CO	04	Display confidence	and compe	etence in h	andling	a rang	ge of	medi	cal e	mergen	cies,	from
		minor injuries to life	-threatenin	g conditior	ıs.							
CC	05	Advocate for and	promote s	afety and	prevent	ive m	easur	es w	ithin	the co	omm	unity,
		contributing to a safe	er environn	nent.								
Unit-	Conte	nt		Contact	Learni	ng O	utcom	e				KL
No.				Hour								
Ι	Unit 1	: Introduction to Li	fe-		This u	nit co	overs	the i	impo	rtance	of	1, 2
	Saving	g Skills			life-sav	ving	skills	and	d th	ne bas	sic	
	•	Importance of life-s	saving		princip	les of	first	aid. It	t disc	cusses t	he	
		skills										
					legal a	nd eth	ical a	spect	s of j	providi		
	•	Basic principles of	first aid		legal a first ai			-		-	ng	
	•			5	-	d, em	phasiz	zing t	he in	nportan	ng .ce	
	•	Basic principles of		5	first ai	d, emj sonal	phasiz safet	zing t y an	he in d the	nportan e use	ng ce of	
	•	Basic principles of Legal and ethical as	spects of	5	first aid of per	d, emj sonal ive e	phasiz safet quipm	zing t y and nent.	he in d the Stud	nportan e use ents w	ng ce of vill	
	•	Basic principles of Legal and ethical as providing first aid	spects of use of	5	first aid of per protect	d, emp sonal ive e now to	phasiz safet quipm asse	zing the second	he in d the Stud e sce	nportan e use ents w ene of	ng ce of rill an	
	•	Basic principles of Legal and ethical as providing first aid Personal safety and	spects of use of nt	5	first aid of per protect learn h	d, emj sonal ive e now to ency	phasiz safet quipm asse to e	zing t y and nent. ess the nsure	he in d the Stud e sce sat	nportan e use ents w ene of	ng ce of rill an	
	•	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment	spects of use of nt	5	first aid of per protect learn h emerge efficier	d, em sonal ive e now to ency ncy in	phasiz safet quipm asse to e provi	zing ti y and nent. ess the nsure ding a	he in d the Stud e sce sat	nportan e use ents w ene of fety a	ng ce of rill an nd	
П	Unit 2	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary	spects of use of nt e of an	5	first aid of per protect learn h emerge	d, em sonal ive e now to ency ncy in	phasiz safet quipm asse to e provi	zing ti y and nent. ess the nsure ding a	he in d the Stud e sce sat	nportan e use ents w ene of fety a	ng ce of rill an nd	2, 3,
II	Unit 2	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency	spects of use of nt e of an	5	first aid of per protect learn h emerge efficier	d, emy sonal ive e now to ency ncy in ts wil	phasiz safet quipm asse to e provi	$\frac{1}{2}$ $\frac{1}$	he in d the Stud e sce sat nid.	nportan e use ents w ene of fety a anator	ng ce of rill an nd ny	2, 3, 4
П	Unit 2 Resuse	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary	spects of use of nt e of an	5	first aid of per protect learn h emerge efficier Studen	d, emy sonal ive e now to ency ncy in ts wil hysiol	phasiz safet quipm asse to e provi l delv ogy	y and nent. ess the nsure ding a re into releve	he in d the Stud e sce sat aid.	nportan e use ents w ene of fety a anator to CP	ng ce of rill an nd ny R,	· · ·
II	Unit 2 Resuse	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and nated External Defit	spects of use of nt e of an	5	first aid of per protect learn h emerge efficier Studen and p learnin on adu	d, emissional ive ency ney in ts will hysiol g the silts, ch	phasiz safet quipm asse to e provi l delv ogy steps	zing t y and nent. ess the nsure ding a re into releve for pe	he in d the Stud e sce sat aid. o the ant rform d infa	nportan e use ents w ene of fety a anator to CP ning CI ants. Th	ng of ill an nd ny R, PR	· · ·
II	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and nated External Defit	spects of use of nt e of an	5	first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i	d, em sonal ive e now to ency ncy in ts wil hysiol g the lts, ch nclude	phasiz safet quipm asse to e provi l delv ogy steps : nildren es th	ving t y and nent. ss the nsure ding a relev for pe n, and ne pr	he in d the Stud e sce sat id. o the ant rforn l infa rincip	anportan e use ents w ene of fety a anator to CP ning CI ants. Th ples a	ng ce of ill an nd my R, PR nis nd	· · ·
II	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and hated External Defit Anatomy and physic relevant to CPR	spects of use of nt e of an <b>brillators</b>	5	first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i procedu	d, emissional ive ency now to ency in ts will hysiol g the silts, ch nclude ures f	phasiz safet quipm asse to e provi l delv ogy steps : nildren es th for us	ving t y and nent. ss the nsure ding a re into releve for pe n, and ne pi ing a	he in d the Stud e sce sat aid. o the ant rform l infa rincip in A	nportan e use ents w ene of fety a anator to CP ning CI ants. TI oles a ED, w	ng of of ill an nd R, R, R R nis nd ith	· · ·
П	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and nated External Defit Anatomy and physic relevant to CPR Steps for performin	spects of use of nt of an orillators iology		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i procedu	d, emi sonal ive e now to ncy in ts wil hysiol g the lts, ch nclude ures f on pra	phasiz safet quipm asse to e provi l delv ogy steps hildren es th for us actice	zing t y and nent. ess the nsure ding a relev for pe n, and ne pr ing a sessi	he in d the Stud e sce sat id. D the ant rform l infa rincip in A ons	anator to CP ning CI ants. TI bles a ED, witto ensu	ng ce of iill an nd my R, PR nis nd ith ure	· · ·
II	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and nated External Defite Anatomy and physic relevant to CPR Steps for performine on adults, children,	spects of use of nt of an orillators iology	5	first aid of per- protect learn h emerge efficier Studen and p learnin on adu unit i proced hands- proficier	d, emissional ive ency necy in ts will hysiol g the silts, ch nclude ures f on pra-	phasiz safet quipm asse to e provi- l delv ogy steps i nildren es th for us actice The u	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, PR nd ith ith ire on	· · ·
11	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency : Cardiopulmonary citation (CPR) and hated External Defit Anatomy and physic relevant to CPR Steps for performin on adults, children, infants	spects of use of nt of an orillators iology ng CPR and		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i proced hands-o proficier	d, emi sonal ive e ow to ncy in ts wil hysiol g the s lts, ch nclude ures f on pra ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, PR nd ith ith ire on	· · ·
II	Unit 2 Resuse Auton	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency <b>: Cardiopulmonary</b> <b>citation (CPR) and</b> <b>nated External Defit</b> Anatomy and physic relevant to CPR Steps for performin on adults, children, infants Use of an AED: pri	spects of use of nt of an orillators iology ng CPR and		first aid of per- protect learn h emerge efficier Studen and p learnin on adu unit i proced hands- proficier	d, emi sonal ive e ow to ncy in ts wil hysiol g the s lts, ch nclude ures f on pra ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, PR nd ith ith ire on	· · ·
П	Unit 2 Resuse Auton (AED)	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency <b>: Cardiopulmonary</b> <b>citation (CPR) and</b> <b>nated External Defit</b> Anatomy and physic relevant to CPR Steps for performin on adults, children, infants Use of an AED: pri and procedures	spects of l use of nt e of an <b>brillators</b> iology ng CPR and nciples		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i proced hands-o proficier	d, emi sonal ive e ow to ncy in ts wil hysiol g the s lts, ch nclude ures f on pra ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, R, PR nd ith ith ire on	· · ·
11	Unit 2 Resuse Auton (AED)	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency <b>: Cardiopulmonary</b> <b>citation (CPR) and</b> <b>nated External Defit</b> Anatomy and physic relevant to CPR Steps for performin on adults, children, infants Use of an AED: pri and procedures Hands-on practice s	spects of use of nt of an orillators iology ng CPR and nciples sessions		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i proced hands-o proficier	d, emi sonal ive e ow to ncy in ts wil hysiol g the s lts, ch nclude ures f on pra ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, R, PR nd ith ith ire on	· · ·
II	Unit 2 Resuse Auton (AED)	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency <b>: Cardiopulmonary</b> <b>citation (CPR) and</b> <b>nated External Defit</b> Anatomy and physic relevant to CPR Steps for performin on adults, children, infants Use of an AED: pri and procedures Hands-on practice sc for CPR and AED u	spects of l use of nt e of an <b>brillators</b> tology ag CPR and nciples sessions use		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i proced hands-o proficier	d, emi sonal ive e ow to ncy in ts wil hysiol g the s lts, ch nclude ures f on pra ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, R, PR nd ith ith ire on	· · ·
П	Unit 2 Resuse Auton (AED)	Basic principles of Legal and ethical as providing first aid Personal safety and protective equipment Assessing the scene emergency <b>: Cardiopulmonary</b> <b>citation (CPR) and</b> <b>nated External Defit</b> Anatomy and physic relevant to CPR Steps for performin on adults, children, infants Use of an AED: pri and procedures Hands-on practice s	spects of use of nt of an orillators iology ag CPR and nciples sessions use sponding		first aid of per protect learn h emerge efficier Studen and p learnin on adu unit i proced hands-o proficier	d, emissional ive ency ney in ts will hysiol g the sills, ch nelude ures f on pra- ency. izing a	phasiz safet quipm asse to e provi l delv ogy steps i nildren es th for us actice The u and re	ving t y and nent. ess the nsure ding a ding a re into for pe n, and ing a sessi unit al	he in d the Stud e sce sat aid. D the ant rform l infa rincip un A ons lso fo	anportan e use ents w ene of fety a anator to CP ning CI ants. TI bles a ED, witto ensu	ng of ill an nd R, R, PR nd ith ith ire on	· · ·

III	Unit 3: First Aid Techniques		This unit teaches essential first aid	1, 2,
	• Managing bleeding,		techniques for managing bleeding,	3, 4
	wounds, burns, and fractures		wounds, burns, and fractures.	
	Providing first aid for		Students will learn how to provide	
	choking, poisoning, and	5	first aid for choking, poisoning, and	
	shock		shock. The unit includes practical	
	Practical sessions for		sessions to practice bandaging,	
	bandaging, splinting, and		splinting, and other first aid	
	other first aid procedures		procedures	
IV	Unit 4: Emergency Medical		Students will explore common	1, 2
	Conditions		medical emergencies such as heart	
	Recognizing symptoms of		attacks, strokes, asthma attacks, and	
	heart attacks, strokes,		diabetic emergencies. This unit covers	
	asthma attacks, and diabetic		the recognition of symptoms,	
	emergencies		immediate response actions, and	
	• Immediate response actions	5	ongoing care until professional help	
	for medical emergencies	5	arrives. Emphasis is placed on staying	
	Ongoing care until		calm and effective communication	
	professional help arrives		during emergencies.	
	• Importance of staying calm			
	and effective			
	communication during			
	emergencies			
V	<b>Unit 5: Safety and Prevention</b>		The final unit focuses on preventive	2, 3,
	• Home and workplace safety		measures to minimize the occurrence	4, 5
	measures		of emergencies. Students will learn	
	• Fire prevention and		about home and workplace safety,	
	electrical safety		including fire prevention, electrical	
	Accident prevention	5	safety, and accident prevention. The	
	strategies		unit also covers community safety	
	Community safety programs		programs and how to advocate for	
	• Advocating for safety and		safety and preventive measures within	
	preventive measures within		the community.	
	the community			

## **Textbooks:**

**T1: "First Aid Manual"** by British Red Cross, St John Ambulance, St Andrew's First Aid, 2016. **T2: "Emergency Care and Transportation of the Sick and Injured"** by American Academy of Orthopaedic Surgeons (AAOS), 2016.

**T3:**"Advanced First Aid, CPR, and AED" by American Academy of Orthopaedic Surgeons (AAOS), 2011.

## **Reference Books:**

## **R1:**"Wilderness First Responder: How to Recognize, Treat, and Prevent Emergencies in the **Backcountry**" by Buck Tilton, 2010.

**R2:"Prehospital Trauma Life Support"** by National Association of Emergency Medical Technicians (NAEMT), 2014.

R3:"Fundamentals of Basic Emergency Care" by Richard W. O. Beebe, Deborah L. Funk, 2013.

	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

	SEN	IESTER -	- III									
<b>Course Title</b>	Introduc	tory Engli	ish for	Engir	neers							
Course code	24UBPD214R Total cre	dits: 1.5	L	Т	Р	S	R	O/F	С			
	Total ho	urs: 45P	0	0	3	0	0	0	1.5			
Pre- requisite	Nil Co-req						Vil					
Programme	Bachelor				-		-					
Semester	Fall / III seme					-		e				
Course	1.To capacitate the students with				-	-						
Objectives	2.To enable the students to c	ommunica	te con	fident	ly wit	haf	òcus	on list	ening and			
	speaking skills. 3.With the help of the basics of Phonetics, the students will be able to pronounce word											
	-	f Phonetics	s, the s	tudent	S W1II	be ab	ole to	pronou	nce words			
<u> </u>	correctly.					:1.	. 1.		£			
CO1	Understand and correctly use						•	-				
	articles, auxiliary verbs, determiners, and degrees of comparison, to construct different											
CO2	types of sentences. Analyze and comprehend writt	on toxts th	rough	compi	ohong	ion ex	oroio	es dem	onstrating			
02	an understanding of sentence c				chens			ics, dem	onstrating			
CO3	Understand the process and p				ifferer	tiate	betw	een list	ening 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 phone	tics, deliv	vering	extem	pore	speec	hes,	and us	ing videc			
	recordings for self-reflection.											
CO5	Understand the fundamentals of communication, including its types, purposes, barriers,											
	and importance, and apply th	is knowle	dge to	impro	ove th	eir co	ommı	unication	n skills ir			
	both formal and informal conte	exts.										
Unit- No.	Content	Contact		Le	arnin	g Out	tcom	e	KL			
		Hour	T .1					• • • •				
Ι	Module 1 - Grammar							vill mas				
	I. Parts of Speech I. Articles I.		the		dation		elem		of			
	Auxiliary Verbs Affirmative and Negative Sentences		-				-	e the pa pronou				
	and Negative Sentences		verbs	,		tives,		adverl	-			
				, sitions	-	conjur			nd			
		6	· ·			-		g artic				
		Ū	-					and th				
			-				,	nphasize				
					-			auxilia				
								ing tens	-			
			voice	s, and	mood	ls. Tł	ne m	odule w	vill			
			also	cove	r the	e co	onstru	iction	of			
			affirm	native	and	negat	tive	sentence	es,			
			helpir	•	stude	ents	to	bu	ild			
			-	matica	•							
				ct and		-						
II	Module 2- Grammar			-				is modu				
	I. Determiners I. Sentence							and the				
	Construction							dents w				
	I. Types of Sentences							techniqu				
	(Assertive, Imperative, etc.)	7				• •		sentenc				
	. Degree of Comparison		(asser	tive,	ımper	ative,	inte	errogativ	ve,			

III	. Comprehension Exercises Module 3 - Listening Skills i. What is listening? i. The Process of Listening i. Factors that adversely affect Listening . Difference between Listening and Hearing, .Purpose and Importance of Effective Listening	6	and exclamatory). The concept of the degree of comparison (positive, comparative, and superlative) will be explored. The module will also 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	1, 2, 3, 4
	I. How to Improve Listening Process.		these concepts, students will enhance their ability to comprehend and retain spoken information.	
IV	Module 4 - Speaking Skills I. Introducing yourself I. Self- discovery I. 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.	
V	Module5- Communication SkillsI.IntroductiontoCommunication,I.ImportanceofCommunicationSkills,I.Purpose of Communication,Types of Communication,.Formalandinformalcommunication I.Importanceof Communication,I.Barriersto Communication,I.I.How to improve/ tips toimproveCommunicationskillsRespondingtodifferentquestions 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.	

## **Text Books:**

T1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida

T2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & amp; Company Ltd.: New Delhi.

#### **Reference Books:**

R1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India

R2. 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:**

- 3. <u>https://youtu.be/bEB8-SWMYhI</u>
- 4. <u>https://youtu.be/-zZau\_dttRY</u>

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.	1, 4,11

		1ESTER –									
<b>Course Title</b>	Introduc	tion to Psy	chology								
Course code	24MOCE213R Total cr	edits: 1	L	Γ	Р	S	R	O/F		С	
	Total ho	urs: 15T	0	0	0	0	0	0		1	
Pre- requisite	e Nil Co-requisite Nil										
Programme	Bachelor	of Technolo	gy in C	ivil I	Engi	neerii	ıg				
Semester	Fall / III seme	ester of seco	ond year	r of t	he p	rogra	mm	e			
Course	1. To identify the stages of hum	an developn	nent.								
Objectives	2.To understand the nature of ps	sychological	disorde	rs.							
	3.To apply psychological principles to real-life situations.										
CO1	An ability to explain the intera	actions betw	veen bio	logic	al, c	ogniti	ve, a	and en	viron	menta	
	factors that shape human behav	vior.									
CO2	An understanding of identify	ying and e	valuatin	g th	e ap	plica	tion	of ps	ycho	logica	
	concepts and theories to re										
	relationships									-	
CO3	An ability to define psychology	, its history	, and its	majo	or sul	ofield	s				
CO4	An ability to understand the sci							cholo	gy.		
CO5	An ability to express psycholog	gical concep	ts and id	leas o	clear	ly and	l con	cisely.			
Unit- No.	Content	Contact								KL	
		Hour									
Ι	Introduction to Psychology		Gain k	now	ledge	e of th	ne fu	ndame	ental	1, 2	
	Overview of psychology as a		princip		•						
	science, Branches of	6	psycho				uding	-	key		
	psychology, Research		perspec					0	-		
	methods in psychology,		cogniti								
	Ethics in psychology		psycho		,						
II	<b>Biological Psychology</b>					ogical	pri	nciples	s to	2, 3	
	Biological PsychologyApply psychological principles toStructure and function of thereal-world scenarios, including								4		
	brain, Sensory systems,	7	mental						-		
	Neurotransmitters and		learnin								
	hormones, Sleep and dreams		process	-					0		
			1								
III	Sensation, Perception, and		Develo	p an	alvti	cal sk	ills t	o eval	uate	1, 2	
	Learning		psycho	•	•					3,4	
	Sensory systems and		experin							,	
	perception, Classical	6	assess		laims		bout		man		
	conditioning, Operant	-	behavio								
	conditioning, Learning										
	theories										
IV	Motivation, Emotion, and		Recogr	nize	h	ow	psv	cholog	rical	1, 2	
	Personality		concep		vary		ross	culti	-	, –	
	Motivation theories, Emotion		gender		-						
	theories, Personality theories,	5	empath		and		-	tion	for		
	Assessment and research		individ								
	methods										
V	Abnormal Psychology and		Unders	tand	ethi	cal co	nsid	eration	is in	2, 3	
·	Therapy	5	psycho							4, 5	
	Defining abnormal behavior,	·	ensurin	-				-		., 0	
	Anxiety disorders, Mood		psycho	-	-						
	disorders, Therapy		profess	-			-				

.Responding to different	
questions in various situations	
(formal/informal)	

## **Textbooks:**

- T1: "Psychology" Richard S. Atkinson & Ernest R. Hilgard
- T2: "Introduction to Psychology" James W. Kalat
- T3: "Psychology: The Science of Mind and Behavior" Richard Gross
- T4: "Understanding Psychology" Robert S. Feldman
- T5: "Psychology" Saundra K. Ciccarelli & J. Noland White

## **Reference Books:**

R1: "The Principles of Psychology" – William James (Classic Work) R2:"Psychology and Life" – Richard J. Gerrig & Philip G. Zimbardo

SN	Course Outcome (CO)	Mapped Program Outcome
1	Gain knowledge of the fundamental principles, theories, and	1.2
1	history of psychology, including key perspectives such as behavioral, cognitive, biological, and humanistic psychology.	1,2
2	Apply psychological principles to real-world scenarios, including mental health, social interactions, learning, and decision-making processes.	3,5
3	Develop analytical skills to evaluate psychological research, understand experimental methods, and critically assess claims about human behavior.	6,9,10
4	Recognize how psychological concepts vary across cultures, genders, and life stages, fostering empathy and appreciation for individual differences.	5,9
5	Understand ethical considerations in psychological research and practice, ensuring responsible application of psychological knowledge in various professional and personal settings.	1, 4,11

			SEMESTER – IV							
Course '	Title		Soil Mechanics & Geo	techni	cal E	ngin	eering			
Course	code	24BTCE222R	Total credits: 4	L	Т	P	S	R	O/F	C
Course	couc	24D1CE222K	Total hours: 45T+30P	3	0	2	0	0	0	4
Pre-requ		Nil	<b>Co-requisite</b>				N	il		
Program			B. Tech in Civ	-		-				
Semes	ter		inter/ IV semester of seco	-		-	-			
Course Objectives		<ul><li>assess slope stal environmental p</li><li>2. To impart know soils and the sui</li><li>3. To characterize compressibility</li></ul>	vledge on the various factor itability of soils for various the failure criteria and to e parameters of soils.	nical in rs gove Geote valuate	nvest erning chnic e the	igatio g the I cal En shear	Engine Engineer streng	constr ering l ing ap	uction pehavio plicatio	and our of
<b>CO</b> 1	l	Distinguish variou	is soil type based on their p	roperti	ies an	nd beh	nabior.			
CO2	2	Calculate soil para	meters of soils at different	site co	onditi	on.				
CO3	3	Predict the occuar	ance of failure of sub-soil b	peneatl	ı any	found	dation.			
CO4	1		ring capacity of soil and po		settle	ement	t of the	found	lation.	
COS	5	Test various direct	t and indirect soil explorati	on.						
Unit-No.		Con	tent	Cont Ho		Lea	arning	Outc	ome	KL
I	Defini system and po weight porosit etc. Re ratio- 1 voids, conten variou Specif	tions and Relations in terms of weigh rosity. Definitions s, degree of satura ty, specific gravity elationship between noisture content, u saturation- moistur t- specific gravity s parameters (such ic gravity, Unit we	, mass specific gravity, n volume weights voids nit weight- percent air re content, moisture etc. Determination of as: Moisture content,	11	l	orig basi soil rela betv	derstan gin, typ ic prop s, and tionshi ween k ameter	es, and erties establi ps ey	of sh	1,2
	limit, j liquidi toughr sensiti limit, Q	sticity of soil, cons blastic limit, shrink ty and Consistency less indices, definit vity. Determination Classification of So	ntroduction to definitions istency limits-liquid age limit, plasticity, v indices, flow & tions of activity and n of: liquid limit, plastic bils.			moi unit	isture c t weigh d ratios	ontent its, and	t,	
II	limit, p liquidi toughr sensiti limit, <b>O</b> <b>Perme</b> Darcy <sup>T</sup> perme method Introdu charac plot flo	sticity of soil, cons blastic limit, shrink ty and Consistency uess indices, definit vity. Determination Classification of So <i>ability of Soil</i> - Dar 's law. Determination ability: Laboratory d, falling-head met action, stream and teristics of flow ne ow nets. Effective struction, effective structure action, effective structure	ntroduction to definitions istency limits-liquid age limit, plasticity, v indices, flow & tions of activity and n of: liquid limit, plastic bils. rcy's law, validity of on of coefficient of method: constant-head hod, Seepage Analysis- potential functions, ts, graphical method to	10	)	Lea Dar dete peri labo and	isture c t weigh d ratios d ratios urn and rcy's la ermine meabili pratory perfor lysis th structio	apply apply w to soil ity using m seep prough	ng ods page the	1,2

IV	Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. <i>Consolidation of Soil</i> - 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,. <i>Shear Strength</i> - 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	7	effective stress, analyze the impact of the water table on soil stress, and differentiate between soil compaction and consolidation processes. 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	1,2
v	<i>Soil Exploration-</i> 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	<ol> <li>Moisture content by oven dry method</li> <li>Field density by core cutter method</li> <li>Sieve analysis</li> <li>Liquid limit test by Casagrande Apparatus</li> <li>Plastic limit test</li> <li>Standard compaction test (OMC &amp; MDD)</li> <li>Consolidation test</li> <li>Direct shear test</li> <li>Unconfined compression test</li> </ol>	30	Describe, illustrate and explain and apply the concepts of geotechnical engineering in engineering prospect.	1,2,3,4

T1: Ranjan G., Rao A.S.R (2011), Basic and Applied Soil MechanicsT2: Saran S. (2015) Analysis and Design of SubstructuresT3:Punmia B.C. (2005), Soil Mechanics And Foundation Engineering

## **REFERENCE BOOKS:**

R1: Soil Mechanics by Craig R.F., Chapman & Hall

R2: Fundamentals of Soil Engineering by Taylor, John Wiley & Sons

R3: An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ

R4: Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme 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	Fluid	mechanics & Hydrauli	ics I	Engin	eerin	g					
Course	code	24BTCE213R	Total credits: 4		L	Т	Р	S	R		)/F	С
			Total hours: 45T+30	P	3	0	2	0	0		0	4
Pre-requ		Nil	Co-requisite					ľ	Vil			
Program			B. Tech in C		-		-					
Semes	ter		vinter/ IV semester of s		-			-				
Course Objectives		<ol> <li>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.</li> <li>Students engage in theoretical lectures, laboratory experiments, and computational exercises to gain a deep understanding of fluid behavior, enhancing their problemsolving skills and critical analysis of fluid flow phenomena.</li> <li>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.</li> </ol>										
CO	l		ious fluid characteristics				id bel	navio	ur.			
CO2		Explain the fluid	pressure and about its me	easu	iremer	nts.						
CO3		Summarize the va										
CO4		Apply the conserv	vation laws for fluids in f	fluid	l dyna	mics.						
CO5	1	Discuss various n	on-dimensional parameter	ers o	of flui	d flov	v.					
Unit-No.		Cont			ntact lour		Lear	ning	Outo	come	e	KL
Ι	betwee weight dynamite tempiperssistension comp Lamicircu Stoke Turbi Transi Defiri Caussion of tur pipess theoric theoric equati Resiss rought Bouri concool layer energy	een a fluid and a sol ht, Specific gravity, mic viscosity; varia erature, Newton law ure, boiling point, c on, capillarity, Bulk ressibility. <b>inar Flow</b> - Lamina lar pipes, annulus a 's law, Measureme <b>sulent Flow</b> - Reyno sition from laminar ition of turbulence, es of turbulence, inst bulence and effect . Reynolds stresses ies of turbulence, P y, universal velocity ion. tance to flow of flue n pipes, Moody's di <b>adary Layer Analy</b> ept of boundary layer thickness, laminar dary layers on a flat	tion of viscosity with v of viscosity; vapour avitation; surface modulus of elasticity, r flow through: nd parallel plates. nt of viscosity. olds experiment, to turbulent flow. scale and intensity, stability, mechanism of turbulent flow in semi-empirical randtl's mixing length y distribution id in smooth and agram. <b>sis</b> -Assumption and er theory. Boundary- ment, momentum &		11	fun pro vis sur cor uno dis	ndam operti cosit face mpre- dersta tincti	ssibil and th	fluid ch as nsity, on, ar ity, ar ne etwee	nd		1,2

	average friction coefficients. Separation and			
	Control.			
Π	<ul> <li>Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer,</li> <li>U-Tube Manometer, Single Column</li> <li>Manometer, UTube Differential Manometer,</li> <li>Micromanometers. Pressure gauges,</li> <li>Hydrostatic pressure and force: horizontal,</li> <li>vertical and inclined surfaces. Buoyancy and stability of floating bodies.</li> </ul>	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
ш	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	<ul> <li>Fluid Dynamics- Surface and body forces;</li> <li>Equations of motion - Euler's equation;</li> <li>Bernoulli's equation – derivation; Energy</li> <li>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</li> <li>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,</li> </ul>	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	<ul> <li>Dimensional Analysis and Dynamic</li> <li>Similitude - Definitions of Reynolds Number,</li> <li>Froude Number, Mach Number, Weber</li> <li>Number and Euler Number; Buckingham's π-</li> <li>Theorem.</li> <li>Flow through Pipes: Loss of head through</li> <li>pipes, Darcy-Wiesbatch equation, minor</li> <li>losses, total energy equation, hydraulic</li> <li>gradient line, Pipes in series, equivalent pipes,</li> <li>pipes in parallel, flow through laterals, flows</li> <li>in dead end pipes, siphon, power</li> </ul>	7	Utilize dimensional analysis and understand dimensionless numbers like Reynolds, Froude, Mach, Weber, and Euler for modeling and analyzing fluid flow similarity.	1,2

	transmissionthrough pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.			
Practical	<ol> <li>Bernoulli's Theorem</li> <li>Discharge Over Notches         <ul> <li>Triangular</li> <li>Rectangular</li> </ul> </li> <li>Impact Of Jet On Vanes         <ul> <li>Flat</li> <li>Hemispherical</li> </ul> </li> <li>Flow Through Orifice And Mouthpiece</li> <li>Reynolds's Number Determination</li> <li>Losses Due To Pipe Friction</li> <li>Determination of metacentric height of a given ship model</li> </ol>	30	Describe, illustrate and explain and apply the properties of fluid in engineering prospect.	1,2,3,4

T1: Dr. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering".

- T2: Dr. R.K.Bansal, "A textbook on Fluid Mechanics and Hydraulic Machines", Laxmi Publication ltd
- T3: Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.

## **REFERENCE BOOKS:**

- R1: Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House.
- R2: Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
- R3: Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme 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				

		1	SEMESTER –									
Cours	se Title	Basic A	cclimatizing Skills (B	,				1		-		
Cours	se code	24UULS221R	Total credits: 1		T	P	S	R	O/F	C 1		
Dro ro	equisite	Nil	Total hours: 60P Co-requisite	0	0	4	0 N	0	0	1		
	ramme		B. Tech in Ci	 	ainaa	nina	IN	11				
-	ester	NV:-			-	-						
Sem	lester		ter/ IV semester of se abilities in technical w						ions to			
		-	y engineering concepts	-	-	-	-			tions		
			ig for designing, constr				-			tions		
Co	urse	-	professional resumes a	-			-					
	ectives	-	ing students' chances o					101 011	5			
Obje			ork abilities and prepa		-			views t	hrough			
		-	s and targeted training,			-			-	g		
		careers.	0 0,		U				C .	0		
	01	Demonstrate clear an	d concise technical con	mmun	icatior	n in bo	oth wri	itten ar	nd oral for	nats,		
C	01	incorporating industr	y-specific terminology	<b>.</b>								
	01	· ·	crafting resumes, cove		rs, and	l techr	nical r	eports	to effectiv	ely		
C	02	showcase engineerin	g qualifications.									
C	02	Acquire proficiency	in creating and deliveri	ing im	pactfu	l prese	entatio	ons, uti	lizing visu	al		
U	03	aids to convey engine	eering concepts to dive	erse au	dience	s.						
C	04	Cultivate effective in	terpersonal skills for c	ollabo	rative	teamv	vork, e	emphas	sizing activ	ve		
U	04		olution, and clear com									
C	05	Prepare for engineeri	ng job interviews by a	rticula	ting qu	ualific	ations	, expei	riences, an	d		
U	05	career goals, address	ing both technical and	behavi	ioral q	uestio	ons cor	nfident	ly.			
Unit-		Conten	ł	Con	ntact	I	earni	ոց Ոս	tcome	KI		
No.				He	our	-	A ar m	ng Ou	teome	111		
		Introduction to Accon	nmodation			Deve	elop sl	kills in				
_	Manag						_		ng, room			
I	-	hone handling techniq	ue	4	4	· •		on, clea	•	1,2		
		nizing of Rooms.								usage	-	
		ning equipments and us	ses.						bed-	makin	ig proc	esses.
	• Bed I	naking Process.				Cair	mart		in using			
	Unit 2	Fundamental of Cook	ing						uipment,			
		of basic cooking equip	-						well as			
		of fire & Fuel	ments						nt cuts of			
II		rent cuts of vegetables		4	4		-	, utiliz		1,2		
		of herbs & spices				-		es, and	-			
		onal Food Habits					-	ling re		al d I,2		
	8						l habit	-	0			
	Unit 3-	Food and Beverage sk	tills					d cater	ing			
	1	duction to catering ind						•				
	Intro	adenon to catering ma	Types menus and beverages				industry basics, menu types, beverage					
III			•		1	l type	s, bev	erage				
ш	• Type		3		4			erage ion, tal	ole	1,2		
ш	• Type • Ident	s menus and beverages	s rockery & glassware		4	iden	tificat	ion, tal	ole stomer	1,2		
III	<ul><li>Type</li><li>Ident</li><li>Table</li></ul>	s menus and beverages ifications of Cutlery, c	s rockery & glassware		4	iden etiqu hand	tificat uette, a lling s	ion, tal and cus kills.	stomer	1,2		
III	<ul> <li>Type</li> <li>Ident</li> <li>Table</li> <li>Custe</li> <li>Unit 4-</li> </ul>	s menus and beverages ifications of Cutlery, c e etiquettes or manners omer handling skills or Travel management	rockery & glassware Situation Handling		4	iden etiqu hand Lear	tificat iette, a lling s n abou	ion, tal and cus kills. ut trave	stomer el	1,2		
	Type     Ident     Table     Custe     Unit 4-     Trave	s menus and beverages ifications of Cutlery, c e etiquettes or manners omer handling skills or Travel management el Documentation (Typ	rockery & glassware Situation Handling			iden etiqu hand Lear docu	tificat iette, a lling s m abou imenta	ion, tab and cus kills. ut trave ation, p	stomer el passport			
III IV	<ul> <li>Type</li> <li>Ident</li> <li>Table</li> <li>Custe</li> <li>Unit 4-</li> <li>Trave</li> <li>Appl</li> </ul>	s menus and beverages ifications of Cutlery, c e etiquettes or manners omer handling skills or Travel management	rockery & glassware Situation Handling Des) Visa		4	iden etiqu hand Lear docu and	tificat lette, a lling s m abou lmenta visa aj	ion, tal and cus kills. ut trave	stomer el passport ions,	1,2		

	• Types of logistics in travel and tourism management		UNESCO sites, and various logistics in travel and tourism management.	
V	<ul> <li>Unit 5- Basic Hospitality Skills</li> <li>Various Egg Preparations</li> <li>Canapés preparations</li> <li>Mocktail &amp; Shakes Preparations</li> <li>Butter Rice / Lemon Rice</li> <li>Various Lentils Preparations</li> <li>1 non-veg preparation/ 1 veg preparation</li> </ul>	4	Master various egg preparations, canapés, mocktails, shakes, rice dishes, lentil preparations, and both vegetarian and non-vegetarian dishes.	1,2

- 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.
- T3: Mohammed Zulfikar (2010) Introductions to Tourism and Hotel Industry Introduction to Tourism and Hotel Industry. Vikas Publishing.
- T4: Sudhir Andrews (2013) Food and Beverage Service: A Training Manual, Tata McGraw Hill, 2013.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme 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					

			SEMESTE										
Cours	e Title		English Languag	-	-			1		1		-	
Cours	e code	24UBPD224R	Total credi		L	T	I				_	1	С
			Total hour		0	0	3	;	0	0	0		1.5
	quisite	Nil	Co-requ						Ni	l			
	amme			in Civil En	-	-							
Sem	ester		ter/ IV semester				-						
		1. Develop students		-	-	-	-						
		•	y engineering conc	•			-				• •	at	ions
Coi	ırse	-	ng for designing, co	-			-	-					
Obie	ctives	2. Focus on crafting	-						or e	ngın	eering	5	
3		· · ·	ing students' chanc		•	•							
		3. Strengthen teamw	-	-		-							ctica
		-	eted training, enha	-				-		-		s.	
C	01	Demonstrate clear a				n bo	th v	vr1	tten	and	oral		
		formats, incorporati									00		-
CO	02	Develop expertise in	-	, cover lette	rs, and t	echn	ncal	re	port	ts to	effect	1V(	ely
		showcase engineeri	• •										
CO	03	Acquire proficiency	-				entat	10	ns,ι	ıtiliz	ing vi	su	al
		aids to convey engin										<u>.</u>	
CO	04	Cultivate effective interpersonal skills for collaborative teamwork, emphasizing active listening, conflict resolution, and clear communication within engineering contexts.											
		-								-			-
CO	05	Prepare for enginee		•	•••				-			an	d
<b>TT 1</b> .	1	career goals, addres	sing both technical		oral que	estio	ns c	on	fide	ntly.		-	
Unit-		Content		Contact	I	Lear	ning	g (	Juto	come	e		KI
No.	Waitin	a Shilla		Hour								_	
		<b>ig Skills</b> graph Writing & Nar	rotives										
		ter Writing	latives		Develop proficiency in various				arious				
		chnical Writing			forms of writing, including								
Ι		nd cistern		7 paragraph and narrative						1,2			
	-	duction of pipes and	cistern	construction, letter writing, and technical documentation	-								
		ving different types of				and te	chni	cal o	loc	cum	entat	tion.	
		orksheet1 and Worksl	•										
		lanagement Skills										+	
		OT Analysis			Gain c	-		-			-		
		l Setting and Persona	l Hygiene		practic	-							
		re allegation and Cl		_	pipes a								
II		troduction of basics		7	and all	-							1,2
	ii. So	lving questions on m	ixture and		profit,								
		igationion.			through targeted practice and worksheets.								
	iii. W	orksheet1 and Works	sheet 2		works	neet	<b>S</b> .						
	Vocab	ulary Development										╡	
	i. Un	derstanding different	aspects of a										
	wo	rd (such as the use of	say, tell, speak).		Entra	00 7	ore -	<b>m</b> -	1				
	ii. Lea	rning strategies to de	velop vocabulary		Enhan	-				. 611			
III	iii Con	textual vocabulary le	arning	7	effecti analys				-				1,2
	iv. Use	e of phrasal verbs and	idioms in a		-	-			-				
	1				maintaining personal hygie		JULIC.	1					
		versation			manna	*****	5 P			50	,		
	v. Eff	versation ectively using diction nent and Course of a			mumu	*111111	5 P				,		

IV	<ul> <li>iv. Revision of syllogism</li> <li>v. Statement and conclusion</li> <li>vi. Course of action based on statement</li> <li>vii. Worksheet1 and Worksheet 2</li> </ul> Interview Skills & Dress Code Ethics <ul> <li>i. Types of interview-</li> <li>telephonic, virtual &amp; face to face</li> <li>online interview, personal interview,</li> <li>Panel interview, Group interview</li> <li>ii. Common interview questions and</li> <li>answering strategies</li> <li>iii. Dress Code Ethics during Interviews</li> <li>iv. Mock Interview Session</li> </ul> Sitting arrangement (puzzle) <ul> <li>i. Linear arrangement puzzle</li> <li>ii. Circular arrangement puzzle</li> <li>iii. Matrix</li> <li>iv. Worksheet1</li> </ul>	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	IV. Worksheet1         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

- 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)

T3: A Modern Approach to Logical Reasoning All Exams

T4:General Mental Ability & Logical Reasoning Compendium

## **REFERENCE BOOKS:**

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

R2: Fast track Objective mathematics for Competitive exam by Arihant

R3: General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme 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				

			SEMEST								
Cours	se Title		Stru	ictural	Anal	lysis I					
Cours	se code	24BTCE223R	Total credits Total hours:	Ļ	L 3	T 0	P 0	S 0	R 0	O/F 0	C 3
Pre-re	quisite	Nil	Co-requisi		-	_	-	N	il	-	_
	amme	B. Tech in Civil	—								
-	ester		ter/ IV semester	of Seco	nd y	ear of	the p	rogra	amm	e	
	urse ctives	determine de indeterminac 2. Utilize strain 3. Apply energ	•	per nod for axia astigliar	e, as l loa 10's,	well a d, bend Betti's	s stati ding, a s, and	ic and and sł Maxy	kine hear a well's	ematic malysis. s to dete	
C	01	Understand the class and concepts of stati					nts, de	egrees	s of fi	reedom	per noc
C	02	Apply strain energy shear, and utilize pri Castigliano's theore	nciples such as m ms, and reciproca	inimum ll theore	n pote ms to	ential e o analy	energy vze str	v, virtu uctura	ual w al bel	ork, havior.	
C	03	Analyze beams, arches, and cables using methods such as strain energy, unit load, and Eddy's theorem, and determine deflections in beams and arches. Evaluate the elastic stability of columns using Euler's theory, derive buckling loads for									
C	04	different end conditi	ons, and apply Ra	ankine's	form	nula fo	or sho	rt and	long	; columr	s.
C	05	Analyze thin cylinde stress and calculatin			-		for h	oop st	tress	and long	gitudina
Unit- No.		Content	5 54 655 65 64 6 10 1	Conta Hou	ict		Learn	ning (	Jutco	ome	K
I	Stress	luction Classification resultants, Degrees of Static and Kinematic	f freedom per	9		Struct	ures, S es of f and K	Stress freedo Linem	resul om pe	ication o ltants, er node,	of 1,
II load, <sup>1</sup> minin virtua 1st an & Ma Defle		<b>Energy</b> Strain energy bending and shear, the um potential energy, work, law of conserved 2nd Castiglione's The well's reciprocal the tion of Beams using S d and Unit load metho	Analysethe strain energy du axial load, bending and shea theorem of ty principle of rvation of energy, Theorem, Betti's g Strain Energy Analysethe strain energy du axial load, bending and shea theorem of minimum potent energy, principle of virtual work, law of conservation o energy, 1st and 2nd Castiglione's Theorem, Bette & Maxwell's reciprocal theorem Deflection of Bear			d shear, potential rtual tion of n, Betti's al f Beams lethod	1,2				
ш	pin-joi section recipro	sis of Arches and Ca nted structures: Meth ns, deflection of joints ocal theorem. Analysi Arch, Eddy's theorem	od of joints and , Maxwell's s of Arches,	9	-	joints of join theore	and se its, Ma m. Ar	ection axwel nalysis	s, def l's re s of A	nethod flection eciproca Arches, neorem,	

UDL

parabolic arch, Spandrel braced arch,

Analysis of Cables under point loads and

three hinged parabolic arch, Spandrel braced arch, Analysis

of Cables under point loads and

			UDL	
IV	<b>Elastic Stability of Columns</b> : Short and Long Column, Euler's Theory of Columns, Derivation of Buckling Load for different end conditions, Rankine's Formula	9	Utilize the concept of short column and long column, Euler's Theory of Columns, Derivation of Buckling Load for different end conditions, Rankine's Formula	2, 3, 4
V	Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.	9	Derive the formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.	2, 3, 4, 5

- T1: Design Of Structures S. Ramamrutham., DhanpatRai Publishing Co Pvt Ltd
- T2: Design Of Steel Structures N. Subramanian

## **REFERENCE BOOKS:**

R1: Analysis of Indeterminate Structures by C.K. Wang.

R2: Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing

R3: KDR building, Calicut,

R4: (Corresponding set of) CAD Software Theory and User Manuals.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	Demonstrate their knowledge of structural mechanics in	1,3 & 4					
I	addressing design problems of structural engineering.	1,5 & 4					
2	Distinguish the varying materials and different loading systems in	1 3					
Z	a structure.	1,2					
3	Classify structures and explain their behaviour by drawing its	7 0 10					
3	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	- IV								
Cours	e Title		Transport	ation Engi	neeri	ng						
Course code		24BTCE221R	L	Τ	Р	S	R	O/F	C			
			Total hours: 45T+3 Co-requisite	OP 3	0	2	0	0	0	4		
	quisite	Nil			N	Nil						
-	amme	B. Tech in Civil Engineering Winter/ IV semester of Second year of the programme										
Sem	ester			-			-		1			
	urse ctives	<ol> <li>To introduce the students about different classifications/types of roads</li> <li>To explain the students about different geometric features of highways</li> <li>To describe about traffic characteristics and traffic control devices</li> </ol>										
C	01	Describe different types of roads, its administration and highway survey techniques										
CO		Design different geometric features of flexible and rigid pavement to determine ideal road alignment in different topographies										
C		Perform traffic survey to collect data required for traffic regulations and control										
C	<b>D4</b>		rent materials and thei									
CO	05	Design various con practice	nponents of flexible a		avem	ents	as pe	er the	latest c	ode o		
Unit- No.		Conter	nt	Contact Hour	Learning Outcome					KI		
Ι	Classif inIndia highwa	<b>Highway development and planning</b> Classification of roads, road development nIndia, Current Road projects in India; ighway alignment, Highway Survey, and roject preparation			concepts, principles, and components of transportation systems, including highways, railways, airways, and waterways.				1,2			
П	Introdu sight d design	Geometric design of highways ntroduction; highway cross section elements; ight distance, design of horizontal alignment; lesign of vertical alignment; design of ntersections, problems			Apply engineering principles to design and analyze transportation facilities, including roadways, intersections, and traffic control systems, to ensure safety, efficiency, and sustainability.				2, 3			
ш	Traffic studies regulat interse	c engineering & co c Characteristics, tra s, traffic flow and ca tion and control; des ctions; design of par ay lighting; problem	9	Evaluate traffic flow characteristics, capacity analysis, and control measures to optimize transportation network performance and reduce congestion.					1, 2 3, 4			
IV	Materi classif and Pl testing testing Design constru	ication for Highway late Load Test, Ag and specification, and specification , uction of bituminous ents, Highway Mair	<ul> <li>for pavements - Soil</li> <li>hway - Soil tests - CBR</li> <li>Aggregate - materials</li> <li>ion, Bitumen - material</li> <li>ation - Concrete Mix</li> <li>9</li> <li>Assess the impact of transportation systems on the environment and society, and explore sustainable, smart, and multimodal transportation</li> </ul>					1,2				

V	<b>Design of pavements-</b> 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; problems.	9	Develop transportation planning strategies and policies that integrate land use, economic development, and technological advancements to improve mobility and accessibility.	2, 3, 4, 5
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## **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.

CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Describe different types of roads, its administration and highway survey techniques	1,3 & 4				
2	Design different geometric features of flexible and rigid pavement to determine ideal road alignment in different topographies	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 – I	V									
Course Title Instrumentation and Control													
Course code		24BTCE225R Total credits: 3				L T P S R O/F						1	
		24D1CE223N	Total hours: 30T+30P	2		0	2	0	0	0	3		
Pre-requisite		Nil	Co-requisite				Nil						
Progra	amme		B. Tech in Civ	il Er	ıgi	inee	ring						
Sem	ester	Winter/ IV semester of Second year of the programme											
Course Objectives		This course is designed for the 4th semester students of Civil Engineering. This course is intended to develop an understanding of Measurement systems and performance models and its analysis at Instrumentation system elements, Signal processing and conditioning; correction elements. The course also indulges Control systems, and different types of Control method.											
CO	D1	The uses of Measurement systems and performance											
CC	)2	To generalization of the Instrumentation system elements											
CC	)3	Analysis of the Signal processing and conditioning; correction elements											
CC	)4	Outlining the Contro	ol systems										
CC	)5	To learn the other C	ontrolling methods										
Unit- No.		Cont	ent		nt [ou	act 1r	Learning Outcome				k	٢L	
I		urement systems and acy, range, resolution	•		9		To provide a basic knowledge about measurement systems and their components					, 2	
Π		mentation system ele on engineering meas			9		To learn about various					, 3, 4	
III	-	l processing and cone nts- actuators: pneum	ditioning; correction natic, hydraulic, electric		9		techniques of signal					, 2, , 4	
IV	loop,	Control systems – basic elements, open/closed loop, design of block diagram			9		To learn about system stability and control1, 2					, 2	
V	what,	•			9		mea with	the press m	ent s roces	ystems	Δ	, 3, , 5	

## **Text Books:**

T1 Instrumentation and control systems by W. Bolton, 2nd edition, Newnes, 2000

T2 Automatic Control Systems by S. Hasan Saeed, Katson Books

T3 Electrical and Electronic Measurement and Instrumentation by A.K Sawhney

#### **Reference Books:**

R1 Instrumentation and control systems by W. Bolton, 2nd edition, Newnes, 2000

R2 Thomas G. Beckwith, Roy D. Marangoni, John H. LienhardV, Mechanical Measurements (6th Edition) 6th Edition, Pearson Education India, 2007

R3 Gregory K. McMillan, Process/Industrial Instruments and Controls Handbook, Fifth Edition, McGraw-Hill: New York,1999.

CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	The uses of Measurement systems and performance	1,3 & 4					
2	To generalization of the Instrumentation system elements1,2						
3	Analysis of the Signal processing and conditioning; correction elements	7.9,10					
4	Outlining the Control systems	5,7					
5	To learn the other Controlling methods	5,8					

			SEMESTER -	- IV							
Course	Title		<b>Construction Equip</b>	oments a	nd T	echni	ques				
Course	e code	24BTCE226R	Total credits: 3	L	Τ	P	S	R	0/	F	С
			Total hours: 45T	3	0	0	0	0	0		3
Pre-req	-	Nil	Co-requisite				1	Nil			
Progra			B. Tech in C								
Seme	ster		ter/ IV semester of Se				-				
Course Objectives		<ol> <li>To provide insight on the different functions and operations of different equipment and techniques during construction</li> <li>To impart knowledge on the various maintenance and safety to be considered during construction</li> <li>To acquire knowledge on the life cycle of a construction equipment</li> <li>Evaluate equipment and techniques required during construction</li> <li>Understand the operation of a batching plant.</li> </ol>									
CO	)3	Analyze the equipme	nt life cycle managem	ent.							
CO	)4		ization and digitalisation		struc	tion					
			to analyze and select a				tion e	equip	ment	and	
CO	95	techniques for variou	s construction projects	, conside	ring f	factors	s sucl	ı as e	fficie	ency,	cost,
	1	safety, and environme	ental impact.								
Unit-		Conter	nt	Contac	t	Learning Outcome					KL
No.			s of Construction	Hour		Lu		504	ceom	U	
Ι	Intro Fun Equ Stro Intro Calo Con layc Hyd	oduction and Compor oduction to Princip culation of Pressur- nponents of a Hydr out of Hydraulic Sys lraulics- Strand Jack (	9	Demonstrate knowledge various types of construction equipment, their functions, and their appropriate applications different construction projects.					nt, eir	1, 2	
П	Hydraulics- Strand Jack OperationConcreting, Earth Moving, Road Making and Quarry/Mining EquipmentOperations of a Batching Plant - Introduction and Components of Concrete Pump & Placer- Concrete Pipeline- Laying and Cleaning- Bulldozer- Classification and Components- Classification, Components and Attachments of Excavator- Backhoe Loader- Classification & components- Introduction and classification to Hot mix Plant- Process of Asphalt Paver- PQC Paver- Classification & Components- Motor Grader- Classification & Components- Motor Grader- Classification & Components- Horizontal Movement Vehicles-9Evaluate factor cost, efficiency environmental site conditions determine the r construction educed to the transmission of the							ncy, tal im ns to le mo equi	pact		
III	Equ Life ( Perfo	rry/Mining ipment Life Cycle M Cycle of an Equipmen rmance Parameters - 1 tenance- Types of Ma	t- Equipment Introduction to	9	co in	xplain onstru icludii oundat	ction ng ex	tech: cavat	nique tion,	es,	1, 2, 3, 4

	Maintenance Practices		placement, and structural assembly, in compliance with industry standards and safety regulations.	
IV	<b>Tunneling Equipment / Piling Equipment</b> Introduction to Tunnel Boring Machines- Details and Operation of a Hard-Rock TBM- Details of Earth Pressure Balance (EPB) TBM- Details and operation of Slurry TBM & Components- Hydraulic Grabs- Piling Rig	9	Calculate and analyze the productivity of construction equipment, considering factors like cycle time, fuel consumption, and maintenance requirements.	1, 2
V	Mechanization and Digitalization in Construction and Safety in Construction Equipment Importance of Digital Analytics- Digital Solution in Construction Projects- Importance of Mechanization - Railway Track Construction- Rebar Processing Machine- Operation of Mechanized Equipment- Introduction to 3D Concrete Printer- Importance of Safety- Various PPE & Purpose- Safety of Men & Machines at Work- Safety During Construction Activities- Safety with Tools & Tackles.	9	Understand and apply safety measures, risk assessments, and maintenance procedures to ensure the efficient and safe operation of construction equipment on- site.	2, 3, 4, 5

#### **Reference Books:**

R1:Velumani. P, "Construction Techniques and Practices", SIA Publishers & Distributers Pvt Ltd, 2020.

#### **Textbook:**

T1:Dr. Manoranjan Samal, "Advanced Construction Techniques and Equipment" S.K. Kataria & Sons T2:S.C.Sharma, "Construction Equipment and management" E-Book .2019

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Evaluate equipment and techniques required during construction	1,2,7&10
2	Understand the operation of a batching plant.	1,3,6&7
3	Analyze the equipment life cycle management.	1,2,3,5,6 &7
4	Comprehend mechanization and digitalisation in construction	1,2,3,5&6
5	Students will be able to analyze and select appropriate construction equipment and techniques for various construction projects, considering factors such as efficiency, cost, safety, and environmental impact.	1,2,3,7

			SEMESTER – I	V											
Course	e Title	E	ntrepreneurship Strateg	gy: Fr	rom I	deatio	n To	Exit							
Course	o oodo	24MOCE221R	Total credits: 2	L	T	P	S	R	O/F		С				
Course	e coue	24MOCE22IK	Total hours: 15T	0	0	0	0	0	0		2				
Pre-ree	quisite	Nil	<b>Co-requisite</b>			Nil									
Progra	amme		B. Tech in Civ	vil En	ginee	ring									
Seme	ester		ter/ IV semester of Seco				-	amm	e						
		-	egic Thinking for Entrep												
Cou	irse		erstanding of how to deve	-						eate	;				
Objec		compelling value propositions, and build sustainable competitive advantages.													
Objec		3. Provide students with the tools to lead entrepreneurial teams, manage organizational													
		growth, and make informed decisions that mitigate risks. Develop the ability to identify and evaluate profitable business opportunities.													
CC		•	· · ·				oppor	rtuni	ties.						
CC			e business models and va	1											
CC			rategic plans for launchin	-		-	-								
CC			skills for managing team												
CC	15	-	ment and decision-makir	ng stra	ategie	s to ei	nsure	busi	ness su	stair	nability				
		and growth.		1											
Unit-		Cont	ent		itact	Le	earnir	ng Oi	utcome		KL				
No.				He	our			-							
	-	er 1: Entrepreneursh				Understand the									
Ι	Resou	rces (Gartner & Rob	erts)		9		•		minds	et	1, 2				
								-	siness		_,_				
	<u></u>	<b>A F 1</b>				opportunities.									
	-	er 2: Entrepreneursh			~					:	2, 3,				
II	Resou	rces (Gartner & Rob	erts)		9		assess		ness		4				
	<u> </u>	2. D					ortunit								
	· ·	er 3: Business Model	Generation		0		erstan				1, 2,				
III	(Oster	walder & Pigneur)			9	-	gn and		-		3, 4				
	<u></u>						ness n								
	· ·	er 4: Business Model	Generation			1	elop s								
IV	(Uster	walder & Pigneur)			9		rentia				1, 2				
							vate b	usine	ess						
	<u>C1</u>	<i>E</i> () , · ) (				models. Analyze industry									
**	-		gement: Concepts and		0		2, 3,								
V	Cases	(David)		9			ture a		.,		4, 5				
						com	petitiv	ve po	sitionin	g.					

# **Text Book**

**T1**: Gartner, W. B., & Roberts, P. W. (Eds.). (2009). *Entrepreneurship: Strategy and resources*. Routledge.

# **Reference Book**

**R1**: Ries, E. (2011). *The Lean Startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Crown Business

	CO PO Mapping								
SN	Course Outcome (CO)	Mapped Programme Outcome							
1	Develop the ability to identify and evaluate profitable business opportunities.	1,3 & 4							
2	Formulate innovative business models and value propositions.	1,2							
3	Create actionable strategic plans for launching and scaling entrepreneurial ventures.	7.9,10							
4	Enhance leadership skills for managing teams and resources in a startup environment.	5,7							
5	Master risk management and decision-making strategies to ensure business sustainability and growth.	5,8							

			SEM	IESTER – I	V							
Cours	e Title			Field-base	d Tra	ining						
Cours	a aada	24BTCE227R	Total cre	dits: 1	L	Т	Р	S	R	O/F	С	
Cours	ecoue	24D1CE227K	Total ho	urs: 16P	0	0	0	0	0	16	1	
Pre-ree	quisite	Nil		equisite				N	Vil			
Progra	amme			Tech in Civ		-	-					
Seme	ester			mester of 2				-				
	<ul> <li>Course</li> <li>Dijectives</li> <li>1. Provide hands-on experience in real-world construction, surveying, and infrastruprojects.</li> <li>2. Develop practical problem-solving skills and adaptability in field conditions.</li> <li>3. Enhance students' ability to interpret and apply theoretical knowledge in professe environments.</li> </ul>											
CC	01	Understand the signif	ficance of f	ield-based ti	aining	g in ci	vil en	gineer	ring a	applicati	ons	
CC	)2	Apply site surveying,			-	-		-	-			
CC	)3	Analyze site constrain	nts, risk fac	ctors, and en	vironr	nenta	l impa	act du	ring p	oroject e	xecution	
CC	)4	Evaluate quality contr	rol measur	es, safety pr	otocol	s, and	field	mana	geme	ent techr	iques.	
CC	)5	Document field obser	vations, re		s, and	sugge	est pra	actical	imp	rovemen	ts.	
Unit- No.		Content		Contact Hour		Le	earnii	ng Ou	tcom	ie	KL	
Ι	– Impo	action to Field-Based T ortance, Objectives, an Engineering Projects.	•	3	obje	erstan ctives neerin	of fie		eleva: sed t	nce an raining i		
П	Station Contou	ring Techniques – Tota n, GPS, Leveling, and uring; Site Layout & rement Methods.	al	3		ly fiel analyz				niques	1, 2, 3, 4	
ш	Reinfo	uction Practices – Fou rcement, Formwork, a eting Methods.	· · · · ·	3	Gain hands-on exposure to key construction practices and material handling and application in pavement construction.							
IV	Assess Quality	, Quality Control & Ri ment – Site Safety Me y Testing, Risk Identif itigation.	easures,	3	-		-	•		ce and ojects.	2, 3, 4	
V	Docun	Report & Analysis – mentation, Report Writi tudy Evaluation	ing, and	3	expe	lyze a rience ovem	es for			ld rence an	d 2, 3, 4, 5	

## Textbooks

**T1:**Construction Planning, Equipment, and Methods – Robert L. Peurifoy **T2:**Surveying for Engineers – J. Uren & W. F. Price

# **Reference Books**

R1: Building Construction Handbook – Roy Chudley & Roger GreenoR2: Field Guide for Construction Management – Richard H. Clough

	CO PO Mapping								
SL N	Course Outcome (CO)	Mapped Programme Outcome							
1	Understand the relevance of field-based training.	1,2							
2	Apply surveying and construction techniques.	3,4							
3	Analyze field constraints and risk factors.	2,5							
4	Evaluate quality control and safety measures.	4,6							
5	Document and report field observations effectively.	5,7							

			SEM	IESTER –	V									
Course	Title			Structural		ysis II								
			Total credits		L	Т	Р	S	R	O/F	(	2		
Course	code	24BTCE311R	<b>Total hours:</b>		3	0	0	0	0	0	3			
Pre-req	uisite	SA I	Co-requ	uisite		1 1		N	lil	1				
Progra	mme		В. Т	<b>Fech in Civ</b>	il En	gineer	ring							
Seme	ster	]	Fall/ V semest	ter of Thir	d yea	r of th	e pro	gram	me					
		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												
Cou		indeterminate beams and frames, with a focus on understanding the distribution of shear												
Objec	tives	force, bending moment, and support reactions. 3. Students will be equipped to analyze different types of arches and suspension systems,												
				•					-	-		s,		
		considering 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												
		and load factors for statically indeterminate structures. Students will be able to analyze statically determinate beams and frames using influence												
CO	<b>)</b> 1		-	-						-				
		-	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												
	2	support reactions.												
		Students will be capable of analyzing different types of arches and suspension systems,												
CO	3	considering factors such as settlement, temperature effects, and the behavior of cables												
	•	under various loadir					,							
			-	ınderstandi	ng of	plastic	theo:	ry and	l its a	pplicatio	on to			
СО	94	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.												
		Students will be able to apply the knowledge gained to analyze and design structural												
CO	5	systems under realistic conditions, incorporating factors such as dynamic loads,												
		environmental effects, and safety considerations.												
Unit-		Content		Contact		L	earni	ng O	utcor	ne		KL		
No.				Hour	TT			-				1.0		
Ι		uence lines for r		5	-		•	•		se, stude	nts	1, 2		
		ically determinate uence lines for shea				demo		-		cy in ifluence				
		iding moment – Ca				s for re		-	-					
		ical stress resultar						,		nce, iber forc	ec			
		centrated and	distributed			-				ninate	05			
		ving loads – absolut								ne frames	s.			
		ding moment - infl			ocui	no una	. pm J	omee	* prur		<i>.</i>			
		member forces in												
		ne frames.	1 J											
II	-	er Breslau's principle	e– Influence		Stud	lents w	vill be	able	to an	alyze		1,		
		for Shearing force, B				ous typ				•		2,		
		nent and support reac	-	10	inclu	uding 1	three-	hinge	ed, tw	o-hinge	d,	3,4		
	com	ponents of propped ca	antilever,	10	and	fixed a	arches	, cons	sideri	ng				
	cont	inuous beams (Redur	Idancy		settl	ement	and to	emper	rature	effects,				
	restr	icted to one), and fixe	ed beams			~ ~ ~			-	orinciple	s			
1					spec	ific to	arch	geom	etry.					
III	-	librium of cable – ler			-			-		tudents				

	- anchorage of suspension cables –		will understand the principles	2,
	stiffening gird	5	governing cables and suspension	3,
			bridges, including the equilibrium of	4, 5
			cables, determination of cable length,	
			and the role of stiffening girders in	
			suspension bridge design.	
IV	Analysis of Indeterminate Structure-		Students will gain proficiency in	2,
	Fixed beam, support settlement,		analysis techniques for statically	3, 4
	Introduction to Matrix Method etc.		indeterminate structures, including	
		5	Matrix Method.	
V	Plastic theory - Statically		Upon completion, students will be	2,
	indeterminate structures – Plastic		able to apply theoretical concepts	3,
	moment of resistance – Plastic		such as Muller Breslau's principle,	4, 5
	modulus – Shape factor – Load factor	5	plastic theory, and influence line	
	– Plastic hinge and mechanism –	5	analysis to solve practical	
	collapse load - Static and kinematic		engineering problems related to	
	methods – Upper and lower bound		structural analysis, including beams,	
	theorems - Plastic analysis of		arches, cables, and suspension	
	indeterminate beams and frames.		bridges.	

- T1: Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004. ISBN: 9780131913455
- T2: 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:**

R1 Gere, J. M. Mechanics of Materials. 2Ed (Pb 2004)

#### **RELATIONSHIP BETWEEN COURSE OUTCOMES (CO) AND PROGRAMME OUTCOMES**

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme Outcome						
1	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.	1,2						
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 – V										
Course	Title		Environmental	Engi	neeri	ng							
Course	aada	24BTCE312R	Total credits: 3	L	Т	Р	S	R	O/F	С			
Course	coue	24DICE312K	Total hours: 45T+30P	2	0	2	0	0	0	3			
Pre-req	uisite	Nil	Co-requisite				N	lil					
Progra	mme		B. Tech in Civil	Engi	ineeri	ing							
Seme	ster	F	all/ V semester of Third	year	of the	e prog	gram	me					
		. To understand the basic principles and concepts and processes involved in water and											
Course		waste water treatment.											
		-	2. To develop a student's skill in the basic design of unit operations and processes										
Objec	tives		and wastewater treatment										
			s of water treatment plant	-				narac	teristics				
			4. To design the structures involved in an water treatment plant										
CO			ics of water and wastewate										
CO			v of drinking water and do	mesti	c was	tewate	er gen	erate	ed				
CO			of water supply systems										
CO		Design sewerage sys											
CO	5	Plan strategies to cor	ntrol, reduce and monitor p										
Unit-		Cont	ent		tact	Le	arnir	ı9 Oi	utcome	KL			
No.					our			0					
		r: -Sources of Water				erstar	-						
	-	y requirement for				-		sses of					
		r quality standards, w			water treatment and supply ensures safe,								
	-	plans, Water Sup											
			chemes, Water demand				ble w						
-		trial and agricultur						l needs					
Ι	-	oonents of water sup		)		envir		ental	1, 2				
		tter, Distribution sys			susta	ainabi	lity.						
		/S systems, service											
	Water												
	•	lation flocculation,											
		orane processes	adsorption, ion exchange,										
			orm water, Quantity of										
		•	ations. Conveyance of										
		ge- Sewers, shapes de	•										
	-	tion and maintenance					erstar	-					
	-		r appurtenances, Design				-		e design,				
		•	l bore systems, Storm				agem						
II			design of Storm water;	ļ	)				impact	2, 3,			
		ge and Sullage, Pollu	•				wage			4			
			al River cleaning plans,					-	stems,				
	-	ewater treatment, aero				•		ment and					
		nent systems, suspend			recy	cling	techi	niques.					
		ns, recycling of sewa											
	-	rious purposes											
		Composition and prop	perties of air,	Underst				nding	the				
III		• • •	ants, Monitoring of air		0		chemistry of			1, 2,			
III	pollut	pollutants, Air pollution- Occupational hazards,			9		combustion is crucial			3, 4			
	Urbar	n air pollution automo	bile pollution, Chemistry			for c	ompr	ehen	ding air				

IV	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. 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	9	pollution sources and implementing effective control measures. Students will be able to demonstrate an understanding of solid waste management principles, including the composition and parameters of municipal solid waste, as well as the methods and environmental impacts associated with its collection, treatment, and disposal.	1, 2
	supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.		and disposal.	
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	Students will gain proficiency in understanding and implementing diverse home plumbing systems, including high- rise building plumbing, pressure reducing valves, storage tanks, and drainage solutions.	2, 3, 4, 5

T1: Droste R.L., (1997), Theory and Practice of water wastewater treatment, John Wiley & sons.

T2: Garg S.K., (2001), Environmental Engineering, Vols. I and II, 12th Edition, Khanna Publishers, New Delhi.

#### **REFERENCE BOOKS:**

- R1: Peavy H. S. Rowe D.R and George Tchobanoglous (2001), Environmental Engineering, McGraw-Hill Company, New Delhi.
- R2: Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition.
- R3: Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme 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					

			SEME	STER – V											
Cours	e Title		F	Ingineering	g Geology										
Cours	e code	24BTCE313R	Total credits:	2	L	Т	P	S	R	0	/ <b>F</b>	С			
			Total hours: 1	15T+30P	1	0	2	0	0	(	)	2			
Pre-re	quisite	Nil	<b>Co-requisite</b>		Nil			•	•						
Progr	amme		Bachelor of 7	Fechnology	y in Civil E	ngine	eerin	g							
Sem	ester		Fall / V semest	er of 3rd	er of 3rd year of the programme										
Cou	urse	1. Use suitab	le software to o	examine ge	eology, soil	, geo	logic	: haz	ard,	and	NE	EHRP			
Obje	ctives		racterize a geolo	-											
			the bulk proper				olidat	ed se	edim	ents	su	ch as			
			id ratio, water c		-										
			ock-mass quality	-											
C	01	1. Discuss the imp		ology in m	aking engir	neerin	ng de	ecisio	ons s	peci	ally	site			
~		selection of engine	• • •					• •							
C		2. Analyze the con	ncepts of how r	ninerals to	rm and the	r use	es to	r idei	ntity	ing	the	rock			
~		forming.	on d m - 1-1	d in -4	mol an al	for	1		+i	at	20	+			
C		3. Analyze graphs and tectonics.	and models use	u in structu	rai geology	ior c	iemo	nstra	ung	stres	ss, s	arain			
C		4. Generalize rocks	using basic geo	logical ave	tems for sel	ectiv	e co*	struc	tion	mat	erio	1			
		5. Apply quantita													
C		problems related t				-		-		-	-				
		thereof.			Beere Brear 1	14241	ab a	14 10	liieu	iui i	nea	54105			
Unit-		Content		Contact	Lea	rning	g Ou	tcom	e		ŀ	κL			
No.				Hour		-	,								
Ι	Introdu	ction- Branches of	geology useful		Geologica	l stu	dies	are	cruc	ial	1,	2			
	to civil	engineering, scope	e of geological		for site s	select	tion,	four	ndati	on					
	studies	in various civi	l engineering		design, and material sourcing										
	projects		ineral, Origin		They prevent hazards like										
		mposition. Physica		5	landslides and sinkholes and aid					uid					
		s, susceptibility of		0	in environmental assessments										
		on, basic of optic			and resource management for										
		forming minerals			sustainable construction.										
		cation of commo	n primary &												
		ary minerals.			<u> </u>		• 1			• 1	1	<u> </u>			
II		gy-Rock forming			Geology	•						2, 3,			
	-	e gravity of ro n. Igneous petrolo			knowledge through	struc		•		-	4				
	-	nenon and differ			hydrogeol			•	eolog						
		by volcanoes. Typ			geology.			-		-					
	e	n. Concept of H			helps unde			-							
	-	s. Characteristics	· ·		under		ess,		wh						
	•	f magma. Division			hydrogeol			eals		ith					
		f depth of format		5	groundwat										
		eristics. Cher			geology			-		-					
	Minera	logical Compositio	n. Texture and		factors at			-	-						
	its type	s. Various forms c	of rocks. IUGS		sites.										
	Classifi	cation of phaneriti	c and volcanic												
	rock														
		res. Classification	-												
		on the basis													
	compos	sition. Detailed stu	udy 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		Geological studies are crucial	1, 2, 3,
	and Denudation. Factors affecting		for site selection, foundation	4, 5
	weathering and product of weathering.		design, and material sourcing.	., -
	Engineering consideration. Superficial		They prevent hazards like	
			landslides and sinkholes and aid	
	deposits and its geotechnical importance:	-		
	Water fall and Gorges, River	5	in environmental assessments	
	meandering, Alluvium, Glacial deposits,		and resource management for	
	Laterite (engineering aspects), Desert		sustainable construction.	
	Landform, Loess, Residual deposits of			
	Clay with flints, Solifluction deposits,			
	mudflows, Coastal deposits.			
IV	Strength Behavior of Rocks- Stress and		Physical geology examines	2, 3, 4
	Strain in rocks. Concept of Rock		weathering (mechanical,	
	Deformation & Tectonics. Dip and		chemical), erosion, and	
	Strike. Outcrop and width of outcrop.		denudation processes	
	Inliers and Outliers. Main types of		influencing rock properties.	
	discontinuities according to size. Fold-		Superficial deposits like	
	Types and nomenclature, Criteria for		alluvium and glacial deposits	
	their recognition in field. Faults:	5	impact construction and	
	Classification, recognition in field,		groundwater management.	
	effects on outcrops. Joints &		Geological structures such as	
	Unconformity; Types, Stresses		folds, faults, and joints affect	
	responsible, geotechnical importance.		rock strength and stability.	
	Importance of structural elements in		Understanding these structures	
	engineering operations. Consequences of		is vital for engineering	
	failure as land sliding, Earthquake and		operations, preventing hazards	
	Subsidence. Strength of Igneous rock		like landslides and earthquakes	
L	0 0 0		1	

	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 Book**

T1:P.C. Varghese, Engineering Geology for Civil Engineers, PHI Learning private limited. T2:Parbin Singh, Engineering & General Geology, S.K. Kataria and Sons- Delhi.

#### **Reference Book**

R1:Dr. D.V. Reddy, Engineering Geology, Vikas Publishing House.

R2:Chadha S. K., Elements of Geological Maps for Geology, Geography & Civil Engineering, CBS Publishers & Distributors- New Delhi.

R3:Gautam Mahajan, Evaluation and Development of Ground Water, APH Publishers.

R4:Jerome V. Degraff Robert B. Johnson, Principles of Engineering Geology, Wiley India Pvt Ltd.

R5:Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

	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 –	V						
Cours	e Title		Concrete 7	Fechnolog	у					
Cours	e code	24BTCE314R	Total credits		T 0	P 0	S	R	O/F	C
		Total hours: 45T 3					0	0	0	3
Pre-ree	-	Nil	Co-requisit		•		Nil			
Progra			B. Tech in Civ							
Semo	ester	Fall/           1. To define and understand	semester of 3rd	•				• 1	<b>/</b>	
Course Objectives		<ul><li>and property of concrete economic development</li><li>2. To present the foundation Concrete technology an</li><li>3. To give an experience in applied in field of Civil</li></ul>	e and different adh for the buildings. ons of many basic d Civil Engineerir n the implementati Engineering.	nesive mate Engineerin ng. ion of engin	rials an ng tools neering	nd its s and g cond	vital u concep cepts v	ise fo ots re vhich	or safe, lated to are	)
CO1		Understand constituents an	d their roles in co	ncrete, incl	uding	ceme	nt, agg	gregat	tes, wa	ter,
co		and admixtures. Improve proficiency in prostrength, workability, and of Development in Leillein	durability.	-			_			
CC	)3	Develop practical skills in properties.	conducting tests to	o assess fre	sn and	nard	ened c	oncre	ele	
co		Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.         Learn to conduct tests to maintain industry standards and ensure safe construction								s in
		practices.			1					
Unit- No.		Content		Contact Hour	L	earni	ng Ou	tcon	ne	KL
I	concre	Historical background, context te, general note on strength practice and future trends.	-	5	unde conc histo	rete, i	ling of ncludi mposi	ng it		1, 2
II	compo hydrate testing Aggreg effect o proper bulking analysi require Standa limitin Additiv benefit blast fu Chemi water r plastic	tuent of Concrete: 1. Cemer sition, hydration, heat of hy ed structure, various types of of cement as per Indian sta gates - Utility in concrete, c of geometry & texture, stren- ties, moisture content, wate g of sand, deleterious substa s, various grading and grad ements, sampling & testing rds. 3. Water - General Rec g values of impurities. 4. A ves and admixtures, types, n Mineral admixture - Fly as unace slag, and other pozzo cal admixtures - Accelerator reducing elements, plasticiz- izer, their functions and usa	rdration, of cement, ndard. 2. lassification, ngth, mechanical r absorption, ances, sieve ling as per Indian quirements & dmixtures - necessity and sh, silica fume, olanic materials. r, retarder, er and super- ge	10	Unde comp (cem wate their	erstan oonen ent, a r, adn prope	d the k ts of c ggrega nixture erties.	oncreates, ates, an	ıd	1, 2, 3, 4
Ш		concrete: Methods of mixin acing of concrete. Workabil		5			ut fres prope			1, 2, 3, 4,

	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.		(workability, handling), how to manage it, and proper curing techniques.	5
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.	5	Understand the mechanics of hardened concrete (strength, elasticity, shrinkage, creep) and how to test its properties.	2, 3, 4
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.	5	Identify and address challenges concrete faces in harsh environments (alkali reaction, sulfate attack, etc.).	2, 3, 4, 5

- T1: M S Shetty; Concrete Technology, S.Chand Publication New Delhi 2. P Kumar Mehta, Monteiro;
- T2: Concrete Technology, Indian Concrete Institute

# **REFERENCE BOOKS:**

- R1: A.M. Neville; Properties of Concrete, Pearson Education
- R2: M L Gambhir; Concrete Technology, Tata McGraw Hill
- R3: IS 456-2000 7. R4: IS 269-1989 R5: IS 516-1959 9 R6: IS 1786-1985 10 R7: IS 1893-2002 R8: IS 12269-1987 R9: IS 9103-1999 R10: IS 8112-1989

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Understand constituents and their roles in concrete, including cement, aggregates, water, and admixtures.	1,2,3,4,5,6,7,12
2	Improve proficiency in proportioning concrete ingredients for desired properties like strength, workability, and durability.	1,2,3,4,5,6,7,12
3	Develop practical skills in conducting tests to assess fresh and hardened concrete properties.	1,2,3,4,5,6,7,12
4	Integrate eco-friendly practices like alternative materials and efficient curing methods in concrete technology.	1,2,3,4,5,6,7,12
5	Learn to conduct tests to maintain industry standards and ensure safe construction practices.	1,2,3,4,5,6,7,12

			SEME	CSTER – V							
Cour	se Title		Deep excava	ations, Foun	dation	s and	l Tu	nnels			
Cour	se code	24BTCE315R	Total cre		L	Т	Р	S	R	O/F	C
			Total hou		3	0	0	0	0	0	3
	equisite	Nil	Co-req					N	il		
-	ramme			fech in Civil	-		-				
Sen	nester		Fall/ V semest								
	Course Objectives1. Explore the concepts of Dee 2. Explain the construction and 3. Discuss the tunnel construct			esign of pile 1 methods an	foundat d suppc	tions ort sys	stem	is	port s	ystems	
C	201	Comprehend the b									
	02	Compute capacity conditions						lation	based	on soil	
С	03	Apply different co	2	-							
	04	Select suitable pre-							nt grou	and cond	litions
	05	Comprehend the tu	innel instrumen	tation and m	onitorin	ng sy	stem	IS			
Unit- No.		Content		Contact Hour		Le	arni	ing O	utcom	e	KL
Ι	of deep pile fou		ign basis for ction of Pile	4	the r stakel indus bodie organ client	oreher coles holde stry, es, nization ts, d	and and ors ind ons, level	l resp in the cludin s profe lopers	onsibi e con g re standa ssiona	ding of lities of struction egulatory rdization l bodies asultants	f 1 7 1, 2 1
П	Construction and design of Pile foundations Bored Cast In-situ piles, Precast driven Piles, Under reamed Piles, Pile group and Load testing on piles, Challenges in piling operations, Quality control of			4	profes perso	oreher ssion onal, neerin s onsibi	nsive al e g of lities	ethics busin contex co	encor ness,	ding o: npassing anc ncluding	2, 3
III	Piles, Case studies         Underground Metro stations and         Retaining structures         Diaphragm walls, Secant piles,         Contiguous piles, Soldier piles, Design         of Embedded Earth retaining systems,         shafts.			4	contra incluc condi legal	oreher act m ding o itions consi	nsive anag contr , bid	e knov gemen ract ty l evalu ations	vledge t princ	ciples, and the	3,4
IV	Metho down Drill a cover Bolts,	els and Pre-Excava Is ds of construction of methods, bottom nd blast, NATM, N tunnels, Support sy Lattice girder ete, face support, u	of tunnels, top up methods, IMT, Cut and stems – Rock s, Anchors,	4	comp arbitra system betwee arbitra altern	oreher ration ms, ir een ar ration native ods li	nsive , con nclue rbitra agre disp ke n	nciliat ding th ation l eemen pute re	vledge ion, ar ne dist	nd ADR inctions ypes of l on	4, 5

	systems.			
	Tunnel Monitoring systems		Students will develop a comprehensive understanding of labor engagement methods,	
V	Instrumentation and monitoring, Monitoring Plan, Trigger limits, Case studies	4	industrial dispute resolution frameworks, and intellectual property laws pertinent to civil engineering projects.	5

T1: B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.

T2: The National Building Code, BIS, 2017

T3: T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

#### Reference Books:

R1: Indian Standard code- IS 456, Guidance on embedded retaining wall design CIRIA- C760 R2:David Chapman, ,Nicole MetjeCRC Press , 2017Alfred Stark "Introduction to Tunnel Construction " R3:M. Ramachandran,"Metro Rail Projects in India- A Study in Project Planning "2011, Oxford University Press

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Recognize professionalism in an organization.	5, 7
2	Distinguish between the does and don'ts for the betterment of the society and environment.	8
3	Classify Various types of contract and their features.	7,9
4	Discuss the measures of Alternative Dispute Resolution.	11,12
5	Categorize different types of Intellectual property rights.	10

			SEMESTER –	·V								
Cours	e Title		Formwork Eng	gineering	g Pr	actice	S					
Cours	e code	24BTCE316R	Total credits: 3		T	P	S	R	O/F		C 3	
Pre-re	anisite	Nil	Total hours: 45T Co-requisite	3	0	0	0 N	0 Vil	0		3	
Progr	-	111	B. Tech in C	ivil Engi	nee	ring	1	111				
Sem				-		-	oran	ıme				
Cou Obje	irse	<ol> <li>To select the app</li> <li>To design the formation</li> </ol>	Fall/ V semester of Third year of the programme         1. To select the appropriate formwork system         2. To design the formwork system         3. To compute the bill of quantity for the formwork system									
CC	)1	-	t, and decide appropriate		-		ıls an	d suit	table for	rmv	vork	
CC	)2	Design formwork s	systems as per Industrial	requirem	nent							
CC	)3	Estimate the bill of	quantity and optimize the	he formw	ork	cost						
CC	)4	Prepare the layout	and detailed drawing for	the form	iwo	rk syst	tem					
CC	05	Analyze the projec system	t, and decide appropriate			nateria	ıls an	d suit	table for	rmv	vork	
Unit- No.		Conte	ent	Contac Hour		Lea	arnin	ig Ot	itcome		KL	
I	comp form consu for Bean Appl Form Comp form Towo stairs	objectives, areas of tion of Formwork, accessories and n of Tools. Formwork Columns, Slab and drawings. Vertical ventional Foundation vork components, and de-shuttering of System, Heavy Duty f work, Formwork for ver.	4		Students will understand the classification, benefits, and components of formwork for various structural elements.							
П	stairs, Load Bearing Tower.Planning and Design of formworkFormwork planning and monitoring, basics offormwork design, design assumptions anddesign methods. Design of wall formwork, slafformwork and checks. Formwork drawingConcept and preparation Guidelines, BOOCalculation and Checklist			4		Stude Devel formv design prepa estima	lop work n, ration	n, a		in g, Q	2, 3, 4	
ш	Formwork cost estimation and optimization Schedule of formwork, Mobilization distribution, BOQ, Quantity Calculation, Cost optimizationStudents will develop a comprehensive Analyze modular and special formwork systems, including scaffolding safety and global innovations.					ze al ıs, ıg	1, 2, 3, 4					
IV	Modula Limitat applica	ar and Special formy tions, Shuttering and tions, Aluminum fo	<b>nwork, scaffolding</b> work: Advantages and l de-shuttering, rmwork - Drawings & igh rise construction,	4		comp under	reher stand arts,	isive ling enco	levelop of India mpassii ndicraf	an 1g	1, 2	

	Table lifting system Scaffolding: Modular scaffold Installation sequence, Tie and material specification, Ladder safety, Loading Classification, application, Components of L&T Modular Scaffolding system, Access scaffold Do's and Don'ts. Innovation and Global practices.		music, dance, drama, architecture, and the evolution of science and technology throughout Indian history.	
V	Formwork building and erection, Formwork Failures Formwork assembly for Wall & Column Panels, Equipment and Layout, Plant and Machinery, Formwork erection and safety, Inspection and Corrections, Plant and Machinery, Code and Contractual Requirements. Formwork Failures: Causes, design deficiency, safety in formwork, prevention of formwork failures.	4	Students will develop a comprehensive understanding of best practices in formwork assembly, erection, safety, and failure prevention	2, 3, 4, 5

T1: DIN 18218 Pressure of fresh concrete on vertical formwork

#### **REFERENCE BOOKS:**

R1: " IS14687:1999 Guidelines for falsework for concrete structures

R2:ACI 347-04 Guide to Formwork for Concrete

R3: Concrete pressure on formwork (R108D) - CIRIA

R4:DIN 18218 Pressure of fresh concrete on vertical formwork

R5:IS 456: Plain and Reinforced Concrete - Code of Practice

R6:IS: 800-2007 General Construction in Steel - Code of Practice

R7:IS: 399–1963 Classification of Commercial Timbers and their Zonal Distribution

R8:IS: 883-1994 Design of Structural Timber in Building - Code of Practice

R9:IS: 4990–1993 Plywood for concrete shuttering work

R10:IS: 2750–1964 Steel Scaffoldings

R11:IS 1161: 2014 Covers Steel Tubes for Structural Purposes

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme Outcome						
1	Analyze the project, and decide appropriate formwork materials and suitable formwork system	2,6,8						
2	Design formwork systems as per Industrial requirement	3,9,5						
3	Estimate the bill of quantity and optimize the formwork cost	1,7,9						
4	Prepare the layout and detailed drawing for the formwork system	9,1,8						
5	Analyze the project, and decide appropriate formwork materials and suitable formwork system	10,12,6						

			SEM	IESTER – Y	V							
Cours	e Title		Founda	ations of Pr	oject	Mana	igeme	ent				
Cours	e code	24MOCE312R	Total cre		L	T	P	S	R	O/F	C	
Due ve		NI	Total hou		0	0	0		0	0	1	
Pre-re	-	Nil		equisite Tash in Cir		~:		Γ	lil			
Progr		Fa		Tech in Civ		-	-	~~~~				
Sem	ester	1.Develop a fundame		ster of Thir			-	-		nainlag	ماييطنهم	
Cou Objec		lifecycle phases, const 2.Equip students with budgeting, and risk ma 3.Enhance analytical evaluating project per	traints, and n essential anagement and dec formance, e	stakeholder tools and to ensure ef ision-makin ensuring suc	roles techni fectiv g ski	iques e exec ills fo ul proj	for production	roject onitor	plan ing, tion.	oning, sc.	heduling,	
C	D1	Understand the funda management.	•	•			•					
CC	)2	resource allocation.										
CC	)3	effectiveness.										
CC	)4	project delivery.	Evaluate project execution, monitoring, and risk management strategies for successful project delivery. Assess project closure processes, documentation, and lessons learned for continuous									
CC	)5	Assess project closure improvement.	e processes	, documenta	tion,	and le	ssons	learno	ed fo	r continu	ous	
Unit- No.		ContentContact HourLearning OutcomeI							KL			
I	Manag Import Project Project (Scope	cance, and Lifecycl t; Project Phases; R t Manager; Project Co c, Time, Cost, Quali	ole of a onstraints	3	conc and ensu	•	of p le of su	•	ma ct ma	ndamenta nagemen nagers in projec	t 1	
П	and Resources).Project Planning and Scheduling –Work Breakdown Structure (WBS);Gantt Charts; Critical Path Method(CPM); Program Evaluation ReviewTechnique (PERT); ResourceAllocation; Risk Management inPlanning.			3	Develop and apply project plannin techniques, including schedulin methods like CPM and PERT.							
III	Estima Techni Manag Budge	<b>U</b>	Control Value Project	3	Analyze and manage project costs, ensuring effective budgeting and financial control.							
IV	Projec Contro Strateg Measu	et Execution, Monitor ol – Project Impler gies; Per rement; Change Man Identification and M	mentation formance agement;	3	mon adhe		g teo to	chniqu scop	ies,	ition and ensuring ost, and	8	

	Communication and Stakeholder			
	Management.			
	Project Closure and Lessons	3	Assess completed projects,	4,5
	Learned – Project Evaluation; Post-		identifying key takeaways and	
V	Project Reviews; Documentation and		improvement areas for future	
	Reporting; Best Practices for Future		project management success.	
	Projects; Case Studies.			

# **Textbooks:**

**T1: Project Management: A Systems Approach to Planning, Scheduling, and Controlling** – Harold Kerzner

**T2:Project Management for Engineering and Construction** – Garold D. Oberlender

# **Reference Books:**

R1: PMBOK Guide (Project Management Body of Knowledge) – Project Management Institute (PMI) R2:Construction Project Management – Frederick Gould & Nancy Joyce

	CO PO Mapping								
SN	Course Outcome (CO)	Mapped Programme Outcome							
1	Understand the fundamentals of project management and its lifecycle.	1,2							
2	Apply project planning and scheduling techniques for effective execution.	3,4							
3	Evaluate project cost estimation and financial control methods.	2,5							
4	Monitor and control project performance, ensuring quality and risk management.	4,6							
5	Assess project closure processes and lessons learned for future improvements.	5,7							

			SEN	1ESTER – V	V								
Cours	e Title			<b>Field-base</b>	d Tra	ining							
Cours	a cada	24BTCE317R	Total o	credits: 1	L	Т	Р	S	R	O/F		С	
Cours	ecoue	24DICESI/K	Total h	ours: 16P	0	0	0	0	0	16		1	
Pre-re	quisite	Nil	Co-r	equisite				N	lil				
Progra	amme		B.	Tech in Civ	vil En	ginee	ring						
Semo	ester			ster of Thir	-		-	-					
		1.Provide hands-on ex	xperience	in real-worl	d con	struct	ion, s	urvey	ing,	and inf	rast	ructure	
Cou	irse	projects.											
Obje		2. Develop practical problem-solving skills and adaptability in field conditions.											
0 ~je			B.Enhance students' ability to interpret and apply theoretical knowledge in professional										
-		environments. Understand the significance of field-based training in civil engineering applications											
CO		_			-	-		-	-				
<u> </u>		Apply site surveying,		-				-					
		-	Analyze site constraints, risk factors, and environmental impact during project execution. Evaluate quality control measures, safety protocols, and field management techniques.										
CC												ies.	
CC	)5	Document field observ	vations, re		s, and	sugge	est pra	ctical	ımpı	rovemen	nts.		
Unit- No.		Content		Contact Hour		Le	earnir	ng Ou	tcom	ie		KL	
	Introdu	uction to Field-Based T	raining		Unde	erstan	d th	e re	eleva	nce a	nd		
Ι		ortance, Objectives, and	-	3	objectives of field-based training in							1, 2	
	-	Engineering Projects.			engineering.								
	Survey	ving Techniques – Tota	1				-						
п	Statior	n, GPS, Leveling, and		2	Appl	ly fiel	d surv	veying	tech	niques		1, 2,	
II	Contou	uring; Site Layout &		3	and analyze measurements.							3, 4	
	Measu	rement Methods.											
	Constr	uction Practices – Four	ndations					exposi		•		1, 2,	
III		rcement, Formwork, a	,	3	construction practices and material						1	1, <i>2</i> , 3, 4,	
		eting Methods.				•	-	plicat		1		5	
		-	_		pave	ment	const	ruction	n.			J	
		, Quality Control & Ris			_								
IV		ment – Site Safety Mea		3 mplement quality assurance and							2, 3,		
		y Testing, Risk Identifi	cation,		safety protocols in field projects.						4		
		itigation.			A 1	I	. 1 1			1.1			
<b>X</b> 7		Report & Analysis –	1	•		•		cumer			. 1	2, 3,	
V		nentation, Report Writi	ng, and	3	-			future	rete	rence ar	nd	4, 5	
	Case S	tudy Evaluation			ımpr	rovem	ent.						

#### Textbooks

**T1:**Construction Planning, Equipment, and Methods – Robert L. Peurifoy **T2:**Surveying for Engineers – J. Uren & W. F. Price

#### **Reference Books**

R1: Building Construction Handbook – Roy Chudley & Roger GreenoR2: Field Guide for Construction Management – Richard H. Clough

	CO PO Mapping	
SL N	Course Outcome (CO)	Mapped Programme Outcome
1	Understand the relevance of field-based training.	1,2
2	Apply surveying and construction techniques.	3,4
3	Analyze field constraints and risk factors.	2,5
4	Evaluate quality control and safety measures.	4,6
5	Document and report field observations effectively.	5,7

			SEN	IESTER – V	V							
Cours	e Title		Comj	<mark>petent Engl</mark> i	<mark>ish fo</mark> i	<mark>r Eng</mark> i	ineer	5				
Cours	a cada	24UBPD314R	Total cre	dits: 2	L	T	Р	S	R	O/F		С
Cours	ecoue	240 DI D314K	Total hou	ırs: 60P	0	0	4	0	0	16		2
Pre-re	quisite	Nil	Co-re	equisite				N	lil			
Programme B. Tech in Civil Engineering												
Sem	ester	Fall/ V semester of Third year of the programme										
		1.Enhance students' communication, leadership, and interpersonal skills for professional										
Coι		and personal growth.										
Obje	ctives	2. Develop critical thinking, problem-solving, and decision-making abilities.										
		3.Improve self-confidence, time management, and adaptability for career readiness.										
	D1	Understand the importance of personal development and self-improvement strategies.										
CO	)2	Apply communication					•			•		
CO		Analyze leadership qualities, teamwork dynamics, and conflict resolution techniques.										
CO	)4	Evaluate stress manag			-						-	
CO	)5	Develop career plann	ing, resum	e building, a	nd int	erviev	v skill	s for	profe	ssional	suc	cess.
Unit- No.		Content		Contact Hour	t Learning Outcome							
	Introdu	uction to Personal Dev	elopment	3	Understand the significance of						of	
Ι	– Defi	nition, Importance, and	l Key		personal development in					in	1,2	
	Areas	of Self-Growth.			professional and personal life.							
	Comm	unication Skills – Verl	bal &	3	Appl	ly effe	ctive	comn	nunic	ation		
Π	Non-v	erbal Communication,	Public		strategies in different professional							1, 2,
11	Speaki	ng, and Presentation			scenarios.							3,4
	Techni	iques.										
		rship & Teamwork –		3		-				es and		1, 2,
Ш	Leader	ship Styles, Team Bui	lding,		teamwork strategies for better							1, 2, 3, 4,
111	Confli	ct Resolution, and Dec	ision-		colla	borati	on.					5, <del>4</del> , 5
	Makin	g Skills.										5
		Management & Emoti		3	Evaluate stress management							
IV		gence – Handling Press				niques						2, 3,
1 1		Life Balance, and Self	_	intelligence for better productiv						uctivity	<i>.</i>	4
	Motiva	ation.										
		Readiness – Resume		3		1 5				ls, caree		2, 3,
V		ew Skills, Professional	1		-	-	-			nfidenc	e	2, <i>5</i> , 4, 5
	Etique	tte, and Goal Setting.			for p	rofess	ional	succe	SS.			1, 5

# Textbooks

**T1:** The 7 Habits of Highly Effective People – Stephen R. Covey **T2:** How to Win Friends and Influence People – Dale Carnegie

#### **Reference Books**

R1: Emotional Intelligence 2.0 – Travis Bradberry & Jean Greaves

**R2: The Power of Positive Thinking** – Norman Vincent Peale

	CO PO Mapping									
SN	Course Outcome (CO)	Mapped Programme Outcome								
1	Understand the importance of personal development.	1,2								
2	Apply communication and presentation skills effectively.	3,4								
3	Analyze leadership and teamwork strategies.	2,5								
4	Evaluate stress management and emotional intelligence techniques.	4,6								
5	Develop career readiness and job preparation skills.	5,7								

			SEN	1ESTER – V	V										
Cours	e Title			Summer	Train	ning									
Course Pre-req Progra Semes Cour Object	a aada	24BTCE318R	Total cre	dits: 3	L	Т	Р	S	R	O/F		С			
Cours	e coue	24DICESIOK	Total ho	urs: 15T	0	0	0	0	0	48		3			
Pre-re	quisite	Nil	Co-r	equisite				N	Vil						
Progr	amme		B.	Tech in Civ	ril En	ginee	ring								
Sem	ester			ster of Thir	÷		-	0							
		1.Provide hands-on industry experience through practical exposure in construction,													
		design, and project management.													
Coι	irse	2.Develop problem-so	lving and	technical ski	lls by	worki	ing on	real-	worle	d engin	eerir	ıg			
Obje	ctives	projects.													
		3.Enhance professional skills, including teamwork, communication, and industry ethics, to													
		prepare for future care	ers.												
C	71	Understand the practical applications of civil engineering concepts in a professional													
C	51	setting.													
CC	)2	Apply engineering kn	owledge to	o analyze and	d solv	e indu	ıstry-r	elated	l prol	olems.					
CC	)3	Develop technical and	l manageri	al skills thro	ough d	irect i	nvolv	emen	t in p	orojects.	•				
CC	)4	Evaluate industry star	ndards, saf	ety regulatio	ns, an	d best	pract	tices i	n the	field.					
CC	)5	Document experience	es, create re	eports, and p	resent	t findi	ngs fr	om th	e sur	nmer tr	ainir	ıg.			
Unit-		Content		Contact		Le	arnir	ıg Ou	tcom	le		KL			
No.				Hour				-				INL.			
		action to Summer Train	•	3	Unde	erstan			-	cance	of				
Ι	-	ives, Industry Expectat	tions,		summer training in career 1										
		arning Outcomes.				lopme									
		isits & Practical Expos	ure –	3	Gain hands-on exposure to real-										
Π		standing Workflows,			world projects and industry 1,										
		uction Processes, and I	Project		pract	tices.						3,4			
	Stages														
	-	eering Analysis – Struc		3		ly theo				-		1, 2, 3, 4,			
III	-	, Material Testing, Sur			practical fieldwork and engineering										
		oject Execution Techn	=			tions.						5			
		, Ethics & Professional		3	Evaluate professional 2, 2										
IV		ry Safety Standards, Et			-			•	y mea	asures,		4			
		erations, and Work Ethics. and ethical concerns.								1					
	-	Writing & Presentation		3		elop c						2, 3,			
V		nentation of Fieldwork	-			nical v		-			2, 3, 4, 5				
	Prepar	ation, and Final Presen	tation.		profe	ession	al doc	umen	itatio	n.		т, Ј			

## Textbooks

T1: Construction Management and Planning – B. Sengupta & H. Guha

T2: Practical Civil Engineering – P.K. Jayasree & K. Balan

**Reference Books** 

**R1: Civil Engineering Project Management** – Alan Twort & Gordon Rees **R2: Site Engineering for Construction** – Edward R. Fisk

	CO PO Mapping								
SL	Course Outcome (CO)	Mapped Programme							
Ν		Outcome							
1	Understand the practical applications of civil engineering.	1,2							
2	Apply engineering knowledge to solve industry-related problems.	3,4							
3	Develop technical and managerial skills through project involvement.	2,5							
4	Evaluate safety standards, ethics, and industry best practices.	4,6							
5	Document and present field experiences effectively.	5,7							

			SEN	IESTER –	V							
Cours	e Title		EXTRA	-CURRIC	ULA	R AC	CTIV	ITIE	S			
Cours	e code	24UBEC311	Total cred Total hou		L 0	T 0	P 0	<b>S</b> 4	R 0	0/F 0	C 1	
Dra ra	quisite	Nil		quisite	U	U	U	4	Nil	U	1	
	amme			Guisite B.Tech Civi	il En	ginee	ring		111			
	ester	Fa		mester of 3		-	•	rnor	amn	ne		
Cou	irse	<ol> <li>To develop soft and</li> <li>To promote a holistication</li> <li>To enhance the learning</li> </ol>	<ul> <li>1. To develop soft and social skills</li> <li>2. To promote a holistic development of the learners</li> <li>3. To enhance the learning experience in different stages etc.</li> </ul>									
C	D1	-	elop personal skills, such as leadership, communication, time network, contributing to their overall character development and self									
CO	)2	Engagement in Community service and outreach activities will cultivate a sense of social esponsibility, empathy, and civic awareness, encouraging students to actively contribute o society Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their										
CO		interest.					•		•			
С( С(		The students will be g Demonstrate and prac demonstrating transfe	tices differe	ent activitie								
Unit- No.		Content	Contact Hour		Le	arnin	ıg Ou	itcom	ie		KL	
I		ent types of activities e regular curriculum	10	AdtU enco outside the meet learr aimed to c and promo learners. Keeping in methodolo different a clubs viz. drama, lite The stude: in regular competitio hobbies. The stude: represent student an Renewed	e reg ner's level ote a n mir ogy th activi Danc erary nts an club ons as nt me AdtU	ular c intere op the holist nd the stuties ho ce, mu etc. re enc active s per to ember U in vational	urricu est. The soci ic dev 360- dents eaded usic, p ourage ities, their i rs of t arious level	alum nese a al and velop degree are e l unde ohoto ged to works intere he clus s inter comj	inten activi d soft ment ce lea engag er dif grapl part shop st an ub ar : Uni petiti	ded to ties are t skills t of the urning ged in fferent hy, icipate s, d e traine versity ons		

			SEMESTEI								
Cours	e Title		Hydrology & Wa		urces l	Engin	eerin	g			
Cours	e code	24BTCE321R	Total credits: 4		Т	Р	S	R	O/F		С
			Total hours: 45T+	-30P 3	0	2	0	0	0		4
	quisite	Nil	Co-requisite	<u> </u>	•	•	Γ	Nil			
-	amme		B. Tech ir		-	-					
Sem	ester		inter/ VI semester o				0			6	
Course Objectives		<ul> <li>1.To study occurrence movement and distribution of water that is a prime resource for development of a civilization.</li> <li>2.To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.</li> <li>3.To know the basic principles and movement of ground water and properties of ground water.</li> <li>Remember the key drivers on water resources, hydrological processes and their integrate behaviour in catchments.</li> <li>Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph</li> </ul>									ntial, nd rateo
CO		management strateg Apply the concepts	of groundwater for w	water reso	ources 1	manag	gemen	ıt			
CO	05	Understand the imp reservoirs.	ortance of spatial and	alysis of	rainfall	and d	lesign	wate	er storag	e	
Unit -No.		Content	,	Contact Hour		Lear	ning	Outo	come		KI
I	equation	<b>uction:</b> hydrologic c on, history of hydrolc e, applications in eng	ogy, world water	9	cycle	and its menta distrib ations	s com l for a pution	pone issess	sing gloł its	bal	1, 2
II	<b>Precipitation:</b> 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 infiltration capacities, infiltration indices			9	and m	easure apotra ing th	ement anspii eir in	t of pr ration npact	racterist recipitat on	ion	2, 3, 4
	of infil	tration capacities, int	filtration indices								

	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.		estimation methods, hydrograph components, and factors influencing surface water resources and environmental flows.	3, 4
IV	<ul> <li>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.</li> </ul>	9	Students will demonstrate an understanding of aquifer properties and well hydraulics, including steady state flow and aquifer test analysis.	1, 2
V	Dam and Spillway:embankment dams:Classification, design considerations,estimation and control of seepage, slopeprotection. Gravity dams: forces on gravitydams, causes of failure, stress analysis,elementary and practical profile. Arch andbuttress dams. Spillways: components ofspillways, 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	Understanding the design considerations and seepage control in embankment dams, gravity dams, arch dams, buttress dams, and spillways, including reservoir capacity, sedimentation, and economic height considerations.	2, 3, 4, 5

T1: K Subramanya, Engineering Hydrology, Mc-Graw Hill. T2: K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.

# **REFERENCE BOOKS:**

- R1: K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
- R2: Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill

R3: G L Asawa, Irrigation Engineering, Wiley Eastern

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Programme 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 storage reservoirs	5,8						

			SEMESTER	R – VI						
Course T	ſitle		Design	of RC S	truct	ure				
Course c	ode	24BTCE322R	Total credits: 3	L	Т	Р	S	R	O/F	C
			Total hours: 45T	3	0	0	0	0	0	3
Pre-requ		Nil	Co-requisite				Ni			
Program			Bachelor of Techr					•		
Semest	er		'inter/ VI semester o		, ,	-	0			
Cours		· ·	understanding and ap				conce	pts in t	the behavi	or and
Objectiv	ves	-	inforced concrete sys							
			e between working st		-			-		1 ·
			the basic concepts for		rced o	concrete	e secti	onal de	esign maii	nly in
<u>CO1</u>			with ultimate strengt			formand		to in		o vrith
C01		IS456:2000.	eral mechanical beh	avior of	rein	lorced	concre	ete in a	accordanc	e with
CO2			the applicable ind	histry d	ocian	codes	rolou	ant to	the dec	ion of
02		reinforced concrete	• •	usity u	csign	coucs	ICICV	ant to	une des	ign of
CO3			reinforced concrete t	flexural	meml	pers wit	th deta	iling		
CO4			for serviceability (					•	nate limi	t state
001		conditions.	(							
CO5			and design vertical a	and horiz	zontal	l shear	reinfo	rcemer	nts in rein	forced
		concrete members v	-							
Unit-		Conte	nt	Contac	et	Lea	arning	g Outc	ome	KL
No.				Hour						
Ι	Con	cepts of RC. Desig		U	pon	compl	etion	of the		
		hod - Limit State		c	ourse,	st	udents	will		
		ss Strain Curves					•	iency in		
		racteristic values	10					Working		
	•	imeters – IS – 4						the Limit	Í	
		mit state analysis and design of singly							design of	
		nforced, doubly reinforced, T and L am sections							structures,	
	bear	n sections				•		· ·	columns,	
II	Lim	it state analysis on	d design of section			abs, an		-	able to	
11		•	- concept of bond,						einforced	
		norage and develo			•		•	for both		
		e provisions. Des	10					capacities		
		oly supported and	10					IS code		
		iling; Design of can				-	~ ~ ~		ll also be	
		0, 0	1.2		-	ompete		•	designing	
					v	arious	types	s of	columns	
					u	nder a	ixial	loads,	uniaxial	
					b	ending,	and	biaxial	l bending	
						cenario				
III		-	nns – under axial			-			e course,	
			ling and biaxial						acquired	
	ben	ding – I S Code prov	visions.	8				-	einforced	
									such as	1 1 2
								-	ensuring	
						-			design	
									structural	
					11	ntegrity	requit	ement	5.	

IV	Footings: Different types of footings – Design of isolated, square, rectangular,		Students will be capable of designing different types of	
	circular footings and combined footings.		footings (isolated, square,	
			rectangular, circular, and	
		7	combined footings) to support	
			varying loads and soil	1,2
			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.	
V	Design of one-way slab, Two-way slabs		Upon completion of the	
	and continuous slab Using I S Coefficients		course, students will be able	
	Limit state design for serviceability for		to assess and design	
	deflection, cracking and codal provision.	10	reinforced concrete structures	
	Design of doglegged staircase.		while ensuring compliance	
			with safety factors,	1,2
			characteristic values, and	
			codal provisions related to	
			serviceability criteria such as	
			deflection, cracking, and	
			durability.	

## **Text Books:**

- T1 Reinforced concrete design by by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.
- T2 Limit state designed of reinforced concrete P. C. Varghese, Prentice Hall of India, New Delhi.

#### **Reference Books:**

R1 Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.

	CO PO Mapping								
SI No.	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							

			SEI	MESTER	- VI						
Cours	e Title			Irrigatio	n Engi	neerin	g				
Cours	e code	24BTCE323R	Total c	credits: 3	L	Т	Р	S	R	O/F	С
			ours: 45T	3	0	0	0	0	0	3	
Pre-requisite		Nil		equisite				N	lil		
Progr				B. Tech in		-	-				
Sem	ester		inter/ VI se					-			
Course Objectives		<ol> <li>To take up the bastructures.</li> <li>To introduce studirrigation and dra</li> <li>The structures in concepts of main</li> </ol>	dents to bas ninage syste volved the c	ic concepts ms design, elementary	of wate plannir hydrau	er, plaı 1g and	nts, the mana	eir int gemei	eract	ions, as v	well as
CO	D1	Summarize the Cor	cepts of irr	igation and	differe	nt hyd	raulic	struct	ures.		
CC	)2	Summarize the estin	mation the c	quantity of	water r	equire	d by c	rops.			
CC	)3	Analyze, plan and c	lesign irriga	tion projec	ets.						
CC	14	Design channels an	d other irrig	gation struc	tures re	quired	for ir	rigatio	on, dr	ainage, s	soil
	74	conservation, flood				•					
CC	)5	Apply math, scienc	e, and techr	ology in th	ne field	of wat	er reso	ource	engir	neering.	
Unit-	Content			Contact		Le	arning	o Out	come		KL
No.				Hour				-		mine the	
I	WATER REQUIREMENTS FO CROPS Irrigation requirements in India: Scope, Soil moisture & Plant growth, crop water requirements, Irrigation efficiencies, Duty-Delta- base period & relation between them, Surface & subsurface irrigation method, Irrigation water Quality. Consumptive use of crop		ndia: nt ments, y-Delta- veen e n water of crops.	9	water and ur soil m will ca and co betwe Additi	requirendersta oisture alculat ompreh en dut ionally y of irr	ement and the e and p e irrig nend th y, delt y, stude rigatio	s for we factor plant g ation he rela a, and ents we n wate	variou ors af growt effici ations l base vill as er and	as crops fecting th. They encies ships e period. esess the	1,2
Π	DIVERSION HEAD WORKS Introduction, layout of diversion headwork and its component, khosla's theory and concept of flow net, safe exit gradient, hydraulic design of weir on Bligh's theory and design of modern barrage on khosla's theory. Necessity & functioning of silt excluder & silt extractor. Classification and selection of cross drainage work, hydraulic design aspects of aqueduct and syphon aqueduct. Canal falls: Necessity and classification of canal falls, hydraulic design of Sarda type and a Straight Glacis fall.			9	Students will develop the ability to design and analyze diversion headworks, including the layout and components of such systems. They will apply Khosla's theory and the concept of flow nets for hydraulic design and understand the principles behind weir and barrage design. Furthermore, students will explore th necessity and functioning of silt excluders and silt extractors and design storage headworks like gravity and earth dams considering various stability and hydraulic design criteria					out and They ad the aulic inciples gn. splore the silt and e gravity arious	,
ш	CANA	<b>LS CANAL WOR</b> LS: Definition. Typ Design of lined and	es of	9	Students will learn to classify and design different types of canals, including lined and unlined channels.					1, 2, 3, 4	

	channels, Alignment of canals. Design of canals by Kennedy's and Lacey's methods. CANAL WORKS: Canal regulators: Classification and suitability. Canal drops: Classification. Hydraulic design principles for notch type drop. Cross drainage works: Classification. Hydraulic design principles for an aqueduct.		They will use Kennedy's and Lacey's methods to design canals and understand the alignment considerations. Additionally, students will evaluate and design canal regulators, drops, and cross drainage works, applying hydraulic design principles for various types of canal structures.	
IV	Storage Head Works Necessity and classification of Dams, Selection of site of Dam. Gravity Dam: Introduction, Forces acting on Dam, Stability criterion, Elementary profile of dam, Drainage gallery, Hydraulic design of gravity dam. Earth Dam: Introduction, design principle, seepage throughout dam, seepage line, control of seepage, and design of filter.	9	Students will understand the various methods of irrigation, including tank and well irrigation, surface and subsurface irrigation, and advanced techniques like drip and sprinkler irrigation. They will design efficient irrigation systems tailored to specific crops and environmental conditions and develop irrigation schedules to optimize water use and distribution systems.	1, 2
V	IRRIGATION METHODS Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub- Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies. CANAL IRRIGATION Canal regulations – direct sluice – Canal drop – Cross drainage works- Canal outlets – Design of prismatic canal-canal alignments-Canal lining – Kennedy's and Lacey's Regime theory.	9	Students will apply the principles of canal irrigation, including canal regulations and the design of canal drops, cross drainage works, and canal outlets. They will design prismatic canals and align canals using the principles of canal lining and regime theories by Kennedy and Lacey. Additionally, students will understand the implications of canal alignment and lining on the efficiency and effectiveness of canal irrigation systems.	2, 3, 4, 5

T1: Irrigation Engineering and Hydraulic Structures, by S. K. Garg, Khanna Publishers, New Delhi.

T2: Irrigation, Water Power and Water Resources Engineering, by K. R. Arora, Standard Publications, New Delhi.

#### **REFERENCE BOOKS:**

R1: Irrigation and Water Power Engineering, by Punmia and PandeyLal, Lakshmi Publications, New Delhi.

	CO PO Mapping								
SN	Course Outcome (CO)	Mapped Programme Outcome							
1	Summarize the Concepts of irrigation and different hydraulic structures.	2,6,3							
2	Summarize the estimation the quantity of water required by crops.	3,9,8							
3	Analyze, plan and design irrigation projects.	1,3,9							
4	Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects.	2,9,4							
5	Apply math, science, and technology in the field of water resource engineering.	10,12							

			SEI	MESTER	– VI						
Cours	e Title		Geosp	atial Tech	nique ir	1 Prac	tice				
Cours	e code	24BTCE324R		credits: 3 ours: 45T	L 3	T 0	P 0	<b>S</b>	R 0	0/F 0	C 3
Pre-re	quisite	Nil		equisite	- 5	U	U	-	l II	U	5
Progr	-	111		*	Civil En	oinee	rino	1	11		
	ester	W	B. Tech in Civil Engineering Winter/ VI semester of Third year of the programme								
Sem		1. Recall the s			-			-			ohting it
Obje	urse ctives D1 D2	relevance in 2. Analyze the Photogramm 3. Comprehen environmen Comprehend the fu lifecycle manageme Utilize different sca UAV, LiDAR, RAI	e principles netry, UAV d the fund t, incorpora ndamentals ent anning and	and scien , LiDAR, I amental o ting all nec of geospat remote se	tific fou RADAR f GIS a cessary c ial techr	, and S and g cartogr niques	SONA enerat caphic in the	R. te a elem cons	map ents. tructi	layout i	n a GI try
CC	)3	Create a map layout	with all ess	sential carto	ographic	eleme	ents ir	n GIS	envii	onment	
CC	)4	Examine case studi	es demonstr	ating the r	ealizatio	n bene	efits o	f geos	spatia	l technol	ogies
CC	)5	Evaluate spatial dat	a for feature	e class anal	lysis and	l terrai	n ana	lysis ı	using	GIS.	
Unit- No.		Content	Contact Hour		Lea	rning	g Out	come	•	KL	
		oduction to C									
Ι	the C Geos Impo Evol Impo Logi Tech of co of tende Cons mana Fund Geos Surv equip equip Hands Levell overvi princip Advan	anology & Its Rele Construction Indust spatial in Day-to-I ortance of Spatial ution of location te ortance of spatial in c and Language of a nologies, Location p onstruction industry, Geospatial technologies, Design and exec struction agement. lamentals and comp spatial Technologies, eying, Conventiona oment Vs Modern oment Components. on Demonstrations of ing and Total Station ew, components and ole, Methods, Benefit tages of GNSS, Pro- data and its applicat orld	<b>Pry</b> Day Life, Thinking, echnology, formation, Geospatial erspective Overview ology in cution and lifecycle onents of Basics of al survey surveying of Auto h, GNSS working ts and ecssing of	9	thinkir in daily sector. locatio signific manag geospa constru- tender lifecyc betwee	ng and y life a Expla on-base cance ement tial te uction ing, de ele man en con ing teo	geosp and the in the ed tech in cor .Ident chnolo phase esign, nagem ventio chniqu	batial e cons e evolu hnolo istruct ify th ogies execu- nent. I onal an	techn struct ution gies a tion p e role in va ludin ution, Differ nd me	of and their project c of rious g and rentiate	1, 2
II	Geos	spatial Engineeri nology	ng and	9	Unders geospa survey	tial te	chnol	ogies,	inclu	ents of iding	2, 3, 4

	Scanning and Remote Sensing Technologies,3D scanning, Sensors and their types, Overview and working of various platforms. Application of sensors & platforms, Principles and the science behind photogrammetry, LiDAR, RADAR, and SONAR. Data Acquisition & Software Processing Hands on Demonstrations of Outdoor & Indoor Terrestrial Lidar Equipment, Bathymetry, Ground Penetrating RADAR. Introduction to Geospatial Engineering Solutions, CORS, Scan to Model-Overview & Use Case,Understanding the need for visualization, UAV in Construction Industry, Quantity Estimation in Construction sites.		methodologies.Compare conventional surveying tools with modern digital surveying technologies like Auto Levelling, Total Station, and GNSS. Demonstrate hands-on knowledge of GNSS technology, including its components, working principles, and real-world applications.Process GNSS data and apply it in construction planning and monitoring.	
ш	Geographic Information System [GIS] & Data Base Management System [DBMS] GIS: Basics & Components of GIS, GIS Data Models (Vector & Raster), Hardware for GIS, DEM and TIN Data products, Attributes Data, Types & Elements of Maps, Coordinate Systems & Projections. Demonstrations of QGIS Software: Features, Toolbars, Panels, Plugins, Attribute Data- Field Calculator & Selection Feature, Choropleth, Graduated Symbol, Heat & Dot Distribution Maps Preparations, Exploring Base maps and GPS Data, Conversion of Excel to GIS, Conversion of CAD TO GIS, Georeferencing & Digitization Techniques for Toposheet, Open Street Maps and Google Earth Images GIS database management – RDBMS, SQL, Creation, configuration, and enterprise Geodatabase.	9	Explain the principles of remote sensing, photogrammetry, LiDAR, RADAR, and SONAR in data acquisition. Utilize 3D scanning and sensor-based technologies for construction site analysis and project monitoring. Conduct hands-on demonstrations of terrestrial LiDAR, bathymetric surveys, and ground-penetrating radar applications. Understand UAV applications in construction, including site surveying and quantity estimation. Analyze real-world use cases of geospatial technologies in construction, such as Scan-to-Model and CORS.	1, 2, 3, 4
IV	<b>Geospatial Analysis and</b> <b>Engineering Applications</b> Exploring QGIS Software for Feature Class Analysis: Satellite	9	Understand the fundamentals and components of GIS, including vector and raster data models.Explain different GIS data products like DEM	1, 2

	Change Detection Analysis. Harnessing QGIS Software for Spatial Analysis: Overlay Analysis, Buffer Analysis, Cluster Analysis, Hotspot Analysis, Viewshed Analysis. Leveraging QGIS Software for Terrain Analysis: Slope, Aspect & Elevation, Catchment Area delineation, Watershed Analysis. Utilizing QGIS Software for Engineering Analysis: Profiling & Cross sectioning Maps, Building Footprints Extraction, 3D Maps. Geospatial Information Technology & Future trends		Explore and apply various mapping techniques, including thematic maps, base maps, and GPS data integration.Demonstrate proficiency in using QGIS software for geospatial data visualization, georeferencing, and digitization.Convert and integrate CAD and Excel data into GIS for construction and infrastructure planning. Understand RDBMS and SQL for geospatial database management and enterprise GIS applications.	
V	Geospatial IT, Enterprise GIS & its components, Web App Essentials, Web & Mobile GIS, FAMeVol Web application & LMNoP Case Study, Emergency response use cases, Decision Support System, Progress GIS Case Study, Spatial Dashboards, Role of Open-Source GIS Web App. Benefits of Geospatial Technologies, Case Studies in Benefit Realization, Advancements in Modern Survey & Mapping Technologies, Advancements in Spatial Analytics – Geo Intelligence, Future Trends, Digital Twin: GIS with BIM, Geospatial Technology - Way Forward.	9	Perform spatial analysis using QGIS, including feature class analysis, supervised and unsupervised classification, and change detection analysis. Conduct spatial operations such as overlay analysis, buffer analysis, cluster analysis, hotspot analysis, and viewshed analysis.Utilize terrain analysis tools for slope mapping, aspect analysis, watershed delineation, and catchment area studies. Generate engineering- related geospatial outputs such as cross-section maps, building footprint extractions, and 3D mapping.	2, 3, 4, 5

T1: "Introduction to Geographic Information Systems" by Kang-Tsung Chang.

## **REFERENCE BOOKS:**

R1 "Geospatial Analysis: A Comprehensive Guide" by Michael J. de Smith, Michael F. Goodchild, and Paul Longley

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Understand the importance of spatial thinking and geospatial technologies in daily life and the construction sector.	1,2,6,3
2	Identify the role of geospatial technologies in various construction phases, including tendering, design, execution, and lifecycle management.	13,9,8
3	Compare conventional and modern surveying techniques and evaluate their impact on construction workflows.	1,3,9
4	Explain the principles of remote sensing, photogrammetry, LiDAR, RADAR, and SONAR in data acquisition and their construction applications.	2,9,4
5	Demonstrate proficiency in GIS software (QGIS) for geospatial data visualization, georeferencing, and digitization.	10,12

			SE	MESTER	- VI								
Cours	e Title		Ca	reer Read	iness in	n Digit	al era						
Cours	se code	24BTCE327R	Total cred		L	T	P	S	R	O/F	C		
Duo no	anicita	Nil	Total hou	rs: 451 equisite	3	0	0	0	0 Vil	0	3		
	equisite amme			B. Tech in (	Civil F.	nainaa	wing	Γ					
	ester	W				-	-	NOGN		0			
Sem	ester			semester of Third year of the programme eracy and career awareness to understand the nature of									
Co	urse	-	-	•	cci awa	u chess	5 10 UII	ucisia	ina ii	ic natur	2 01		
	ctives	<ul><li>psychological disorders.</li><li>2. To enhance career development and employability skills.</li></ul>											
Obje	CHVC5	<ol> <li>To enhance career development and employability skills.</li> <li>To Build Professional Online Presence and Networking Skills.</li> </ol>											
			An ability to explain the impact of digital technologies on the workforce identify										
C	01	· · ·	•	•		•						for	
U.	01		emerging trends and technologies, and recognize the skills and competencies required for success in the digital era										
		An understanding		rating effect	ctive ne	etwork	ing sk	ills u	sing	digital	platfor	ms	
CO	02	communicate prof		-			-		-	-	-		
_		relationships with in		-			-			,			
CC	03	An ability to design	and develo	p a profess	sional of	nline p	resen	e					
		An ability to assess	their streng	gths, weakn	esses, o	pport	inities	, and	threa	ts (SW0	DT		
CC	<b>D4</b>	analysis), set career goals, and create a tailored plan to achieve those goals, incorporating											
		digital tools and str	ligital tools and strategies.										
CC	D5	An ability to unders	tand the sci	entific met	hod and	l its ap	plicati	on to	psycl	hology.			
Unit-		Content		Contact		Les	arning	, Out	come	•	K	T.	
No.				Hour		Lu	••••••	, Out	come	,		L	
		: Introduction to C											
		ness in the Digital En		An understanding of demonstrating						-			
		iew of the digital era		effecti		etwor	•			•			
	-	t on careers, Definin	9	digital platforms, communicate professionally and persuasively in digital environments, and build relationships with industry							1, 2		
Ι		ess in the digital age											
		standing the importa literacy and career a											
	-	g career goals and de			professionals, mentors, and peers.						ly		
	-	onalized career devel											
	plan		- Pinone										
	•	I: Digital Literacy a	and										
		· Awareness			Studer				-	te the			
	Under	standing digital tech	nologies		moder	-				1			
		eir applications in va	-		<b>^</b>				-	nent pla	u,		
Π	indust	ries, Identifying eme	rging	9	and bu					-	2,	3,	
11	trends	and technologies in	the job	9						ons, and	4	1	
		t, Developing digital								will gain			
	-	tencies for career su								nfidenc			
		ing a professional online			to thri		-				-		
	-	ce (e.g., LinkedIn pr					8						
		II: Career Develop	ment and		Studer	nts wil	l be ec	uippe	ed to	launch			
	-	yability Skills	c c		Students will be equipped to launch their careers and stay adaptable in a rapidly changing job market. This								
117		standing the importa		•							1,	2,	
III	-	yability skills in the	aigital	9	course is essential for studer						3, 4		
		eveloping effective	orle altrilla		seeking to future-proof the		their	careers					
		unication and teamw	,		and su	-	-						
	Duilat	ng a professional net	work and										

	establishing mentorship relationships, Creating a personalized career portfolio and resume			
IV	Unit IV: Professional Online Presence and Networking Creating a professional website or blog to showcase skills and experience, Developing a social media strategy for career advancement, Building and engaging with a professional online network, Understanding online etiquette and digital citizenship	9	Through interactive lectures, discussions, and hands-on activities, students will gain the knowledge, skills, and confidence to thrive in the digital workforce	1, 2
V	Unit V: Launching and Advancing Your Career in the Digital Era Developing a job search plan and timeline, Preparing for and acing job interviews in the digital era, Understanding career advancement strategies and opportunities for continuous learning and professional development.	9	An ability to explain the impact of digital technologies on the workforce, identify emerging trends and technologies, and recognize the skills and competencies required for success in the digital era. An understanding of demonstrating effective networking skills using digital platforms, communicate professionally and persuasively in digital environments, and build relationships with industry professionals, mentors, and peers.	2, 3, 4, 5

T1"Career Development in the Digital Age" by Debra Osborn and Seth C. W. Hayden "The Digital Career: How to Get Ahead in the Digital Age" by James P. Rosenbaum

## **REFERENCE BOOKS:**

R1: "Career Readiness in the Digital Age: A Guide for Students" by Christine H. Nittrouer "Digital Career Management: How to Develop Your Personal Brand and Online Presence" by Katy Tynan

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Comprehend the fundamentals of geospatial techniques in the construction	1,3 & 4
-	industry lifecycle management.	
2	Create a map layout with all essential cartographic elements in GIS	1,2
<u> </u>	environment	
3	Utilize different scanning and remote sensing technologies, including	7.9,10
5	Photogrammetry, UAV, LiDAR, RADAR, and SONAR.	
4	Evaluate spatial data for feature class analysis and terrain analysis using	5,7
4	GIS.	
5	Examine case studies demonstrating the realization benefits of geospatial	5,8
5	technologies	

			SEMESTER -	-VI								
Course	Title		Building Pla	nning & D	)rawi	ing						
Course	code	24BTCE326R	<b>Total credits: 3</b>		L	Т	Р	S	R	O/F		С
			Total hours: 30T+30	P	2	0	2	0	0	0		3
Pre-requ		Nil	Co-requisite					Ni	1			
Program			B. Tech in (	-		-						
Semest	ter		Winter/ VI semester of '			he p	rogr	amm	e			
Cours Objecti		<ol> <li>To develop skills in building planning and design.</li> <li>To apply principles of building planning and design to create functional and aesthetically pleasing buildings.</li> <li>To analyze and interpret building plans and drawings.</li> </ol>										
CO1	-	responsive design functional and eff		ssment, an	id ap	ply	thes	e pri	nciple	es to o	des	ign
CO2		tools, including ha	te accurate and detailed l and drafting, computer-a	ided design	ı (CA	D)	C					
CO3		such as spatial rel	yze and interpret buildin ationships, building syste	ems, and co	onstru	ictio	n de	tails.		-		
CO4		that buildings are	ly relevant building cod safe, accessible, and mee	et minimun	1 buil	ding	g star	ndard	s.	-		
C05		various methods	municate building desigr and tools, including uding architects, enginee	drawings,	mo	dels	, an	d w		•		•
Unit-No.		Con	tent	Contact Hour		Learning Outcome						KL
I	and Over Impo Basio	<b>l Drawing</b> view of building pl		11	Demonstrate knowledge of building codes, zoning laws, and regulations to ensure compliance in planning and designing structures.							1,2
П	analy regul need	vsis and planning, H ations, Climate res	ponsive design, User uilding programming,	10	ard ind ele sit dra	chite clud evati te pla aftir	ectur, ing f ions, ans,	loor j secti using chniq	wings blans, ons, a manu ues ar	und 1al		1,2
III	Hand and e build techr const	it 3: Building Dra I drawing technique elevations, CAD dr ling plans and eleva niques for building truction, Dimension niques, Drawing co lards	10	<ul> <li>Utilize principles of space planning, orientation ventilation, and lighting to design functional and aesthetically pleasing buildings.</li> </ul>							1,2	
IV	Buile door	it 4: Building Desi ling design elem s, roofs; Building dation, frame, exte ces: plumbing,	7	aro an un	chite Id se Iders	ectur rvice stand	e drav the c	ret uctur vings lesign ructio	to I		1,2	

	Sustainability and energy efficiency in building design, Building codes and regulations for accessibility and safety		requirements.	
V	Unit 5: Building Presentation and Communication Presentation techniques for building designs, Communication skills for architects and builders, Drawing and rendering techniques for building presentation, Model making and visualization techniques, Final project presentation and critique	7	Integrate sustainable design principles, safety measures, and cost-effective planning techniques in building layouts and designs.	1,2

# **Reference Books:**

R1: Building Planning and Drawing – M. Chakraborti

## **Textbooks:**

# T1: Building Planning and Drawing" - S. S. Bhavikatti

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	An ability to explain the principles of building planning, including site analysis, climate responsive design, and user needs assessment, and apply these principles to design functional and efficient buildings.	1,3 & 4
2	An ability to create accurate and detailed building drawings, using various techniques and tools, including hand drafting, computer-aided design (CAD)	1,2
3	An ability to analyze and interpret building plans and drawings, identifying key elements such as spatial relationships, building systems, and construction details.	7.9,10
4	An ability to apply relevant building codes and regulations to building design, ensuring that buildings are safe, accessible, and meet minimum building standards.	5,7
5	An ability to communicate building design and construction information effectively, using various methods and tools, including drawings, models, and written reports, to stakeholders, including architects, engineers, contractors, and clients.	5,8

			SEMESTER	R-VI								
Course Title     Build Personal Resilience       Total credits: 1     L     T     P     S     R     O/I												
Course o	ada	24MOCE322R	Total credits: 1			Τ	P	S	R	O/F	С	
Course	oue	24WIOCE522K	Total hours: 15T		0	0	0	0	0	0	1	
Pre-requ	isite	Nil	Co-requisite	e				Ni	1			
Progran	nme		B. Tech ii	n Civil E	ngin	eerin	g					
Semest	ter		inter/ VI semester o		-		e prog	gram	me			
Cours	e	•										
Objecti	-	*	elf-awareness and sel									
		3. To build positive relationships and support networks.										
C01			ate a growth mindset									
CO2			ce self-care and prior									
CO3			op problem-solving a		tabili	ty ski	lls.					
CO4		•	o enhance overall re									
C05		An ability to develo	op effective coping s	-								
Unit-No.		Conten	ıt	Conta		L	earni	ng Ou	itcom	e	KL	
				Hour		Defini			ailian		<u> </u>	
	Over	view of personal resi			Define personal resilience and recognize its importance							
I	comp	omponents of resilience, Assessing				in managing stress, setbacks,						
	perso	nal resilience			and challenges effectively.							
						Apply strategies to manage						
		rstandingself-awarer		10		emotions, maintain a positive						
II	-	gulation strategies, Mindfulness and self-			r	mindset, and stay composed						
	comp	bassion		υ	under pressure.							
	Effac	tive coping strategie	s Stress		I	Utilize	e critic	al thi	nking	and		
III		gement techniques, 1		10		-	-		solvin	g	1,2	
	netwo		Bunding a support	10			ques to				1,2	
	110100						les an					
							fy and	-				
		ying resilience skills	e	_			-	•	ategie			
IV		cles and setbacks, M	aıntaınıng	7					ss, sel		1,2	
	resili	ence				care, and social support, to navigate adversity.						
					-							
	Main	toining a negitient wi	ndaat Continuin						reness	-		
<b>V</b> 7		taining a resilient mi	-	-		confidence, and perseverance						
V		ild resilience, Finaliz	a personalized	7		to embrace challenges as					1,2	
	resilience plan					opportunities for growth and						
				ŀ	personal development.							

## **Textbooks:**

T1: "Resilient: How to Grow an Unshakable Core of Calm, Strength, and Happiness" – Rick Hanson & Forrest Hanson

#### **Reference Books:**

R1:"The Road to Resilience" – American Psychological Association (APA)

R2:"The Bounce Back Book: How to Thrive in the Face of Adversity, Setbacks, and Losses" – Karen Salmansohn

	CO PO Mapping								
SN	Course Outcome (CO)	Mapped Programme Outcome							
1	1. An ability to cultivate a growth mindset.	1,3 & 4							
2	2. An ability to practice self-care and prioritize well-being.	1,2							
3	3. An ability to develop problem-solving and adaptability skills.	7.9,10							
4	4. An understanding to enhance overall resilience.	5,7							
5	5.An ability to develop effective coping strategies.	5,8							

		SEMESTER	R-VI									
Course 7	Citle EFFECTI	VE ENGLISH FOR			S (Co	ommur	nicativ	ve Eng	lish &			
		1	Soft Skills	/	r	I _	1 ~					
Course c	code 24UBPD324R	Total credits: 2 Total hours: 60P	-	L 0	T 0	P 4	<b>S</b>	R 0	0/F 0	C 2		
Pre-requ	isite Nil	Co-requisite	<u>`</u>	U	U	4	U Ni	ļ -	U	2		
Program		Bachelor of Technology in Civil Engineering										
Semest		Winter/ VI semester of third year of the programme										
	1.This course wi	1. This course will enable the students to acquire the important knowledge on grammar										
Cours	-	like the formation of sentences.										
Objecti		2.To enable the students to use vocabulary meaningfully for a successful conversation.										
		putation and Rapport										
CO1		to understand gram						speak	c flawl	essly,		
	e	usage of tenses and re juire the technique of		-				maatim		ronda		
CO2	and	june me technique of	expandi	ng v	/ocab	ulary	and C	reating	g new v	voras		
	use them in differ	ent contexts.										
			arpen the	ir li	stenin	ng skil	ls an	d to b	ecome	good		
CO3	listeners.	Encouraging and helping them to sharpen their listening skills and to become good listeners.										
CO4	To make them pr	epare for various pub	lic and pr	ivate	e sect	or exa	ms &	place	ment dr	ives.		
CO5	To enhance the a	nalytical skill and pro	blem-solv	ving	skill	of the	stude	nts				
Unit-No.	Conte	nt	Contac Hour	t	L	earni	ng Oı	ıtcom	e	KL		
	Interchange of Interrog	ative and Assertive			Stude	ents v	vill ł	be ab	le to			
	Sentences, Interchange		12		analy	se an	d tra	nsforn	n the	1,2		
Ι	Assertive Sentences	, Analysis of			differ	ent ty	pes of	sente	nces.			
	Sentences, Types of T	enses, Exercises on										
	Tense											
	Synonyms, Antonyms,	Homonyms			-	ful in				2.4		
Π			0					•	and	3,4		
			8		speaking in professional communication.							
	Techniques of Ef	fective, Reading,				$\frac{1}{5}$ in		yzing	the			
	Gathering ideas and i	, U	8			iques			ective	<b>.</b> .		
III	text, The SQ3R Tech					ng, ga				3,4		
	text	-				matior						
	Introduction to Dress	,				s cod		•				
	Purpose and Importanc				boost	their	confi	lence.				
IV	FIRST IMPRESSION		6							3,4		
	During Interviews or	•								,-		
	Meetings – Male & Fen				C4 1		11 1		4:1:-			
	Introduction To T Purpose And Impo	ime Management rtance of Time	6			ents wi effecti		rn to u	1111ze			
V	Management, Basic		U			CITECII	very.			3,4		
	Tips to Maintain Time.											
	rips to munitum rinte.											

# Textbooks:

- 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

## References

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

	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 -	-VI								
Course	Title		Technical su	pport Fu	Indamen	tal						
Course	code	24MOCE321R	Total credits: 1		L T	P	S	R	O/F	C		
			Total hours: 15T		0 0	0	0	0	0	1		
Pre- req		Nil										
Program		Bachelor of Technology in Civil Engineering Winter/VI semester of third, year of the programme										
Semes	ter	Winter/ VI semester of third year of the programme           1.To introduce students to the fundamentals of IT support, including computer										
			ng, and troubleshoot		of II s	support	t, inc	luding	g com	outer		
Cour	50		s with knowledge of	•	a system	e evete	am ad	minis	tration	and		
Object		cybersecurity best p	-	operating	g system	s, sysic			stration	, and		
Object	1005		ents with profession	al skills t	for techn	ical su	innor	roles	s inclu	dino		
			nd problem-solving to			icui su	ppon	. 10101	s, mere	umg		
			ndamental concepts	-		ware, c	perat	ing sv	ystems.	and		
CO1	l	networking.	L	1		,	•	с.	- ^			
CO2		-	oting skills to diagno	ose and re	esolve ha	rdware	and	softwa	are issu	es.		
CO3		Gain knowledge o	of system administr	ration, us	ser acco	unt ma	anage	ment,	and l	oasic		
CO3		scripting.										
CO4		Learn cybersecuri	Learn cybersecurity principles, best practices, and methods for securing IT									
		environments. To enhance the analytical skill and problem-solving skill of the students										
CO5		To enhance the ana	lytical skill and prob		-	of the s	tuder	nts				
Unit-No.		Content	t	Contac Hour	t L	earnin	ng Ou	tcom	e	KL		
Ι	Intro	duction to Technica	al Support – Role	12	Stud	ents v	vill ı	unders	stand	1,2		
	of	IT Support,	Importance of			basics		-	· · ·			
		bleshooting, Overvie			the	role		tech				
			RAM, Storage,		supp		ngine		and			
	-	herals).	0 0 4	0		ware fu				2.4		
Π		•ating Systems inistration – Introdu	& System	8		hands diffe		-		3,4		
		x, and macOS, Fil	,		syste		user	-	count			
		agement, Software Ir	•		-	agemer		nd l				
		tenance.	, ~ <i>j</i> ====			m adm						
III		orking Basics & T	roubleshooting –	8	Lear			etwor		3,4		
	IP /	Addressing, DNS,	DHCP, Network		fund	amenta			gnose			
	Conf	igurations, Common	Network Issues,		netw	ork iss	sues,	and a	apply			
	and T	Froubleshooting Tech	niques.		basic		troub	lesho	oting			
					meth							
IV	•	ersecurity & IT 1		6		erstand	•		-	3,4		
	Secu	• • • •	Authentication,			ts and	_					
		·	hreats (Malware,		secur	•	meas	ures	to			
V		ning), Data Protection		6	prote	and	3,4					
v		munication Skills, H		U		elop pi persona		skills	to	5,4		
		ies, Ticketing System	-			ide teo						
		s, Industry Case Studi			-	tively.						
	1001				01100							

## **Textbooks:**

T1: Meyers, Mike. CompTIA A+ Certification All-in-One Exam Guide – McGraw-Hill Education. T2: Jean Andrews, A+ Guide to IT Technical Support – Cengage Learning.

## **References:**

R1: Charles Severance, Introduction to Networking – CreateSpace Independent Publishing.

R2: Jason Cannon, Linux for Beginners – Independently Published.

R3: William Stallings, Computer Networking with Security Principles – Pearson Education.

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the fundamental concepts of computer hardware, operating systems, and networking.	1, 2, 10
2	Develop troubleshooting skills to diagnose and resolve hardware and software issues.	4, 5, 9
3	Gain knowledge of system administration, user account management, and basic scripting.	3, 5, 9
4	Learn cybersecurity principles, best practices, and methods for securing IT environments.	6, 7, 11
5	Improve communication and customer support skills for effective problem resolution.	9, 10, 12

			SEM	ESTER –VI								
Course '	Title		EXTRA	-CURRICULA	R A	CTIV	/ITII	ES				
Course	code	24UBEC311	Total cred		L	Т	P	S	R	O/F		С
			Total hour		0	0	0	4	0	0		1
Pre-requ		Nil		equisite				1	Nil			
Program				Tech in Civil E	-		-					
Semes	ter			mester of 3rd y	ear o	of the	e prog	gram	me			
Cour	se	<ul><li>1.To develop soft and social skills</li><li>2.To promote a holistic development of the learners</li></ul>										
Objecti	ives	· ·	-				-					
		3.To enhance the learning experience in different stages etc. Participants will develop personal skills, such as leadership, communication, time										
CO	1	-				-	-					alf
CO	L	management, and teamwork, contributing to their overall character development and self-										
		confidence. Engagement in Community service and outreach activities will cultivate a sense of social										
CO2	)		•									
	-	responsibility, empathy, and civic awareness, encouraging students to actively contribute to society										
		Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their										
CO3		Express their ideas, views, in-depth evaluation and analysis clearly in the topic of their interest.										
~~~		The students will be given a platform to earn from invited experts in their respective										
CO4		fields.	0 1				•			1		
0.05		Demonstrate and pra	ctices differ	ent activities, by	/ Inte	grati	ng lea	arning	g expe	rience	s by	
CO5		demonstrating transf	erable skills									
Unit-No.		Content	Contact	t Learning Outcome KI								
			Hour									
Ι		rent types of	10	AdtU encourages a range of activities outside								,3,4,
		ities outside regular		the regular cur							5	
	curric	culum		learner's intere						ned		
				to develop the								
				promote a holi learners.	istic (	level	opme	int of	the			
				Keeping in mi	nd th	e 36(	)-deo	ree le	arning	y.		
				methodology t			-		-	-		
				different activity				•	•			
				clubs viz. Dan	ce, n	nusic.	, phot	ograp	ohy,			
				drama, literary	vetc.		-		-			
				The students a	re en	coura	aged	to par	ticipa	te in		
				regular club ac	ctiviti	ies, w	vorksl	hops,				
				competitions a	is per	their	r inter	rest a	nd			
				hobbies.								
				The student m								
				represent Adtl						ty		
				student and na				-		ا		
				Renewed perso								
				workshops that students by give								
				from experts in	-		-			carn		
				nom expens n	n uie	respo			10.			

			SEMESTE	R – VII								
Cours	e Title		Design	of Steel	Stru	icture	es					
Cours	e code	248TCE411R	Fotal credits: 4	T	L	T	P	S	R	<b>O</b> /2		C
Duo no	anisita	Total hours: 60T40000NilCo-requisiteNil									4	
	quisite amme		-	in Civil		inoor	ina					
-	ester	Fall	VII semester o					oaro	mma			
Sem	cstci				-		-	-			nrinci	nles of
	ırse ctives	<ol> <li>This course aims at providing students with a solid background on principles of structural engineering design.</li> <li>Students will be exposed to the theories and concepts of both concrete and steel design and analysis both at the element and system levels.</li> <li>Hands-on design and skills will be gained and learned through problem sets and a comprehensive design project.</li> </ol>										
C		Demonstrate their kn structural engineering	Ţ.						-	Ţ	-	lems of
C(		Distinguish the varyin Classify structures an acting on it.										l forces
CC	)4	Apply the design con	cepts to develop	a R.C.C.	mer	mbers						
CC	)5	Explain the basic con	cepts of special	structures	s.							
Unit- No.	Conte	nt		Contac Hour	t 1	Learn	ing (	Dutco	ome			KL
I	safety, perfor princip a stru archite functio	roduction- concepts of energy principles, fety, sustainable development in rformance; what makes a structure; nciples of stability, equilibrium; what is structural engineer, role of engineer, chitect, user, builder; what are the nctions' what do the engineers design, st principles of process of design			p s in c	Unders princip sustain n stru creatin structu	oles abili uctur g sta	of e ty, ar al ei	nerg nd de ngine	y, sa sign ering	afety, roles g for	1, 2
п	Planni Loads Proper	ng and Design Proce and Design Safety; ties of Concrete and S uake Loads	ess; Materials, Behaviour and	10	u in Ie	Studen inders nterac oads, structu	tandi tions and	ng betv des	o veen ign	f mate safet	the rials,	1, 2,
ш	structural systems. Analyses of determinate and indeterminate trusses, beams, and frames and design philosophies for					emons analy eterm d fra d	yzing ninate ames, esign	1, 2, 3, 4, 5				
IV	Eleme Theori steel elemen Analy Design	n of Structural Elements, Steel Elements, St es and concepts of bot design and analysis nt and system levels sis Methods as a Bas n of Reinforced Concr e; Design of Reinfo	ructural Joints; th concrete and both at the Approximate this for Design; rete Beams for	10	c e n s	Ability concre elemer nethoo service consid	te a nts ds eabili	nd s using ar ty	teel	struc proxi e	ctural	2, 3, 4

	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			
V	System Design Concepts; Special Topicsthat may be Covered as Part of the DesignProject Discussions; Cable Structures;Prestressed Concrete Bridges;Constructability and Structural Control;Fire Protection	10	Understanding the principles of fire protection in structural design enhances constructability and ensures structural safety.	

T1: Design Of Structures - S. Ramamrutham., DhanpatRai Publishing Co Pvt Ltd

T2: Design Of Steel Structures - N. Subramanian

#### **REFERENCE BOOKS:**

R1: Analysis of Indeterminate Structures by C.K. Wang.

- R2: Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing
- R3: KDR building, Calicut,
- R4: (Corresponding set of) CAD Software Theory and User Manuals.

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme 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

		SEN	1ESTER – VI	I								
Cours	e Title	Mindfulness an	d Wellbeing:	Livii	ng with	balan	ice a	n ea	ise			
Cours	e code	24MOCE411R Total Cre	dits: 2	L	Т	P	S	R	O/I	<u>.</u>	С	
Cours	c couc	Total Hou	ırs: 30	0	0	0	0	0	0		2	
Pre-re	quisite	Nil Co-requi	site	Nil								
Progr			. Tech in Civi		0	0						
Sem	ester	Fall/ VII sem		•		_ ·	0					
Cou Objec		<ol> <li>To introduce students to mindfulness techniques for reducing stress and improving emotional well-being.</li> <li>To develop self-awareness and resilience by incorporating mindfulness practices into daily life.</li> <li>To enhance concentration, focus, and cognitive abilities through meditation and breathing exercises.</li> <li>To promote holistic well-being by integrating mindfulness into professional and personal life.</li> <li>To cultivate emotional intelligence and positive relationships through mindful communication and empathy.</li> </ol>										
CO		Demonstrate an understanding health.		Â	•				•			
		Apply mindfulness techniques									ulation.	
		Develop stress management strategies for improved well-being and productivity. Analyze the role of mindfulness in fostering resilience, empathy, and personal growth.										
CC	)4	Integrate mindfulness practice	-					_		-		
CC	)5	lifestyle.	s into everyda	ly IIIC	, 10 mai	mam	a Uai	anc	cu an	iu su	035-1100	
Unit- No.	Conte		Conta Hour		Learni	ng Ou	itcon	ne			KL	
Ι	Unit I	: Introduction	10		Introdu	ction	to	Mi	ndful	ness	1,2	
	being:	action to Mindfulness and Definition, importance, benefit ations in daily life.		and Well-being: Definition, importance, benefits, and applications in daily life.								
Π		I: Mindful Living	5		Technic				Min	dful	1,2	
11	Techn exercis	iques for Mindful Living: Breases, meditation practices, ment, and visualization.	athing		Living: meditat movem	Brea tion p	athin oracti	g ( ces,	exerc min	ises, dful		
III	Unit I	II: Emotional Intelligence	5		Emotio	nal	Intell	lige	nce	and	1,2	
	-	U	Self- itions, I self-		Self-Av Underst empath resilien strategi	tandin y .ce,	ıg	deve	emoti eloprr self-	nent,		
IV	Unit I	V: Mindfulness in daily life	5		Mindfu	lness	in	Da	ily I	Life:	1,2	
	Mindf person comm relatio	ulness in Daily Life: Applicati al and professional settings, m unication, and man nships.	indful aging		Applica profess commu relation	ional nicati	setti on, a	ngs, nd 1	, min mana	dful ging		
V	Advan term	V: Advanced Mindfulness Strate ced Mindfulness Strategies: 1 integration, overcoming challe practices, and case studies.	Long-		Advance Strategi integrate challen and case	ies: tion, ges,	•	L ov	ndful .ong-1 ercon practi	term ning		

#### **Text Books:**

- T1: Mindfulness in Plain English Bhante Henepola Gunaratana
- T2: The Miracle of Mindfulness Thich Nhat Hanh

#### **Reference Books:**

- R1: Wherever You Go, There You Are Jon Kabat-Zinn
- R2: The Headspace Guide to Meditation and Mindfulness Andy Puddicombe
- R3: The Mindful Path to Self-Compassion Christopher K. Germer

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme Outcome
1	Demonstrate an understanding of mindfulness principles and their impact on mental health.	1,3 & 4
2	Apply mindfulness techniques to enhance concentration, focus, and emotional regulation.	1,2
3	Develop stress management strategies for improved well-being and productivity.	7,9,10
4	Analyze the role of mindfulness in fostering resilience, empathy, and personal growth.	5,7
5	Integrate mindfulness practices into everyday life to maintain a balanced and stress-free lifestyle.	5,8

			SEMESTI	ER – VII									
Cour	se Title		Element	tary Stat	istical	Anal	ysis						
Сош	rse code	24RTCF415R	otal credits:		L	Т	P	S	R	O/F		С	
		To	otal hours:	45T	0	0	0	0	24	0		3	
	equisite	Nil Co	o-requisite		Nil								
	gramme			h in Civi	-		-						
Sen	nester		VII semeste		•								
	ourse ectives	<ol> <li>Describe the concept of statistical equation and apply them in understanding comple problems.</li> <li>Apply the concept of ordinary differential equations of higher orders.</li> <li>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.</li> </ol>										the	
	CO1	equations, and those solv	Solve first-order ordinary differential equations using exact, linear, Bernoulli's, Euler's equations, and those solvable for ppp, yyy, xxx, and Clairaut's type. Analyze and solve second-order linear differential equations with variable coefficients										
	CO2	using variation of parameters and the Cauchy-Euler equation.											
C	203	Evaluate complex function for analyticity, and ident	ify harmoni	c functio	ns and	their	conju	gates.					
C	CO4		Understand and analyze basic probability concepts, including probability spaces, conditional probability, independence, and various distributions.										
	205	Evaluate statistical methods with the statistical stat	hods for m ributions, ar	easures	of cen	tral t	enden	cy, m				ss,	
Unit- No.	Content		Contact Hour	Learni	ng Ou	tcom	e				1	KL	
I	equations Exact, Equations Equations equations equations	linear and Bernoulli's s, Euler's equations, s not of first degree: s solvable for p, s solvable for y, s solvable for x and	10	First-or include linear, Euler's Student not of solvable type ec enhance skills ir	unde and B equat ts will the t quation ing an	rstance ernou ions f also first pp, y ns. Th nalytic	ling a lli equ for rig learn t degree y, or nese c cal an	and subtraction and the second secon	olving ns, as ody dyn ndle eq cluding nnd Cl mes fo	exact, well as namics. uations those airaut's ocus on	1	1,2	
II	of higher Second equations coefficien	order linear differential with variable nts, method of variation ameters, Cauchy-Euler	10	will als Euler e second- useful i	skills in differential equations. Method of variation of parameters. Studen will also understand and solve the Cauch Euler equation, which is a specific type second-order linear differential equation useful in various applications.							1,2	
III	equations harmonic	<i>tiation:</i> iation, Cauchy-Riemann a, analytic functions, functions, finding conjugate; elementary functions(exponential, etric, logarithm) and	5	Gaining linear coeffici variatio student: Euler e order d its appl expertis	differe ients on of s will quation ifferen lication	ntial using pa learn n, a p tial e	equat tecl ramete n to so oarticu quatio	ions hniqu ers. solve lar ty n, and tion 1	with ves like Addit the C pe of s d composition	variable (e the ionally, Cauchy- second- prehend	]	1,2	

			complex differential equations found in various scientific and engineering contexts	
IV	<i>Basic probability:</i> Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution.	10	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:MeasuresBasic:MeasuresItendency:Moments,skewnessandKurtosis-Probabilitydistributions:Binomial,PoissonandNormal-evaluationofstatistical parametersforthreedistributions,Correlationand regression.Applied:TestLargesampletestforproportion.Differenceofproportions,singlemean,differenceofmeansanddifferenceofstandard deviations.	10	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

T1: Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006. T2: N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

#### **REFERENCE BOOKS:**

R1: S. Ross, A First Course in Probability, 6<sup>th</sup> Ed., Pearson Education India, 2002. R2: S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed. Wiley India, 1984.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Solve first-order ordinary differential equations using exact, linear, Bernoulli's, Euler's equations, and those solvable for ppp, yyy, xxx, and Clairaut's type.	1,2				
2	Analyze and solve second-order linear differential equations with variable coefficients using variation of parameters and the Cauchy- Euler equation.	1,2,3				
3	Evaluate complex functions through differentiation, using Cauchy- Riemann equations for analyticity, and identify harmonic functions and their conjugates.	2,4,5				
4	Understand and analyze basic probability concepts, including probability spaces, conditional probability, independence, and various distributions.	1,3,5				
5	Evaluate statistical methods for measures of central tendency, moments, skewness, kurtosis, probability distributions, and conduct significance tests for large samples.	1,2,3,4,5				

			SEMESTE	CR – VII								
Cour	se Title		Heavy Liftin	g Techni	iques d	& Mac	hine	ry				
Cour	se code	24BTCE414R	Total credits: Total hours:		L 3	T 0	P	<u>S</u>	R	0/F 0		C 3
Dro r	equisite	Nil	Co-requisite	451	3 Nil	U	0	U	0	U		3
	ramme		-	h in Civi		noorin	n .					
-	nester	F	all/ VII semeste		_		-	amm	Δ			
501	litstei				•		0			heavy	lif	ting
	ourse ectives	and provid techniques of 2. Provide the and tower movement. 3. Give the lea	3. Give the learners an understanding on design of load bearing structures and ho to develop a lift plan including the selection of suitable methods, machineric							and ines ntal now		
(	C <b>O</b> 1	Comprehend the bas	sic concepts of h	eavy lifti	ng							
C	202	Analyze the use of v	various heavy lift	ing proce	edures	in diff	erent	proje	ects			
C	203	Apply the tools, tacl	cles, gears and ed	quipment	requir	ed for	liftin	g or s	hiftin	g		
C	204	Create lift plan for h										
	:05	Create work plan fo	r heavy equipme	nt based	on site	condi	tions					
Unit- No.		Content		Contact Hour		Lea	rnin	g Ou	tcome	2		KL
I	lifting in engineeri Machiner advantage of reeving forces on	a of heavy lifts, Example of heavy lifts, Example various industries, ng mechanics in ry for heavy liftin e of lifting and shiftin g, Lever principle and load handling elemer	Application of heavy lifting, g, Mechanical g, Applications d calculation of tts.	10	mech Macl Mech and reevi	shifti ing,	in for adv ing, Lever of	he vantag App r pr forc	avy eavy ge of olication		, ç f	1,2
П	lifting be Limitation gear, Cal and sling Ropes Elements and shift classificat right usag Classificat cranes, L	on of shackles, wire eams, Right use of n of pre-engineered culate of forces on y g capacity. Applica Spreader/Lifting I of Lifting Machines, ing machines & cor- tion, terminologies, a ge during execution. ation and compone coad charts, safety a nes. Case studies	f shackle and product, lifting wire rope sling tions of Wire Beam, Basic Various lifting nponents, their pplication, and	5	Sprea Eleme Vario machi classi	us l ines of fication cation,	ting of I ifting & c n,	Bo Lifting g a compo	nd onents ærmin	Ropes Basic achines shifting s, their ologies e during	, , ,	1,2
III	Applicati for horiz Hydraulic types of j control sy in heavy	ion of hydraulics a ontal movement c systems and basi acks and applications ystems. Application	c components, , principles and of Strand jacks	10	Dime Over confi load	sportat ensiona weight iguration of the	ion al Car t Car on ba cons	argos gos ( ised o ignm	OWC on the ent, th	in Over C) and ), trailer e size & he basic Skidding		1,2

	(ODC) and Overweight Cargos (OWC), trailer configuration based on the size & load of the consignment, the basic principle of friction & Skidding System, Components and its application in project sites, Wheel bogies & its application, Rail and Sea transport & lashing.		System, Components and its application in project sites, Wheel bogies & its application, Rail and Sea transport & lashing.	
IV	Design of load bearing structures and lift plan Design Basis of Handling Provisions, Design procedure for bolted type, welded case, link plates and trunnions. Parameters affecting the Handling Provisions, Design of Lifting lugs- Bolted, welded case, link plates and trunnions. Design of Load Bearing Structures and Enabling Structures, Stress limitation with respect to yield stress of steel structure, standard design procedure for Girders and Lifting beams. multilevel of spreader beam and Grillage.	10	Understanding the Design of Lifting lugs- Bolted, welded case, link plates and trunnions. Design of Load Bearing Structures and Enabling Structures, Stress limitation with respect to yield stress of steel structure, standard design procedure for Girders and Lifting beams. multilevel of spreader beam and Grillage	1,2
V	Alternate methodologies and safety Pre-cast construction with Case studies, Push Launching and float over installation with method, Hydraulic Lifting Gantries, and their applications. Hydraulic Lifting Gantries, Safety Requirements for Crane and lifting operations, load test procedures and inspection check list, Importance of PPEs and signals used for crane operation, Safe methods to avoid Crane accidents.	10	Understanding Pre-cast construction with Case studies, Push Launching and float over installation with method, Hydraulic Lifting Gantries, and their applications. Hydraulic Lifting Gantries, Safety Requirements for Crane and lifting operations, load test procedures and inspection check list, Importance of PPEs and signals used for crane operation, Safe methods to avoid Crane accidents.	1,2

### Textbook:

T1. L&T EduTech LMS

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	Understand the significance of literature review in research and academic writing.	1,2					
2	Develop skills to search, identify, and evaluate scholarly literature.	1,2,3					
3	Synthesize information from multiple sources to develop coherent arguments.	2,4,5					
4	Analyze existing research to identify gaps and formulate research questions.	1,3,5					
5	Apply proper citation and referencing techniques in literature reviews.	1,2,3,4,5					

			SEMES	ΓER – VII	[						
Cour	se Title			Literatur	e Revi	iew					
Cour	se code	24BTCE416R	Total Credit	s: 3	L	Т	P	S	R	O/F	C
Cour	se coue		Total Hours:		0	0	0	0	24	0	3
	equisite	Nil	Co-requisite		Nil						
-	ramme			ech in Civi							
Sen	nester		ll/ VII semeste		-			-			
	<ul> <li>Course</li> <li>Objectives</li> <li>1. To introduce students to the importance of literature review in acader research writing.</li> <li>2. To develop skills in identifying, analyzing, and synthesizing scholarly and research papers.</li> <li>3. To equip students with techniques for critical evaluation of existing research</li> </ul>						nolarly g resear	articles			
C	201	Understand the sign	ificance of lite	rature revie	ew in 1	resear	ch an	id aca	demic v	writing.	
	02	Develop skills to se				-					
C	03	Synthesize informat							•		
	O4	Analyze existing res								s.	
	05	Apply proper citation	on and reference			1 litera	ature	revie	WS.		
Unit-		Content		Contact		Le	arniı	ng O	utcome		KL
No.	Tutus das a	tion to Titonoto	na Darriarry	Hour				-			+
I	Searchin Literatur	on, Purpose, T nce in Research.	Ypes, and g Relevant es, Keywords,	Understandthefoundation10aspects of literature review.Developproficiency in literation						1,2 1,2	
П	summari Structuri Review:	Analysis and ng credibility, ident izing key findings. ing and Writing Components, Lo c and Chronological	a Literature ogical Flow,	5	analy Lear	yze ar n to	nd syn struc	nthes: ture	to cr ize litera and pro ectively	ature. esent a	2,3 2,3,4
III	Reference question etc.), Pla Introduc Definitio	lentifying Research Gaps and eferencing: Formulating research uestions, Citation styles (APA, IEEE tc.), Plagiarism avoidance. htroduction to Literature Review definition, Purpose, Types, and nportance in Research.			and j Unde	proper erstan	r refe d	renci the	ng tech	fication niques. lational	3,
IV	Searchin Literatur Boolean Critical Evaluatir summari	ng and Identifyin re: Research database operators, Citation tr Analysis and ng credibility, ident izing key findings.	es, Keywords, racking. Synthesis: ifying biases,	<ul><li>Develop proficiency in literature search and identification.</li><li>10 Gain the ability to critically analyze and synthesize literature.</li></ul>					1,2		
V	Review:	Structuring and Writing a Literature Review: Components, Logical Flow, Thematic and Chronological Approaches.							and pro	esent a	2,3,4

#### **Text Books:**

- T1: Mindfulness in Plain English Bhante Henepola Gunaratana
- T2: The Miracle of Mindfulness Thich Nhat Hanh

#### **Reference Books:**

- R1: Wherever You Go, There You Are Jon Kabat-Zinn
- R2: The Headspace Guide to Meditation and Mindfulness Andy Puddicombe
- R3: The Mindful Path to Self-Compassion Christopher K. Germer

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	Understand the significance of literature review in research and academic writing.	1,3 & 4					
2	Develop skills to search, identify, and evaluate scholarly literature.	1,2					
3	Synthesize information from multiple sources to develop coherent arguments.	7,9,10					
4	Analyze existing research to identify gaps and formulate research questions.	5,7					
5	Apply proper citation and referencing techniques in literature reviews.	5,8					

			SEMES'	FER – VI	I						
Cour	se Title		E	stimation	& Cos	sting					
Cour	se code	24BTCE413R	<b>Total Credits:</b>	L	Т	Р	S	R	O/F	С	
Cour	se coue		<b>Total Hours: 1</b>	5T+30P	0	0	2	0	0	0	1
Pre-re	equisite	Nil	<b>Co-requisite</b>		Nil						
0	ramme			ech in Civ	-		-				
Sen	nester		Fall/ VII semeste		÷			0			
			uce students to th	e principle	es of es	stimat	ion a	nd co	sting ii	n civil	
Co	ourse	engineeri	e e								
	ectives		op skills in quanti		-						
- ~ <b>j</b>			students with tec	hniques fo	r prepa	aring	letail	ed es	timates	s for	
	101		ion projects				•1	•	•		
	201	Understand the pr	•		•			•	•		
	02	Develop proficiency in quantity surveying and cost estimation techniques.									
	03	Prepare detailed estimates and analyze project costs. Apply contract procedures and tender documentation in civil engineering projects.									
	04										
Unit-	05	Evaluate cost estimates and manage construction budgets effectively.							1		
No.		Content		Contact Hour	Learning Outcome					KL	
110.	Introduc	tion to Estimation	n & Costing:	nour	Understand fundamental						
I	Purpose.		nd Types of	9		iples	u of	est	imatio		
1	Estimate	· ·	lid Types of		costi		01	031	mano	ii and	1,2
	Quantity		Methods of		Deve	•	ski	ls	in c	quantity	
II	Measure			9		eying		and		imation	
	Preparat	,				niques					
111	· •	alysis: Cost of M	aterials, Labor,	9				cy in	rate a	analysis	
III	Equipme	ent, Overheads, and	Profits.	9	and a	cost es	stima	tion.		-	2,3
Prepara		ion of Detaile	ed Estimates:		Laam	n to	nrot	ara	and a	evaluate	
IV	Building	s, Roads, and Othe	er Infrastructure	9	1		· ·			valuale	2,3,4
Projects. detailed project est											
	Contract		,			•				es and	
V		ntation, and Bu		9	mana	•	-	roject	t	budgets	3,4,5
	Aspects,	Bidding, Cost Cor	ntrol.		effec	tively	<b>.</b>				

# **Text Books:**

- T1: Estimating and Costing in Civil Engineering B.N. Dutta
- T2: Quantity Surveying and Valuation Rangwala

### **Reference Books:**

- R1: Estimating and Costing G.S. Birdie
- R2: Civil Engineering Contracts and Estimation S.C. Rangwala
- R3: PWD Schedule of Rates and Analysis of Rates (Latest Edition)

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Programme Outcome					
1	Understand the principles of estimation and costing in civil engineering.	1,3 & 4					
2	Develop proficiency in quantity surveying and cost estimation techniques.	1,2					
3	Prepare detailed estimates and analyze project costs.	7,9,10					
4	Apply contract procedures and tender documentation in civil engineering projects.	5,7					
5	Evaluate cost estimates and manage construction budgets effectively.	5,8					

		SEMI	ESTER – VII	I							
Cour	rse Title	]	Foundation <b>H</b>	Engineerin	g						
Cour	rse code	24BTCE422R	l credits: 4		T	P	S	R	O/F	C	
Dro r	requisite		l hours: 60T Co-requisite		0	0	0 Nil	0	0	4	
	gramme		Tech in Civi		ina		INII				
	mester	Winter/ VIII ser				nnog	nomm	0			
Sei	nester			-					oundat	ion	
	ourse jectives	<ul><li>analysis.</li><li>2. To develop students the ability parameter for foundation anal</li><li>3. To prepare students for the effective students for the effective students.</li></ul>	<ol> <li>To introduces to students the fundamental concepts of soil mechanics and foundation analysis.</li> <li>To develop students the ability to interpret field and laboratory data to get design parameter for foundation analysis.</li> <li>To prepare students for the effective use of the commonly used formulas, tables and figures in the design and analysis of shallow and deep foundations.</li> </ol>								
	CO1 CO2	Demonstrate proficiency in class and conducting analysis and des Understand the principles of foo settlement considerations, and th	ign for variou ting design, in	s foundation	on sys	stems nent o	of bear	ring c	apacit		
(	C <b>O</b> 3	Analyze lateral earth pressure co Rankine and Coulomb's theories Analyze factors influencing bear	nsidering var , surcharge, v	ious factor vater table,	s suc wall	h as e fricti	arth pi on etc.	ressu	re at re		
(	C <b>O</b> 4	determining allowable bearing p Design deep foundations consider	ressure.								
(	C <b>O</b> 5	group action, negative skin fricti	-		-	_				,	
Unit- No.		Content	Contact Hour		-		utcon			KL	
I	types ar	ction: Classification of foundation of principles of selection. Analysi ign of foundations, types of ions.		Understand the classification of foundation types and the principle for selecting appropriate foundations for various structures					iples	1, 2	
II	footings	ments for satisfactory action of Bearing capacity and settlement ions; ground movements due to option	of 10	Evaluate the bearing capacity and settlement characteristics of foundations and analyze ground movements due to construction.					d	1, 2, 3, 4	
III	Rankine and pas	earth pressure: Earth pressure at r e and Columb's theories for active sive states, influence of surcharge ble, wall friction and deformation essure.	, 5	Apply th pressure Rankine' retaining various i	theor s and struc	ies, ir Coul tures	ncludir omb's, consic	ng to de lering	0	1, 2, 3, 4, 5	
IV	factors a of eccer Determ	foundation: Terzaghis theory, affecting bearing capacity, influer atric and inclined loads. nation of allowable bearing press portioning of footing on clay and	pacity, influence ads. bearing pressureshallow foundations using Terzaghi's theory and determine th allowable bearing pressure and					e the	2, 3, 4		
V	bearing sand, In action, 1 pile gro	undation: Uses and types of piles capacity of single pile in clay and dian standard pile load test, group negative skin friction, settlement of ups. Piers and caisson foundation s of well foundation, depth of we	1 2 5 5 s,	Assess the foundation evaluate settlement well as un forces ac	ons, in their nt, and nders	nclud bearin d grou tand t	ing pil ng cap 1p acti the ele	es, ai acity on, a ment	nd , s s and	2, 3, 4, 5	

foundation, list of forces acting on well.			
--------------------------------------------	--	--	--

- T1: Soil Mechanics by Craig R.F., Chapman & Hall
- T2: Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
- T3: Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.
- T4: Ranjan G., Rao A.S.R (2011), Basic and Applied Soil Mechanics
- T5: Saran S. (2015) Analysis and Design of Substructures
- T6: Punmia B.C. (2005), Soil Mechanics And Foundation Engineering.

## **REFERENCE BOOKS:**

- R1: Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 1999.
- R2: B.M. Das, Principles of Foundation Engineering, 5th Ed., Thomson Asia, Singapore, 2003.
- R3: N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003
- R4: An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Demonstrate proficiency in classifying foundation types, applying principles of selection, and conducting analysis and design for various foundation systems	1,2,3,4,5,6,7,12				
2	Understand the principles of footing design, including assessment of bearing capacity, settlement considerations, and the impact of ground movements during construction	1,2,3,4,5,6,7,12				
3	Analyze lateral earth pressure considering various factors such as earth pressure at rest, Rankine and Coulomb's theories, surcharge, water table, wall friction etc.	1,2,3,4,5,6,7,12				
4	Analyze factors influencing bearing capacity, addressing eccentric and inclined loads and determining allowable bearing pressure.	1,2,3,4,5,6,7,12				
5	Design deep foundations considering factors such as bearing capacity, pile load tests, group action, negative skin friction, and settlement according to Indian standards.	1,2,3,4,5,6,7,12				

				SEMEST	ER – VII	I							
Course Title Application of AI in Engineering													
Course code		24BTCE413RTotal crTotal ho		edits: 3		L	Т	P	S	R	O/F	C	
				Total ho	Total hours: 45T		3	0	0	0	0	0	3
Pre-requisite			Nil	Co-requisite						Nil			
Programme		B. Tech in Civil Engineering											
Ser	nester	Winter/ VIII semester of fourth year of the programme											
Course Objectives		<ol> <li>To introduce students to the principles of estimation and costing in civil engineering.</li> <li>To develop skills in quantity surveying and rate analysis.</li> <li>To equip students with techniques for preparing detailed estimates for construction projects.</li> </ol>											
(	C <b>O</b> 1	Understand the principles of estimation and costing in civil engineering.											
C	CO2	Develop proficiency in quantity surveying and cost estimation techniques.											
C	CO3	Prepare detailed estimates and analyze project costs.											
	CO4	Apply contract procedures and tender documentation in civil engineering projects.											
	CO5	Evaluate cost estimates and manage construction budgets effectively.											
Unit- No.		Content			Contact Hour		Learning Outcome						KL
Ι	Purpose	Introduction to Estimation & Costing: Purpose, Importance, and Types of Estimates.			10	Understand fundamental principles of estimation and costing.						iples	1,2
II	Quantity Surveying: Methods of Measurement, Abstracting, and Bill Preparation.			ill	5	surv	evelop skills in quantity rveying and estimation chniques.						1,2
III	Rate Analysis: Cost of Materials, Labor, Equipment, Overheads, and Profits.				10		-	proficiency in rate analysis cost estimation.					
IV	Building	Preparation of Detailed Estimates: Buildings, Roads, and Other Infrastructure Projects.			10	1	Learn to prepare and evaluate detailed project estimates.						2,3,4
V	Contract Procedures, Tender Documentation, and Budgeting: Legal Aspects, Bidding, Cost Control.			10	· ·	ply contract procedures and nage project budgets effectively.						3,4,5	

## **Text Books:**

- T1: Estimating and Costing in Civil Engineering B.N. Dutta
- T2: Quantity Surveying and Valuation Rangwala

## **Reference Books:**

- R1: Estimating and Costing G.S. Birdie
- R2: Civil Engineering Contracts and Estimation S.C. Rangwala
- R3: PWD Schedule of Rates and Analysis of Rates (Latest Edition)

CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome			
1	Understand the principles of estimation and costing in civil engineering.	1,3 & 4			
2	Develop proficiency in quantity surveying and cost estimation techniques.	1,2			
3	Prepare detailed estimates and analyze project costs.	7,9,10			
4	Apply contract procedures and tender documentation in civil engineering projects.	5,7			
5	Evaluate cost estimates and manage construction budgets effectively.	5,8			

		SEMEST	FER – VII	I									
Course Title Construction Practice & Management													
Course code		24BTCE421R	l credits: hours: 6(		T 0	P 0	<b>S</b>	R 0	0/F	C 4			
Pre-requisite			-requisite		U	U	Nil	U	U	4			
Programme					ring		1 111						
	ProgrammeB. Tech in Civil EngineeringSemesterWinter/ VIII semester of 4th year of the programme												
Course Objectives		<ol> <li>Develop knowledge of material science and behavior of various building materials used in construction.</li> <li>Identify the construction materials required for the assigned work.</li> <li>Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc.</li> </ol>											
C	201	Recognize the various phases associated with simple residential and commercial construction.											
	202	Identify and use correctly a wide variety of hand and power tools associated with the construction industry. Understand current construction industry trends and become familiar with standards for											
	203	1 V	quality construction and trends in building technology.										
С	204	Understand construction procedure of different components											
С	205	Understand the property, use, advantage and disadvantage of different material used in construction.											
Unit- No.		Content	Contact Hour	Learning Outcome						KL			
Ι	Require Superst Aim O	<b>DUCTION-</b> Objectives, ements Of Foundation, Aim Of ructure, Types Of Construction, f Site Inspection, Laying Out The g Plan At Site For Foundation	15	Students the objec building of supers gain prof planning involved plan at the foundation	tives found tructu iciend , and in lay	and relation ares. The provide the provided	equire s and They v site in cocess- out a b uring a	the a will a spect es uildi	ts of im lso tion, ng	1, 2			
Π	Specific activitie Site Cle masonr – floori constru expansi Buildin tempora – slip fo forms – trusses brick –	<b>TRUCTION PRACTICES</b> cations, details and sequence of es and construction co-ordination – earance – Marking – Earthwork - y – stone masonry – Bond in y - concrete hollow block masonry ng – damp proof courses – ction joints – movement and on joints – pre cast pavements – g foundations – basements – ary shed – centering and shuttering orms – scaffoldings – de-shuttering - Fabrication and erection of steel – frames – braced domes – laying - weather and water proof – roof a – acoustic and fire protection.	15	Students will learn to describe and sequence construction activities, ensuring proper coordination on- site. They will understand specifications and details for site clearance, earthwork, masonry, concrete block masonry, flooring, damp proofing, and various joint constructions. Additionally, they will be able to manage temporary structures, steel fabrication, and the installation of weatherproof and fire protection systems.					es, on- ite y, int ey ary d	2, 3, 4			
III	SUB ST Technic	<b>TRUCTURE CONSTRUCTION</b> ques of Box jacking – Pipe Jacking water construction of diaphragm	10	Students of advance construct	ced su	ıbstru	icture		-	1, 2, 3, 4			

	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.		box and pipe jacking, underwater diaphragm walls, basement construction, tunneling, and piling. They will be skilled in handling deep excavations, dewatering, and installing well points, as well as using stand-by equipment for underground excavations.	
IV	SUPERSTRUCTURE 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.	10	Students will develop the ability to oversee the construction and erection of superstructures, including launching girders, bridge decks, offshore platforms, and special forms for shells. They will be proficient in techniques for handling and erecting heavy decks and lightweight components, supporting high-rise structures, and assembling articulated and braced dome structures.	1, 2
V	<b>CONSTRUCTION EQUIPMENT</b> 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.	10	Students will be able to identify and select appropriate construction equipment for diverse activities such as earthwork, foundation work, pile driving, and concreting. They will also learn about equipment for compaction, batching, mixing, material handling, structure erection, dredging, trenching, and tunneling.	2, 3, 4, 5

- T1: Building construction: metric volume 1 by WR McKay.
- T2: Fundamentals of building construction: materials and methods by Edward Allen and Joseph Iano.

### **REFERENCE BOOKS:**

R1: Building materials and construction book with reference to B.C.Rangawala, Sushil Kumar, B.P.Bindra, A.Kamala.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Programme Outcome				
1	Recognize the various phases associated with simple residential and commercial construction.	1,2,3,4,5,6,7,12				
2	Identify and use correctly a wide variety of hand and power tools associated with the construction industry.	1,2,3,4,5,6,7,12				
3	Understand current construction industry trends and become familiar with standards for quality construction and trends in building technology.	1,2,3,4,5,6,7,12				
4	Understand construction procedure of different components	1,2,3,4,5,6,7,12				
5	Understand the property, use, advantage and disadvantage of different material used in construction.	1,2,3,4,5,6,7,12				

		SE	EMEST	TER – VII	I									
Cour	·se Title	Research Based Course III												
Cour	se code	24BTCE414R	l credits:	6	L	Т	P	S	R	O/F	C			
Cour	se coue	24D1CE414K	Total	hours: 15	5T	0	0	0	0	0	64	6		
Pre-r	equisite	Nil	Co-	requisite					Nil					
Prog	ramme			ch in Civi	-									
Sen	nester	Winter/ VI			-			-						
C	ourse	<ol> <li>To develop research s</li> <li>To enable students to</li> </ol>												
	ectives	3. To familiarize studen							•			niques.		
(	C <b>O</b> 1	Demonstrate an understanding	ng of re	search me	ethodo	ologi	es an	d tech	nique	s.				
C	CO2		Conduct literature reviews to identify gaps in existing research.											
C	203	Develop problem-solving skills by designing and executing research projects.												
C	CO4	Analyze and interpret research data using appropriate tools.												
C	CO5	Communicate research findings effectively through written and oral presentations.												
Unit- No.		Content		Contact Hour		L	earni	ng O	utcon	ne		KL		
	Introduc	ction to Research: Defin	nition,		Und	Understanding fundamental								
Ι		nce, Types, and Ethics in Res	· · ·	18		esearch principles and ethical onsiderations.								
II	Identifie	re Review and Research Gap cation: Techniques for review re and formulating research ns.	ing	18		-	-	-	y in lit 1 gap a			1,2		
III		h Methodologies: Qualitative ative, and Mixed Methods ches.	,	18	appl		appro	opriat	select e rese		und	2,3		
IV		ollection and Analysis: Techni and Interpretation of Research	-	18	usin		tistica		search quali			2,3,4		
V	Structur	h Writing and Presentation: ring a Research Paper, Citation and Effective Presentation pues.	n	18	Develop skills in academic writing and research presentation.									

#### **Text Books:**

T1: Research Methodology: Methods and Techniques - C.R. Kothari

T2: The Craft of Research - Wayne C. Booth

#### **Reference Books:**

- R1: Research Design: Qualitative, Quantitative, and Mixed Methods Approaches John W. Creswell
- R2: Conducting Research Literature Reviews Arlene Fink
- R3: How to Write a Thesis Umberto Eco

	CO PO Mapping									
SN	Course Outcome (CO)	Mapped Programme Outcome								
1	Demonstrate an understanding of research methodologies and techniques.	1,3 & 4								
2	Conduct literature reviews to identify gaps in existing research.	1,2								
3	Develop problem-solving skills by designing and executing research projects.	7,9,10								
4	Analyze and interpret research data using appropriate tools.	5,7								
5	Communicate research findings effectively through written and oral presentations.	5,8								



# Assam down town University

# **Curriculum and Syllabus**

# Bachelor of Technology in Mechanical Engineering

OUTCOME BASED EDUCATION FRAMEWORK CHOICE BASED CREDIT SYSTEM Version: 2.2

# FACULTY OF ENGINEERING July, 2024

# 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 Board of Studies (BOS) meeting of the Faculty of Engineering held on dated 16/07/2024 and approved by the 51<sup>st</sup> Academic Council (AC) meeting held on dated 26/07/2024.

In

Chairperson, Board of Studies

Aroney

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:**

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

The curriculum provides skill enhancement and value-added courses along with the core papers.

#### **II.** Eligibility Criteria:

Minimum 45% in 10+2 with Mathematics, Physics & Chemistry.5% relaxation for SC/ST, EWS, and Especially abled candidates.

#### **III.** Programme 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. Programme 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. Programme Outcome (PO):

- **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: 175

#### **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 weight age 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 insemester (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	<b>Components/ Examinations</b>	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

<b>S. N.</b>	Level	Questions /verbs for test
1	Remember	List, Define, tell, describe, recite, recall, identify, show who, when,
1	Kemember	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,
4	Allalyze	etc.
5	Evaluate	Assess, summarize, choose, evaluate, recommend, justify, compare
5	Evaluate	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

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-Voice etc.:

- i) Practical examination shall be conducted in the presence of one external expert and one or more internal examiners.
- ii) Viva-Voice, 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,  $CP = GP \times CR$ 

#### 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 weight age 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.

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

#### **Table 2: Letter Grades and Grade Points**

#### 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.

$$SGPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$
(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<sup>th</sup> 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 enrolled Programme.
- (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.

$$CGPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i}$$
(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 performa 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 Flipped Classroom approach Cooperative learning approach	05% 10% 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.

# **Breakdown of Credits**

Sl. No	l. No Category		Total number of Credits
		Skill Enhancement Course (SEC)	2
1		Ability Enhancement Course (AEC)	5
	University Core (UC)	Field Training	2
		Discipline Specific Elective (DSE)	2
		Value Added Course (VAC)	4
2	Liniversity Elective (LE)	Multidisciplinary Course (MDC)	2
	University Elective (UE)	Value Added Course (VAC)	6
		Discipline Specific Core (DSC)	96
3	Dragman Cara (DC)	Field Training	4
5	Programme Core (PC)	Research /Industry Internship	4
		Summer Internship	2
4	Programma Electiva (DE)	Discipline Specific Elective (DSE)	24
4	Programme Elective (PE)	Value Added Course (VAC)	6
5	Faculty Core (FC)	Skill Enhancement Course (SEC)	6
5	Faculty Core (FC)	Ability Enhancement Course (AEC)	10
		Total	175

# Breakdown by categories of courses

Sl. no	Category	Credits	%
1	Engineering	120	68.58
2	Science	18	10.29
3	Value added course	20	11.42
4	Humanities	17	9.71
	Total	175	100

	S. Course Code Course Title				]	Eng	gag	em	ent	ţ	Maximum Marks for					
	No.	Course Code	Course litle	Category	L	T	P	S	R		С	IA*	SEE*	PE*	Total	
1	1	24BTME111R	Calculus and Linear Algebra	DSC	3	0	0	0	0	0	3	40	60	0	100	
	2	24BTME112R	Introduction to Basic	DSC	2	1	2	0	0	0	4	40	(0	100	200	
	2	24BTME112K	Mathematics, Logic and Coding	DSC	2	1	2	0	0	0	4	40	60	100	200	
	3	24BTME113R	Physics for Engineers	DSC	2	1	2	0	0	0	4	40	60	100	200	
Semester I	4	24BTME114R	Workshop/Manufacturing Practice	DSE	0	0	2	0	0	0	1	0	0	100	100	
Sen	5	24MOCE111R	MOOCS Ethics in Engineering	VAC	1	0	4	0	0	0	3	40	60	100	200	
	6	24BTME115R	Industrial Visit		0	0	0	0	0	16	1	0	0	100	100	
	7	24UBPD113R	Introductory English for Engineers	SEC	0	0	4	0	0	0	2	0	0	100	100	
	8	24UBEC111	Extra-curricular	VAC	0	0	0	4	0	0	1	0	0	100	100	
			Total		8	0	12	4	0	16	19	160	240	700	1100	
	<b>S.</b>	<b>Course Code</b>	Course Title	Course		E	nga	age	me	nt		Max	timum	Marl	ks for	
	No.	Course Coue	Course Title	Category	L	Т	P	S	R	0	C	IA*	SEE*	PE*	Total	
	1	24BTME121R	ODE, Probability and Statistics	DSC	4	0	0	0	0	0	4	40	60	0	100	
	2	24BTME122R	Chemistry for Engineers	DSC	2	0	2	0	0	0	3	40	60	100	200	
	3	24BTME123R	Engineering Drawing	DSC	0	0	4	0	0	0	2	40	60	100	200	
er II	4	24BTME124R	Problem solving and Python Programming	DSC	2	0	2	0	0	0	3	40	60	100	200	
Semester II	6	24MOCE122R	MOOCS Ethics, Technology and Engineering	VAC	0	0	0	0	0	0	1	0	0	100	100	
	7	24BTME125R	Field-based Training	AEC	0	0	0	0	0	16	1	0	0	100	100	
	8	24BTME126R	Environmental Science	AEC	2	0	0	0	0	0	2	40	60	0	100	
	9	24UBPD123R	PDP	AEC	0	0	4	0	0	0	2	0	0	100	100	
	10	24UBEC121	Extra - Curricular	VAC	0	0	0	4	0	0	1	0	0	100	100	
	Total			10	0	12	4	0	16	19		300	600			
	<b>S.</b>	<b>Course Code</b>	Course Title	Course		E	nga	age	me				imum			
	No.		Course Thie	Category	L	Т	P	S	R	0		IA*		PE*	Total	
	1	24BTME211R	Biology for Engineers	SEC	2	1	0	0	0	0	3	40	60	0	100	
	2	24BTME212R	Transform and Discrete Mathematics	DSC	2	1	0	0	0	0	3	40	60	100	200	
	3	24BTME213R	Introduction to Electrical and Electronics Circuit	DSC	2	0	2	0	0	0		40	60	0	100	
	4	24BTME214R	Engineering Mechanics	DSC	2	1	2	0	0	0		0	0	100	100	
	5	24BTME215R	Basic Thermodynamics	DSC	2	1	0	0	0	0		40	60	0	100	
La	6	24BTME216R	Techno-Professional Skills II	DSC	0	0	2	0	0	0		40	60	0	100	
este	7	24BTME217R	Field Based Training	DSE	0	0	0	0	0	16	1	0	0	100	100	
Semester III	8	24BTME218R	Design of Fire & Life Safety System	DSC	3	0	0	0	0	0	3	40	60	100	200	
	9	24UBPD213R	English for Employability Skills	MDC	0	0	4	0	0	0	2	0	0	100	100	
	10	24UBEC211	Extra-curricular	AEC	0	0	0	4	0	0		0	0	100	100	
[	11	24UULS212R	Basic Life Saving Skills	VAC	0	0	2	0	0	0		0	0	100	100	
[	12	24UUFL211R	Personal Financial Planning	SEC	0	0	2	0	0	0	1	0	0	100	100	
			MOOCS II													
	13	24MOSY211R	Computational Thinking for Problem Solving	VAC	0	0	0	0	0	0	1	0	0	0	100	

#### SEMESTER WISE COURSE DISTRIBUTION

	<b>S.</b>		C T'4	Course	Engagement							Maximum Marks for				
	No.	Course Code	<b>Course Title</b>	Category	L	Т	P	S	R	0	C	IA*	SEE*	PE*	Total	
	1	24BTME221R	Applied Thermodynamics	DSC	3	0	0	0	0	0	3	40	60	0	100	
	2	24BTME222R	Fluid Mechanics & Fluid Machines	DSC	3	0	2	0	0	0	4	40	60	100	200	
	3	24BTME223R	Strength of Materials	DSC	2	0	2	0	0	0	3	40	60	100	200	
1	4	24BTME224R	Engineering Materials and Applications	DSC	2	0	2	0	0	0	3	40	60	100	200	
Ν	5	24BTME225R	Instrumentation and Control	DSC	2	0	2	0	0	0	3	40	60	100	200	
ster	6	24BTME226R	Ambience Control System Design	DSC	3	0	0	0	0	0	3	40	60	0	100	
Semester	7	24UBPD223R	English Language Proficiency for Engineers	AEC	0	0	4	0	0	0	2	0	0	100	100	
	8	24UBCC221	Co-curricular	AEC	0	0	0	4	0	0	1	0	0	100	100	
	9	24UBEC221	Extra-curricular	AEC	0	0	0	4	0	0	1	0	0	100	100	
	10	24BTCE227R	Techno-Professional Skills III	DSC	0	0	2	0	0	0	1	0	0	100	100	
	12	24MOCE221R	MOOCS III	VAC	0	0	0	0	0	0	1	0	0	100	100	
	14	24UULS221R	Basic Acclimatizing Skills (BAS)	VAC	0	0	2	0	0	0	1	0	0	100	100	
			Total		15	0	16	8	0	0	26		360	100 0	1600	
	<b>S.</b>	<b>Course Code</b>	<b>Course Title</b>	Course			Enga				1		imum			
	No.			Category	L	Т	Р	S	R	0	C	IA*	SEE*		Total	
	1	24BTME311R	Heat Transfer	DSC	3	0	2	0	0	0	4	40	60	100	200	
	2	24BTME312R	Manufacturing Processes	DSC	3	0	2	0	0	0	4	40	60	100	200	
	3	24BTME313R	Kinematics and Dynamics of Machines	DSC	3	0	2	0	0	0	4	40	60	100	200	
	4	24BTME314R	Utility Systems for Industrial Facilities	DSC	3	0	0	0	0	0	3	40	60	0	100	
	5	24BTME315R	Industrial Piping and Pipeline Engineering	DSC	3	0	0	0	0	0	3	40	60	0	100	
$\sim$	6	24BTME316R	Field Based Training	DSC	3	0	0	0	0	0	3	40	60	0	100	
r V	7	24BTME317R	Summer Internship	DSC	2	0	0	0	0	0	2	40	60	0	100	
ester	8		Professional Practice, Law & Ethics	DSC	0	0	4	0	0	0	2	0	0	100	100	
Sem	9	24UBPD314R	Professionability Employability Enhancement Skills	AEC	0	0	0	4	0	0	1	0	0	100	100	
	10		Essence of Indian Traditional Knowledge	AEC	0	0	0	4	0	0	1	0	0	100	100	
	11	24UBEC311	Storage Learning Plan: Block Storage Or, Infrastructure Security Learning Plan	VAC	0	0	0	0	0	0	1	0	0	0	100	
	12	24UBEC312	Extra Curricular	SEC	0	0	0	4	0	0	1	0	0	0	100	
	13	24UBPD315R	Competent English for Engineers	AEC	0	0	4	0	0	0	2	0	0	100	100	

	S.	Course Code	Course Title	Course		E	nga	ige	mer	nt		Ma	iximur fo		arks	
	No.			Category	L	Т	Р	S	R	0	C	IA*	SEE*	PE*	Total	
	1	1     24BTME321R     Advanced Manufacturing Processes     DSC     4		4	0	0	0	0	0	4	40	60	0	100		
Ν	2	24BTME322R	Machine Element and System Design	DSC	3	0	2	0	0	0	4	40	60	100	200	
Semester	3	24BTME323R	Mechatronics, Robotics and Control	DSC	3	0	0	0	0	0	3	40	60	0	100	
ne	4	24BTME324R	Introduction to Neural Network	DSC	3	0	0	0	0	0	3	40	60	0	100	
Sen	5	24BTME325R	Design & Simulation of Process Plant Equipment	DSC	3	0	0	0	0	0	3	40	60	0	100	
	6	24MOCE321R	MOOCS	VAC	1	0	0	0	0	0	1	0	0	0	100	
	7	24UBEC321	Extra Curricular	SEC	0	0	0	4	0	0	1	0	0	0	100	
	8	24UBPD324R	Corporate Proficiency for Engineers	AEC	0	0	4	0	0	0	2	0	0	100	100	
			Total		17	0	2	0	0	0	31	240	360	200	900	
	S.	Course Code Course Life	Course	Engagement				Maximum Marks for								
	No.			Category	L	Т	Р	S	R	0	C	IA*	SEE*	PE*	Total	
	1	24BTME411R	Power Plant Engineering	DSC	3	0	0	0	0	0	3	40	60	0	100	
Semester '	2	24BTME412R	Production and Operation Management	DSC	3	0	0	0	0	0	3	40	60	0	100	
Je	3	24BTME413R	Design of Static Equipment	DSC	3	0	0	0	0	0	3	40	60	0	100	
en	4	24BTME414R	Elementary Statistical Analysis	DSC	3	0	0	0	0	0	3	40	60	0	100	
Ś	5	24BTME415R	Literature Review	DSC	0	0	0	0	24	0	3	0	0	100	100	
	6	24MOCE411R	MOOCS	VAC	0	0	0	0	0	0	2	0	0	100	100	
			Total		12	0	0	0	24	0	17	160	240	200	600	
	S. No.	Course Code	Course Title	Course Category		E	nga	ige	mer	ıt			ximum Marks for			
	110.				L	Т	Р	S	R	0	C		SEE*	PE*		
	1	24BTME421R	Total Quality Management	DSC	4	0	0	0	0	0	4	40	60	0	100	
er	2	24BTME422R	Renewable Energy Engineering	DSC	4	0	0	0	0	0	4	40	60	0	100	
Semester	3	24BTME423R	Application of AI in Engineering	DSC	3	0	0	0	0	0	3	40	60	0	100	
)el	4	24BTME424R	Research	DSC	2	0	0	0	0	0	2	40	60	0	100	
	5	24BTME425R	MOOCs	VAC	2	0	0	0	0	0	2	40	60	0	100	
											15	200	300	100		

\*IA: Internal Assessment, SEE: Semester End Examination, PE: Practical Examination

		SEMESTER – I								
<b>Course Title</b>		Calculus & Li	near Alg	gebra						
Course code	24BTME111R	Total credits: 3	L	T	Р	S	R	0/	F	С
		Total hours: 45T	3	0	0	0	0	0		3
Pre- requisite	Nil	Co-requisite				Nil				
Programme		Bachelor of Technolo	ogy in M	[echan	ical I	Engin	eerin	g		
Semester		Fall/ I semester o	f first ye	ar of t	the pr	rogra	mme			
Course	1. To make underst	and to evaluate definite	e and im	proper	inte	grals.	Apar	t fro	om 1	these
Objectives	some special func	some special functions like Beta and Gamma function must be introduced.								
	2. To provide the ap	plication of differential	and integ	gral ca	lculus	5.				
		and the convergence and								
CO1		ept of definite integrals	and Fund	lament	tal Th	eorer	n of C	alcu	ılus.	
CO2	Familiarize with the	techniques of calculus								
CO3	Understand the conc	ept of different sequence	e and ser	ies						
CO4		ncepts of matrices. to	solve	system	ns of	line	ar eq	uati	ons	and
	application problems									
CO5		systems of linear equation	ons and a	applica	tion p	oroble	ems re	quir	ing	
	them.									
Unit-No.	Co	ntent	Contact Learning Outcome					e	K	L
		and its applications:	Hour							
I	Evolutes and invo definite and improp Gamma functions Applications of defi	olutes; Evaluation of per integrals; Beta and and their properties; nite ate surface areas and	10	Enabling solving sk of definite and impro integrals				1,2,3	3	
П	Rolle's Theorem, M Taylor's and Mach remainders; indete L'Hospital's rule; Ma		10	Understand Ro theorem, Mean w theorems and max minima of a function				lue na,	3,4	
Ш	for convergence; P	es: uence and series, tests Power series, Taylor's onential, trigonometric	10	serie Fou	Introduction to Powe series, Taylor's series Fourier series, Parseval's theorem			es,	3,4	
IV	matrices; Symmetric Inverse and rank of a	matrices; Operation of , skew-symmetric and matrix, Determinants;	5	Diff Con	Introduction to Differentiation, Limits Continuity, Gradient, Curl and Divergence			,	2	4
V	Application and alg System of linear equa and eigenvectors; Dia matrices; Cayley- Hamilton Theorem.	ations; Eigenvalues	10		lerstai rices a es.	-			2	4

#### **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.

R1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

#### OTHER LEARNING RESOURCES: <a href="https://nptel.ac.in">https://nptel.ac.in</a>

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Understand the concept of definite integrals and Fundamental Theorem of Calculus.	PO1,PO2,PO3					
2	Familiarize with the techniques of calculus	PO3, PO4					
3	Understand the concept of different sequence and series	PO1, PO2					
4	Understand the concepts of matrices. to solve systems of linear equations and application problems requiring them.	PO1,PO2,PO3,PO4					
5	Understand to solve systems of linear equations and application problems requiring them.	PO2,PO3					

Course Title	Intra	SEMESTER – I oduction to Basic math	ematics	logic ar	nd codi	<b>1</b> σ						
Course ride Course code		Total credits: 3	L	T I		R	O/F	С				
Course coue	24011112K	Total hours: 30T+30			2 0	<b>N</b>	0/1	3				
Pre- requisite	Nil	Co-requisite		•	-   • Nil	-	V	U				
Programme		helor of Technology in	Mechan	ical Eng								
Semester		all/ I semester of first y		-	-	8						
Course		*				and	notat	ion o				
Objectives	1. To understand and be able to use the language, symbols and notation of mathematics											
0	<ol> <li>To develop the ability to create a programmable model for a given problem</li> </ol>											
	-	fident in using mathema			-	-		nalyz				
	and solve proble	ems in real-life situation	S		-		-	-				
CO1	Understand the conce	epts of mathematics, log	gic, reaso	ning and	l coding	•						
CO2	Applications of the c	oncepts in other discipl	ines such	1 as engi	neering	, com	puter s	cience				
	physics, etc.											
CO3	Learn to solve and	devise solutions to a ra	ange of e	elementa	ry real-	world	l probl	ems i				
	mathematics and pro	ogramming.										
CO4	Explore and apply ke	ey concepts in logical th	inking to	busines	s proble	ms						
CO5	Enable students to	critically analyze infor	mation i	n order	to eval	uate	eviden	ce an				
	construct reasoned a	rguments										
Unit-No.	Cor	itent	Contact	Lea	rning (	<b>)</b> utco	me	KL				
			Hour									
		ory and Functions:			tudents							
		ns, cardinality of a set,			demons		the					
	principle of exclu		-	to unc	ersta							
		union, intersection,		conce	-		of					
	· •	ent etc., De Morgan			matics,		logic,					
	laws, Venn Diagram				ning an		oding.					
	Products and Relat			They	will		ecome					
	,	binary relations –		confid		in	using					
	-	verse, binary relation			matics,		logic,					
		perties – reflexive,			ning and		•					
		etric, antisymmetric,		analyz		nd	solve					
	-	nce relations, partial		proble		n re	al-life	1.0				
Ι	order relations	с <sup></sup>	6	situati	ons			1,2,				
		efinition, domain and						3				
	-	and range, identity e and onto functions,										
		cteristic function,										
	5	ctions, inverse of a										
	-	is on sets: unary										
	· •	ence, binary operators										
	– associativity, com	• •										
	Number systems:	•										
	whole numbers,											
		bers, operations on										
	numbers: addit	-										
	multiplication and di	· · · ·										
	_											
	Introduction to "	Mathematical Logia		The of	ndonta	03/111 h	e oble					
II	and Induction to <b>F</b>	Mathematical Logic	6		tudents demons		e able the	2,3				

	<ul> <li>mathematical statements, formulas in mathematical logic, logical operators - AND, OR, NOT etc, De Morgan Laws, Truth values of formulas, Truth tables</li> <li>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</li> <li>Mathematical Induction: Principle of mathematical induction – induction basis and induction step, examples</li> <li>Introduction to Logic and Reasoning:</li> </ul>		mathematics, logic, reasoning and coding. They will become confident in using mathematics, logic, reasoning and coding to analyze and solve problems in real-life situations.	
П	Alphanumeric series, Direction, Logical Reasoning, Data Sufficiency, Ranking and order, Puzzle, Blood Relations, Analogy, Cube and Dice, Coding Decoding	6	to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. Explore and apply key concepts in logical thinking to business problems.	3
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 ifelse block, Switch case Block, GOTO statement. Looping: Concept of Loop, For loop, While loop, Do- while loop, jumping in Loop, break and continue statement	6	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.	6	The students will be able to demonstrate the ability to understand the concepts of mathematics, logic, reasoning and coding. Solve and devise	1,3

Functions: Concept of Functions, user-	solutions to a range of
defined Functions, System-defined	elementary real- world
Functions, passing in Functions.	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

- 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 Lipchitz and Lipson

#### **OTHER LEARNING RESOURCES:**

#### https://www.javatpoint.com/discrete-mathematics-tutorial https://www.khanacademy.org/test-prep/lsat/lsat-lessons/logical-reasoning/a/logicalhttps://www.javatpoint.com/c-programming-language-tutorial

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Understand the concepts of mathematics, logic, reasoning and coding.	PO1,PO8
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

		TER – I							
Course Title		ysics for I	Engine	ers				1	
Course code	24BTME113R Total credits		Ι		P	S	R	O/F	C
	Total hours:		2	0	2	0	0	0	3
Pre- requisite		requisite					Nil		
Programme	Bachelor of Techn						-		
Semester	Fall/ I semester	ĩ	ear of	the p	rogr	amr	ne		
Course	1. To understand the theories of p	•							
Objectives	2. To apply the concepts in practi	-							
	3. To understand the physics of an	•							
<b>CO1</b>	To make the students in understandi								
CO2	To enable the students in understand	-	nportar	ice of	f qua	ntum	n phy	sics	
CO3	To apply quantum ideas at the nanos								
CO4	To understand the materials character								
CO5	To equip the students on the knowle	dge of nev							
Unit-No.	Content		Conta		Le	arni	ng O	utcome	KL
	Hour								
	Unit I: MECHANICS Moment o			•		-	basic		1, 2
	(M.I) - Radius of gyration - Theorem						ge of		
	.I - M.I of circular disc, solid	•			mec				
	hollow cylinder, solid sphere and			•				e basic	
	sphere - K.E of a rotating body –			prin	-				
Ι	diatomic molecule - Rotational energy		6		mec	hani	cs.		
	of a rigid diatomic molecule - c								
	mass – conservation of linear mom								
	Relation between Torque and	angular							
	momentum -Torsional pendulum.								
	-	ANICS:		•	App	-			1,
	Photons and light waves - Electr						nding		2,
	matter waves - The Schrodinger	· ·	-		1			nanics	3,
II	(Time dependent and time inde	-	6	•	App	•			4
	forms) - meaning of wave fur				-	ciple			
	Normalization - Particle in a				quar	ntum	mec	nanics	
	potential well - Normalization, prob	babilities							
	and the correspondence principle	<u>.</u>			TT 4	4	1.1		4
III	Nanophysics: Introduction to	Nano-		•			nd th		1,
	materials, Moore's law, Properties of		6				behin		2,
	materials, Quantum confinement, (	Zuantum			nano	omat	erials		3,
	well, wire &								4, 5
<b>IN</b> 7	Electricity and Magnetism, El-	otnicit	(		Las		of 1	onica -f	
IV	Electricity and Magnetism: Ele	•	6	•		-		asics of	
	Basic Definitions, ohm's law, Vol- current source. Kirchhoff's laws	-			mag	tricit	-	and	3 4
	circuit components, series parallel re	<i>,</i>			mag	neus	111		4
	circuits, mesh analysis and nodal and								
	Magnetism: -Origin of magnetic	-							
	Bohr magneton, Classificatio								
	magnetism, Domain theory, Hyster								
	and hard magnetic materials,								
	ferromagnetic materials, Ferri								
	Applications of magnetism-r								
	Applications of magnetism-	magnette							<u>i                                    </u>

	recording and readout storage of magnetic data tapes, floppy and magnetic disc drives.			
V	Material Characterization Techniques	6	• Understand the	2,
	and Instrumentation:		basics materials	
	Principle, construction and working of X-		characterization	4,
	ray Diffractometer, crystal size		• Learning of various	5
	determination by Scherrer equation.		characterization	
	Principle, construction,working and		techniques and	
	applications of -Atomic Force		instrumentation	
	Microscope (AFM), X-ray			
	Photoelectron			
	Spectroscope (XPS), Scanning			
	Electron			
	Microscope (SEM), Transmission Electron			
	Microscope (TEM) Numerical problems.			

#### **TEXT BOOKS:**

T1. Arthur Beiser et al., Concepts of Modern Physics, 2013, Sixth Edition, Tata McGraw Hill T2. Applied Physics for Engineers – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech

#### **REFERENCE BOOKS:**

R1. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, (Wiley)

#### OTHER LEARNING RESOURCES: <u>https://nptel.ac.in</u>

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	To make the students in understanding the importance of mechanics	1,2
2	To enable the students in understanding the importance of quantum physics	3,5
3	To apply quantum ideas at the nanoscale.	6,9,10
4	To understand the materials characterization and instrumentation.	5,9
5	To equip the students on the knowledge of new engineering materials.	4,1,11

		SEN	AESTE	R –	I							
<b>Course Title</b>		Works	hop/Ma	nuf	actu	ring P	ractice	es				
Course code	24BTME114R	Total credi	ts: 1	L	Т	P	S	R	O/F	C		
		Total hours	s: 30P	0	0	2	0	0	0	1		
Pre-requisite	Nil	Co-req				1	1	Nil	1			
Programme		Bache	lor of T	echi	ıolog	gy in M	lechan	ical En	gineering			
Semester						-			gramme			
Course	1. Learning this co	urse will le	ad you	to	under	rstand	basic	concept	s of worksh	nop and		
Objectives	manufacturing.											
	2. Apply fundament	tal knowledg	ge of wo	rksh	op ai	nd man	ufactu	ring in o	day-to-day li	fe.		
	3. Recognize compo											
CO1	Infer about various	nanufacturir	ng metho	ods 1	ike c	asting,	formi	ng, mac	hining etc			
CO2	Apply fitting oparat	ion and powe	er tools	in m	anuf	acturin	g work	KS .				
CO3	Demonstrate to Carj	oentry & fitti	ing oper	atio	ns an	d its ap	plicati	on in ir	dustries			
CO4	Enhance skills in n	nachining op	erations	s lik	e ma	terial	cutting	and pi	reparation of	f mould		
	etc.											
CO5	Critique the differen	t types of we	elding, r	neta	l cass	sting a	nd its f	ield of a	application.			
Unit-No.	Content		Conta	ıct		L	earnir	ng Outc	ome	KL		
			Hou	ır				-				
Ι	Manufacturing Me	thods:	6		Introduction to various							
	Casting, Forming, N	Iachining,			ma	manufacturing methods like						
	Joining, Advanced				ca	sting, H	Formin	g, mach	nining etc.			
	manufacturing meth	ods										
II	CNC machining,	Additive	6									
	Manufacturing:				Aŗ	er coding in						
	Overview of CNC	machining			au	tomati	on of N	<b>Aachine</b>	s.	3,4		
	process, overview	of additive										
	manufacturing											
III	Carpentry &	Fitting	6			Introduction to Carpentry & fitting						
	operations: Carpen	2			_			its appli	cation in	3,4		
	carpentry peration				inc	lustries	5.					
	tools, fitting operation											
IV	Machining operation		6					various				
	Turning, milling	U				nufact	-			4		
	processes, milling p	rocesses.						sting, fo	orming,			
						achinin	-					
V	Welding:							safety p	recautions			
	Arc welding & ga	s welding,	6		in	weldin	ıg.			4		
	brazing											

#### **Text Books:**

T1. 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:**

R1. Manufacturing Technology – I Gowri P. Hariharan and A. Suresh Babu Pearson Education, 2008 R2. Processes and Materials of Manufacture Roy A. Lindberg 4th edition, Prentice Hall India, 1998

#### OTHER LEARNING RESOURCES: <u>https://nptel.ac.in</u>

	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 casting and its field of application.	8,9						

		SEMESTEF	l – I								
Course Title	Introductory English for Engineers										
Course code	24UBPD113R To	otal credits: 2	L	Т	Р	S	R	O/F	С		
	Τ	otal hours: 30P	0	0	2	0	0	0	1		
Pre- requisite	Nil	Co-requisite				N	il				
Programme	Bach	elor of Technolog	y in M	echan	ical E	ngine	ering				
Semester	Fall: V	Vinter/ I semester	of first	year	of the	prog	ramn	ne			
Course	1. To capacitate the s		•		•	•					
Objectives	2. To enable the stu	dents to commun	cate co	nfider	ntly w	ith a t	focus	on liste	ening and		
	speaking skills.	1 1 ° CD1			1.	•••					
	3. With the help of	the basics of Pho	onetics,	the st	udent	s will	be a	ble to p	ronounce		
	words correctly.	fully and with da	0.000								
C01	4. To interact success Understand and corre			or ala	mente	inclu	ding	parts o	fspeech		
COI	articles, auxiliary verb	•	0		,		U	1	-		
	types of sentences.	, acterimiers, ar	u uegit	05 01	comp	un 15011	,	ionsti uot	anneren		
CO2	Analyze and comprehe	end written texts t	hrough	comp	rehens	ion ex	ercis	es, demo	onstrating		
	an understanding of se							ŕ			
CO3	Understand the proce	ss and purpose o	f listen	ing, d	ifferer	ntiate	betwo	een liste	ening and		
	hearing, identify facto	ors affecting lister	ing, an	d imp	lemen	t strat	egies	to impr	ove their		
	listening skills.										
<b>CO4</b>	Develop speaking skil	• •		· •		•		•			
	pronunciation through	-	vering	extem	pore	speec	nes,	and usi	ng video		
CO5	recordings for self-refl Understand the fundation		nication	n incl	uding	ite tur	100 m	NITPOSAS	barriers		
003	and importance, and a				-		-	-			
	formal and informal co			prove	then		umeu	uon skii	15 111 000		
Unit- No.	Content	Contac	t	L	earni	ng Ou	tcom	e	KL		
		Hour				8					
Ι	Module 1 - Grammar		In t	nis mo	odule,	stude	nts w	vill mast	er 1, 2		
	I. Parts of Speech I. A	rticles I.	1			1	elem	ents	of		
	-		the		ndatio						
	Auxiliary Verbs Aff	irmative	gran	nmar.	They	will ex	xplore	e the par			
	-	irmative	gran of	nmar. spee	They ch,	will ex inclu	xploro ding	e the par noun	rts Is,		
	Auxiliary Verbs Aff	irmative	gran of pror	nmar. spee 10uns,	They ech, verbs	will ex inclu , adjeo	xplore ding ctives	e the par noun , adverb	rts is, is,		
	Auxiliary Verbs Aff	irmative es	gran of pror prep	nmar. spee nouns, positio	They ech, verbs ns,	will ez inclu , adjeo conju	xplore ding ctives nctio	e the par noun , adverb ns, ar	ts is, is, nd		
	Auxiliary Verbs Aff	irmative	gram of pror prep inter	nmar. spee nouns, positio rjectio	They ech, verbs ns, ns. U	will ez inclu , adjec conju nderst	xplore ding ctives nction andin	e the par noun , adverb ns, ar ng article	ts is, is, id es		
	Auxiliary Verbs Aff	irmative es	gram of pror prep inter (def	nmar. spee nouns, position rjectio inite	They ech, verbs ns, ns. U and i	will ex inclu , adjec conju nderst ndefin	xplore ding ctives nction andin iite)	e the par noun , adverb ns, ar ng article and the	ts s, s, nd es eir		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr	nmar. spee nouns, positio rjectio inite ect us	They ech, verbs ns, ns. U and i sage v	will ex inclu , adjec conju nderst ndefin will b	xplore ding ctives nction andin ite) e en	e the par noun , adverb ns, ar ng article and the nphasize	rts is, is, id es es ir d.		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr Stuc	nmar. spee nouns, positio rjectio inite ect us lents	They ech, verbs ns, ns. U and i sage v will le	will ex inclu , adjec conju nderst ndefin will b earn a	xplore ding ctives nction andin ite) e en ibout	e the par noun , adverb ns, ar ng article and the nphasize auxiliar	ts is, is, id es bir d. ry		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr Stud verb	nmar. spee nouns, positio rjectio inite ect us lents os and	They ech, verbs ns, ns. U and i sage will le d the	will ex inclu , adjec conju nderst ndefin will b earn a ir rol	xplore ding ctives nction andin ite) e em ibout e in	e the par noun a, adverb ns, ar ag article and the phasize auxilian formir	ts s, s, d es sir d. ry ng		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr Stuc verb tens	nmar. spee nouns, positio rjectio inite ect us lents s and es, v	They ech, verbs ns, ns. U and i sage v will le d the oices,	will ex inclu , adjec conju nderst ndefin will b earn a ir rol and	xplore ding ctives nction andin ite) ie en ibout e in mo	e the par noun , adverb ns, ar ng article and the nphasize auxilian formir ods. Th	ts is, is, id es bir d. ry ng ne		
	Auxiliary Verbs Aff	irmative es	gran of pron prep inter (def corr Stuc verb tens mod	nmar. spee nouns, positio rjectio inite ect us lents os and es, v lule	They ech, verbs ns, ns. U and i sage v will le d the oices, will	will ex inclu , adjec conju nderst ndefin will b earn a ir rol and also	xplore ding ctives nction andin ite) e en ibout e in mod cc	e the par noun , adverb ns, ar ag article and the phasize auxilian formir ods. Th over th	ts s, s, nd es sir d. ry ng ne ne		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr Stud verb tens mod cons	nmar. spee nouns, positio rjectio inite ect us lents ses, v lule structio	They ech, verbs ns, ns. U and i sage w will la d the oices, will on o	will ex inclu , adjec conju nderst ndefin will b earn a ir rol and also f afi	xplore ding ctives nction andin ite) e en ibout e in mod co firma	e the par noun a, adverb ns, ar ng article and the phasize auxilian formir ods. Th over th tive ar	ts ss, nd es sir d. ry ng ne ne ne nd		
	Auxiliary Verbs Aff	irmative es	gran of pror prep inter (def corr Stud verb tens mod cons nega	nmar. spee nouns, positio rjectio inite ect us lents bs and es, v lule structio ative s	They ech, verbs ns, ns. U and i sage w will la d the oices, will on o	will ex inclu , adjec conju nderst ndefin will b earn a ir rol and also f aff ces, ho	xplore ding ctives nction andin ite) e en ibout e in mod co firma	e the par noun , adverb ns, ar ag article and the phasize auxilian formir ods. Th over th	ts ss, nd es sir d. ry ng ne ne ne nd		

II	Module 2- Grammar		Building on the basics, this module	2, 3,
11	I. Determiners I. Sentence		will delve into determiners and their	2, 3, 4
	Construction		functions in sentences. Students will	Ŧ
	I. Types of Sentences		learn sentence construction	
	(Assertive, Imperative, etc.)	6	techniques and the different types of	
		0	1 21	
	. Degree of Comparison		sentences (assertive, imperative,	
	. Comprehension Exercises		interrogative, and exclamatory). The	
			concept of the degree of comparison	
			(positive, comparative, and	
			superlative) will be explored. The	
			module will also	
III	Module 3 - Listening Skills		Students will be introduced to the	1, 2,
	i. What is listening?		fundamentals of listening,	3, 4
	i. The Process of Listening		distinguishing it from hearing. They	
	i. Factors that adversely affect		will study the process of listening	
	Listening		and identify factors that adversely	
	. Difference between		affect it. The module will highlight	
	Listening and Hearing,	6	the purpose and importance of	
	.Purpose and Importance of		effective listening and provide	
	Effective Listening		strategies to improve the listening	
	I. How to Improve Listening		process. By understanding these	
	Process.		concepts, students will enhance their	
			ability to comprehend and retain	
			spoken information.	
IV	Module 4 - Speaking Skills		This module focuses on developing	1, 2
1.	I. Introducing yourself I. Self-		students' speaking abilities. They	1, 2
	discovery		will learn how to introduce	
	I. Basics of Phonetics,		themselves and engage in self-	
	pronunciation		discovery to build confidence. Basics	
	-		-	
	. Extempore speech	(	of phonetics and pronunciation will	
	. Video Recording for Self-	6	be covered to ensure clear and	
	reflection		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.	
V	Module 5-		Students will gain a comprehensive	2, 3,
	Communication Skills		understanding of communication and	4, 5
	I. Introduction to		its significance. The module will	
	Communication, I.		cover the types and purposes of	
	Importance of		communication, distinguishing	
	Communication Skills, I.		between formal and informal	
	Purpose of Communication,		contexts. Students will learn about	
	. Types of Communication,		the importance of communication	
	. Formal and informal	6	skills and the barriers that can	
	communication I. Importance		impede effective communication.	
	of Communication, I. Barriers		Tips and strategies to improve	
	to Communication,		communication skills will be	
	I. How to improve/ tips to		provided. The module will also	
	a. 110w to improve/ tips to		provided. The module will also	

improve Communication	include exercises on responding to
skills.	different questions in various
.Responding to different	situations, enhancing students'
questions in various situations	adaptability and effectiveness in both
(formal/informal)	formal and informal interactions.

#### **Text Books:**

T1. Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida

T2. Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & amp; Company Ltd.: New Delhi.

#### **Reference Books:**

R1. Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India

R2. 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. <u>https://youtu.be/-zZau\_dttRY</u>

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.	1, 4,11

		SEMESTER		<b>D</b> '	0	71/22-2	TC					
Course Title	EXTRA-CURRICULAR ACTIVITIES											
Course code	24UBEC111	Total cred	its:1	L	T	P	_	5	R	0/		1
Duo noquisito	NII	Color		0	0	0	2	1 Ni	0	0		1
Pre- requisite	Nil	Co- equ B.Tech Mech		Eng	incor	ina		IN.	11			
Programme Semester		emester of fi		0		0						
Course			rst yea	r 01	ine p	rogi	am	me				
Objectives	<ol> <li>To develop soft and so</li> <li>To promote a holistic d</li> </ol>		f tha la	aarna	rc							
Objectives	<ol> <li>To promote a nonstre c</li> <li>To enhance the learnin</li> </ol>	-				s ata						
CO1	Participants will develop p							mun	icatio	n tin	10	
COI	management, and teamwor											
	self-confidence.	k, contributin	g to th		Clair	Cilai	acit	JI U	eveloj	pinen	i anu	
CO2	Engagement in Community	service and	outread	h act	ivitie	o wi	11 cr	Itiv	vate a	sense	of	
02	social responsibility, empa											,
	contribute to society	iny, and ervie	aware	1035,	ciico	urug	mg	stut	ients	10 401	lvely	
CO3	Express their ideas, views,	In-denth eval	uation	ands	nalv	sis c	lear	lv it	n the t	onic	of the	eir
005	interest.	m-depth eval	uution	ana	illaly	515 C	ICarr	ly II	i uic t	opie	JI UN	
CO4	The students will be given	a platform to	earn fr	om i	vite	lexr	nerts	in	their	resneo	tive	
001	fields.		cum n			4 U.I.		, 111	unen i	respec		
CO5	Demonstrate and practices	different activ	vities. ł	ov In	tegra	ting	learı	ning	expe	erienc	es by	I
	demonstrating transferable		,	5	0	0		2			5	
Unit- No.	Content	Contact			L	earr	ning	Οι	itcom	e	I	KI
		Hour					8					
Ι	Different types of	10	1. Ac	dtU	enco	urag	es a	a r	ange	of	1,2,	3,4
	activities outside regular	-				-			regu		5	
	curriculum								to m			
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			int 4. Th clu	ne st ub ar	and uden e trai	hobł t m ined	emb repi	ers rese	nt Ac	ltU		
			int 4. Th clu in	ne st ub ar va	and uden e trai rious	hobł t m ined in	emb repi ter	ers rese Ui	nt Ac nivers	ltU sity		
			int 4. Th clu in stu	ne st ub ar va udent	and uden e trai rious an	hobl t m ined in in	emb repi ter	ers rese Ui	nt Ac	ltU sity		
			int 4. Th ch in stu co	ne st ub ar va	and uden e trai rious an ition	hobł t m ined in in in id	emb repi ter	ers rese Ui ona	nt Ad nivers 1 le	ltU sity		

that benefit the members and students by giving them the
platform to learn from experts in the respective fields.

	CO PO Mapping						
	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					

		SEMESTER	R – II							
<b>Course Title</b>		ODE, Proba	ability a	nd S	Statistic	5				
Course code	24BTME121R	Total credits: 4	L	Т	Р	S	R	O/F		С
		Total hours: 60T	4	0	0	0	0	0		4
Pre- requisite	Nil	Co-requisite				Ni	1			
Programme	Ba	chelor of Technolog	gy in Mo	echa	nical E	nginee	ering			
Semester		Fall/ II semester of t	-		-	-				
Course		concept of first o	rder dif	fere	ntial eq	uatior	and	apply th	nem	n ir
Objectives	-	complex problems.								
		cept of ordinary diffe		-		-				
	-	nts' skills in basic pr		-				-	-	
	- ·	stributions, measures			-			-	met	ters
	· · ·	ese concepts to real-			• •					•
CO1		olve differential Eq	uations	and	their	applic	ations	in engi	nee	ring
	problems.	· · · · 1 · C	1		1 1			1 · 1		
CO2		asic principles of se	et theore	em a	ind appl	y the	n in s	olving d	iffe	ren
	complex problems		_							
CO3		s of proposition logic			1: 4:					
CO4 CO5		pt of basic probabilit ncept of basic and ap	-							
Unit-No.	Con Con						ing ()	ng Outcomo		
Unit-NO.	Con	lent	Hou	8				atcome	1	KL
	First order ord	linary differential	IIUu		First-or	lor		ordinar		
	equations: Exa						nuation	includ	-	
	· ·	uations, Euler's			understa		-			
	1	ons not of first				•		Bernoul		
		s solvable for p,						as Euler'		
		e for y, equations			equation		or rig			
	solvable for x and	. –						will als	-	
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					differen	tial eq	uations	5.		
	Ordinary differen	tial equations of			Method				f	
	higher orders: Sec				paramet	ers. S	tudents	s will als	0	
	differential equation				understa			olve th		
II	coefficients, metho		12		Cauchy	Euler	equati	on, whic	h	2
11	parameters, Cauch	y-Euler equation.	12		is a spe	ecific	type o	of second	-	3
					order	linea	ur d	lifferentia	ıl	
					equatior	ı				
					useful ir	1 vario	us app	lications		
III	Complex varia	ble-Differentiation:						in solvin		
	Differentiation,	Cauchy-Riemann		s	econd-or	rder li	near d	lifferentia	1	
	equations, analy	-		e	quations	s v	with	variabl	e	
	harmonic f	· · · · ·			afficia	ato in	ing t	echnique	c	
	narmonic i	unctions, finding		c	oemciei	ns u	sing i	eeninque	5	

	analytic functions (exponential, trigonometric, logarithm) and their properties.	12	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	6
IV	<b>Basic probability:</b> Probability spaces, conditional probability, independence; Discrete random variables, Independent random variable-the multinomial distribution, Poisson approximation to the binomial distribution.	12	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.	4
V	<b>Basic and applied Statistics:</b> <b>Basic:</b> 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. <b>Applied:</b> Test of significance: Large sample test for single proportion. Difference of proportions, single mean, difference of means and difference of standard deviations.	12	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:**

T1. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
T2. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,

2010.

**REFERENCE BOOKS:** R1. S. Ross, A First Course in Probability, 6<sup>th</sup> Ed., Pearson Education India, 2002. R2. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed. Wiley India, 1984.

	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				

Objectives       2 To lay foundation for practical application of chemistry in engineer         CO1       Recall and analyze the issues related to impurities in water and their and apply recent methodologies in water treatment for domestic and incomposition of metals.         CO2       Evaluate the causes of metallic corrosion and apply the methods for composition of metals.         CO3       Evaluate the electrochemical energy storage systems such as lithium be and solar cells, and design for usage in electrical and electronic application of different fossil fuels and create an awareness alternative fuels.	gram nistry ring a remo dustri prrosi patteri tions.	nme 7. aspects. oval me al usag	ethods e						
Total hours: 30T+30P2020Pre-requisiteNilCo-requisiteNilProgrammeBachelor of Technology in Methanical EnSemesterFall/ II semester of First year of the proCourse1Toimparttechnological aspectsofappliedcherObjectives2To lay foundation for practical application of chemistry in engineerand apply recent methodologies in water treatment for domestic and indCO1Recall and analyze the issues related to impurities in water and their and apply recent methodologies in water treatment for domestic and indCO2Evaluate the causes of metallic corrosion and apply the methods for co of metals.Evaluate the electrochemical energy storage systems such as lithium br and solar cells, and design for usage in electrical and electronic applicatCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	<b>0</b> <b>gram</b> mistry ring a remo dustri prrosi- patter tions.	0 ering ime 7. aspects. oval me al usag	3 ethods						
Pre-requisite       Nil       Co-requisite       Nil         Programme       Bachelor of Technology in Mechanical En         Semester       Fall/ II semester of first year of the pro         Course       1       To       impart       technological aspects       of       applied       cher         Objectives       2       To lay foundation for practical application of chemistry in engineer       of       applied       cher         CO1       Recall and analyze the issues related to impurities in water and their       and apply recent methodologies in water treatment for domestic and incomplete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the causes of metallic corrosion and apply the methods for complete the cause of metallic corrosion and apply the methods for complete the cause of metallic corrosion and apply the methods for complete the cause of metallic corrosion and apply the methods for complete the cause of metallic corrosion and apply the methods for complete the cause of metallic corrosion and apply the methods for complete the cause of metallic corrosion	<b>ginee</b> <b>gram</b> nistry ring a remo dustri orrosio patteri tions.	ering me 7. aspects. oval me al usag	ethods						
ProgrammeBachelor of Technology in Mechanical EnSemesterFall/ II semester of first year of the proCourse1Toimparttechnological aspectsofappliedcherObjectives2To lay foundation for practical application of chemistry in engineerCO1Recall and analyze the issues related to impurities in water and their and apply recent methodologies in water treatment for domestic and indCO2Evaluate the causes of metallic corrosion and apply the methods for co of metals.CO3Evaluate the electrochemical energy storage systems such as lithium b and solar cells, and design for usage in electrical and electronic applicationCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	gram nistry ring a remo dustri prrosi patteri tions.	nme 7. aspects. oval me al usag	ethods e						
SemesterFall/ II semester of first year of the proCourse1To impart technological aspects of applied cherObjectives2To lay foundation for practical application of chemistry in engineerCO1Recall and analyze the issues related to impurities in water and their and apply recent methodologies in water treatment for domestic and indCO2Evaluate the causes of metallic corrosion and apply the methods for co- of metals.CO3Evaluate the electrochemical energy storage systems such as lithium be and solar cells, and design for usage in electrical and electronic applicationCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	gram nistry ring a remo dustri prrosi patteri tions.	nme 7. aspects. oval me al usag	ethods e						
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CO1Recall and analyze the issues related to impurities in water and their and apply recent methodologies in water treatment for domestic and incCO2Evaluate the causes of metallic corrosion and apply the methods for co of metals.CO3Evaluate the electrochemical energy storage systems such as lithium b and solar cells, and design for usage in electrical and electronic applicat CO4CO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	remo dustri orrosio oatteri tions.	oval me al usage	ethods e						
and apply recent methodologies in water treatment for domestic and incCO2Evaluate the causes of metallic corrosion and apply the methods for co of metals.CO3Evaluate the electrochemical energy storage systems such as lithium b and solar cells, and design for usage in electrical and electronic applicaCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	dustri orrosi oatteri tions.	al usag	e						
<ul> <li>CO2 Evaluate the causes of metallic corrosion and apply the methods for corresion and solar cells, and design for usage in electrical and electronic application.</li> </ul>	orrosi oatteri tions.	-							
of metals.         CO3       Evaluate the electrochemical energy storage systems such as lithium be and solar cells, and design for usage in electrical and electronic application         CO4       Assess the quality of different fossil fuels and create an awareness alternative fuels.	oatteri tions.	on prot	action						
CO3Evaluate the electrochemical energy storage systems such as lithium be and solar cells, and design for usage in electrical and electronic applicatCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	tions.	oply the methods for corrosion prote							
and solar cells, and design for usage in electrical and electronic applicatCO4Assess the quality of different fossil fuels and create an awarenes alternative fuels.	tions.	tomo mak as listim hattain fait							
CO4 Assess the quality of different fossil fuels and create an awarenes alternative fuels.									
alternative fuels.									
	ss to	develo	p the						
LIDE I Analyzza the mean antice of different nelyzname and distinguish the nelyzn		which	an h						
CO5 Analyze the properties of different polymers and distinguish the polymers degraded and demonstrate their usefulness	ners	which c	an de						
	Outo	omo	KL						
Hour	Learning Outcome								
<u>CORROSION CONTROL</u> :									
Dry and wet corrosion - detrimental									
effects to buildings, machines, devices									
& decorative art forms, emphasizing									
Differential aeration, Pitting, Galvanic									
and Stress corrosion cracking; Factors									
that enhance corrosion and choice of									
parameters to mitigate corrosion.									
Corrosion protection cathodic	,								
I protection – sacrificial anodic and 6 C1, C2	,		1						
impressed current protection methods;									
Advanced protective coatings:									
electroplating and electroless plating,									
PVD and CVD. Alloying for corrosion									
protection – Basic concepts of Eutectic									
composition and Eutectic mixtures -									
Selected examples Ferrous and non-									
ferrous alloys.			<u> </u>						
POLYMER CHEMISTRY:									
Classification of polymers- natural and									
synthetic, thermoplastic and									
thermosetting. Difference between									
thermoplastics and thermosetting plastice: Properties of polymers: Tr			2						
II plastics; Properties of polymers: Tg, tacticity, molecular weight-weight C C1, C	2								
average, number average and polydispersity index; Engineering									
application of plastics - PE, PVC, PC,									
PTFE, PP, Nylon 6, Nylon 66,									
Bakelite, Epoxy; Compounding of									

plastics: moulding of plastics for Car	
parts, bottlecaps (Injection moulding),	
Pipes, Hoses (Extrusion moulding),	
Battery Trays,(Compression	
moulding), Fibre reinforced polymers,	
Composites (Transfer moulding), PET	
bottles(blow moulding); Polymer	
Coatings and Sealant	
Conducting polymers- Polyacetylene-	
Mechanism of conduction –	
applications	
(polymers in sensors, self-cleaning	
windows)	
ELECTROCHEMICAL ENERGY	
SYSTEMS: Brief introduction to	
conventional primary and secondary	
batteries; High energy electrochemical	
energy systems: Lithium batteries –	
Primary and secondary, its Chemistry,	
advantages and applications.	
Fuel cells – Polymer membrane fuel	
cells, Solid- oxide fuel cells- working	
III principles, advantages, applications. 6	3
Solar cells – Types – Importance of	
silicon single crystal, polycrystalline	
and amorphous silicon solar cells, dye	
sensitized solar cells - working	
principles, characteristics and	
applications.	
Explosives – classification, examples:	
TNT, RDX, Dynamite	
FUELS AND COMBUSTION:	
Calorific value - Definition of LCV,	
HCV. Measurement of calorific value	
using bomb calorimeter and Boy's	
calorimeter including numerical	
problems. Controlled combustion of	
<b>IV</b> fuels - Air fuel ratio – minimum <b>6</b> C1,C	2 4
quantity of air by volume and by	<sup>2</sup> 4
weight Numerical problems-three-way	
catalytic converter- selective catalytic	
reduction of NOX; Knocking in	
IC engines-Octane and Cetane number	
- Ant knocking agents.	
WATER TECHNOLOGY:	
Water quality parameters: color, odor,	
V pH, hardness, alkalinity, DS, COD and 6 C1,C	6
BOD. Boiler feed water – requirement	
– troubles (scale &	

## **TEXT BOOKS:**

T1. Sashi Chawla, A Text book of Engineering Chemistry, Dhanpat Rai Publishing Co., Pvt. Ltd., Educational and Technical Publishers, New Delhi, 3rd Edition, 2015T2. O.G. Palanna, McGraw Hill Education (India) Private Limited, 9th Reprint, 2015.

#### **REFERENCE BOOKS:**

R1. V. Roussak and H. D. Gesser, *Applied Chemistry-A Text Book for Engineers and Technologists* Springer Science Business Media, New York, 2nd Edition, 2013.
R2. S. S. Dara, *A Text book of Engineering Chemistry*, S. Chand & Co Ltd., New Delhi, 20<sup>th</sup>Edition, 2013

## **OTHER LEARNING RESOURCES:**

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
	Recall and analyze the issues related to impurities in water and	
1	their removal methods and apply recent methodologies in	1,3
	water treatment for domestic and industrial usage	
2	Evaluate the causes of metallic corrosion and apply the	2 4 7
2	methods for corrosion protection of metals.	3,4,7
	Evaluate the electrochemical energy storage systems such as	
3	lithium batteries, fuel cells and solar cells, and design for	6,8,12
	usage in electrical and electronic applications.	
4	Assess the quality of different fossil fuels and create an	4,6
4	awareness to develop the alternative fuels.	4,0
	Analyze the properties of different polymers and distinguish	
5	the polymers which can be degraded and demonstrate their	7,11,12
	usefulness	

		SEMESTER	R – II										
Course Title		Problem	Solving us	ing P	ytho	n Pro	ograr	nmin	g				
Course code	24BTME 124 R	Fotal credits: 3 To	tal hours:	L	Т	P	S	R	O/F	С			
		30T+30P		2	0	2	0	0	0	3			
Pre-requisite	Nil	Co-requi	site				Ni	1					
Programme		echnolog	y in N	Aecha	anica	ıl Eng	ginee	ring					
Semester				f first year of the programme									
Course		0 0	Python" a	" aims to provide students with a basi									
Objectives	-	hon programming.											
		lem Solving using F	ython" air	ns to	provi	de st	udent	s pro	blem-so	olving			
	skills.					_							
	-	nts write efficient,	structured,	and r	nodu	lar co	ode to	o solv	e a few	basic			
601		tational problems.	•	T				6					
CO1	Understand about th	•				es, t	ypes	of 1	program	ımıng			
	languages, Basic Synt	÷ ÷					. 1 1		4	1.1			
CO2	Understand the fundation to units have to units have to			ing l	angua	ige a	na it	s syn	iax, ena	ioiing			
CO3	them to write basic to Demonstrate proficient			ondi	tional	atot	amor	to to	maka a	imala			
	Python programs and		-	Jonali	nonal	state	emen	15 10	make s	mpie			
CO4	Understand about Loc	-		kanes	in Pa	<i>z</i> thon							
C04	Understand Lambda a	-	-		-	unon							
Unit-No.	Conte		Contact	ythor		lear	ning	Outc	ome	KL			
0 111-110.	Conte	int	Hour				mng	Oute	ome				
	History of Program	ming Languages	noui	Des	cribe.	illus	strate	and	explain				
	Overview of Program			vari					mming				
	Basic Syntax of a		6			s, and			l-world				
Ι	-	vantages and			icatio								
	disadvantages	C											
	of Python, Real-life	examples of the											
	application of Python												
	Introduction to Pyth	on Programming	6	Des	cribe,	illus	strate	and	explain				
	Introduction to P			-	non		-	-	data	3,4			
II	-	mpiling Python		type	s and	cons	stants	•					
	Programs, Basic Stru	•											
	Program, Data Types												
	Data types and Vari		6						explain				
	Data types, Variable			-	rators		in		Python,				
	use, Typecasting in	•			ectior	· ·	data	type	s and	3,4			
III		nment, Logical,		varia	ables.								
	Arithmetic, Conditio												
	statement, If else												
	Collections: List,	Tuple, Sets and											
	Dictionary	~		Der		;11	turt.	or 1	orres 1 - 1 -	A			
	Loops and Functions		6					and	explain	4			
IV	Loops in Python: For				ps in	ryth	on						
	and Nested Loops	, User Defined											
	functions	ana Tarana f	6	Dec		:11	tucto	o	orra1	4			
V	Lambda Function	~ 1	6						explain	4			
	functions, Lambda fur	neuons		vari	ous ty	pes	of tur	iction	18.				

## **TEXT BOOKS:**

T1 Introduction To Computing And Problem-Solving Using Python, BALAGURUSAMY, 1st Edition, McGraw Hill, ISBN 9789352602582

#### **REFERENCE BOOKS:**

R1. Andrew Ngo, Introduction to Python Programming: Beginner to Advanced, Practical Guide, Tips and Tricks, Easy and Comprehensive, 1<sup>st</sup> Edition, 2017, Kindle Books

R2. Venugopal and Prasad, Python: The Complete Reference, 4th Edition, 2018, Tata McGraw Hill

	CO PO Mapping									
SN	Course Outcome (CO)	Mapped Program Outcome								
1	Understand about the history of Programming Languages, types of programming languages, Basic Syntax of a few programming languages	1,3								
2	Understand the fundamentals of Python programming language and its syntax, enabling them to write basic to intermediate level programs.	3,4,8								
3	Demonstrate proficiency in using data types and conditional statements to make simple Python programs and manipulate data effectively	6,8,12								
4	Understand about Loops, functions and various packages in Python.	4,6								
5	Understand Lambda and user defined functions in Python.	7,11,12								

<b>Course Title</b>		SEMESTER		-									
		Environ											
Course code	24BTME126R	Total credits: 2	L		P S		O/F	C					
<b>D</b> • • •	NT*1	Total hours: 30T	2	0	0 0	, i i	0	2					
Pre-requisite	Nil	Co-requisite	• N7 1		I.E. •	Nil							
Programme		chelor of Technolog											
Semester		all/ II semester of fi	•				<u> </u>	. 1					
Course	1 1												
Objectives	÷ .	-		•	uiveisi	y conse	i vation, ai	ia ine					
	<ul><li>impacts of human activities on the environment.</li><li>2. Through a blend of theoretical knowledge and practical applications, students dely</li></ul>												
	-	2. Through a blend of theoretical knowledge and practical applications, students delve into the complexities of pollution, resource management, and sustainable											
	-	e course emphasizes			-								
	-	ivate an understan											
	environmental ha		0				1						
		vironmental chemistry	y, biodiv	ersity,	and po	llution,	students de	evelop					
		ed to critically ana		-	-			-					
	environmental ch	allenges.											
CO1	Develop critical t	hinking for shapir	ng strate	egies	(scienti	fic, soc	cial, econ	omic,					
	administrative, and	legal) for environm	ental pro	otection	n, conse	ervation	of biodive	ersity,					
	environmental equity		-										
CO2	Develop critical t	<b>v</b> .	•	•	·								
	administrative, and		-		n, conse	ervation	of biodive	ersity,					
	environmental equity												
CO3	Understand the cons	-	ictions or	the w	eb of li	fe, globa	al economy	y, and					
COA	quality of human life		<u>C1 1 1</u>	<u>г</u> .		T	( CT	r					
CO4	Understand about Er				nment i	ssues, Ir	npact of H	luman					
CO5	*	Population and modern civilization on the Environment											
003	Analyse various aspects of human population, and the impact of the population growth on												
	• •	ects of human population			pact of	he popu	lation grow	vth on					
Unit-No.	the environment.		tion, and	the imp	•			1					
Unit-No.	• •		tion, and Contact	the imp	•	he popu		wth on KL					
Unit-No.	the environment.	ent	tion, and	the imp	Lea	rning O		1					
Unit-No.	the environment.	ent ronment:	tion, and Contact	the imp	Lea clop a h	rning O		1					
Unit-No.	the environment. Cont Introduction To Envi	ent ronment: , components of	tion, and Contact	the imp Deve unde	Lea lop a herstandir	olistic of the		1					
Unit-No.	the environment. Cont Introduction To Envi Definition and scope	ent ronment: , components of here, hydrosphere,	tion, and Contact	the imp Deve unde envir	Lea lop a he rstandir	olistic of the	putcome	1					
Unit-No.	the environment. Cont Introduction To Envi Definition and scope environment, atmosp	ent ronment: , components of here, hydrosphere, ohere, structure and	tion, and Contact	Deve unde envir princ syste	Lea elop a ho rstandir onment iples go ms, me	olistic ng of the 's compo overning tabolic p	putcome	1					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic	tion, and Contact Hour	Deve unde envir princ syste	Lea elop a ho rstandir conment ciples go	olistic ng of the 's compo overning tabolic p	Putcome onents and life	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals.	tion, and Contact Hour	Deve unde envir princ syste	Lea elop a ho rstandir onment iples go ms, me	olistic ng of the 's compo overning tabolic p	Putcome onents and life	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals.	tion, and Contact Hour	Deve unde envir princ syste	Lea elop a ho rstandir onment iples go ms, me	olistic ng of the 's compo overning tabolic p	Putcome onents and life	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers.	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and	tion, and Contact Hour 6	Deve unde envir princ syste and b	Lea elop a ho rstandir onment iples go ms, me piodiver	olistic ng of the 's compo overning tabolic p sity.	onents and life rocesses,	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and tons, Metabolic lants and animals. s and gy and approach,	tion, and Contact Hour	Deve unde envir princ syste and b	Lea elop a he rstandir ronment iples go ms, me piodiver	olistic ng of the 's compo overning tabolic p sity.	putcome onents and life rocesses,	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of e	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and tons, Metabolic lants and animals. s and gy and approach, ecosystems;	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo	Lea elop a he rstandir conment piples go ms, me piodiver	arning O olistic ng of the 's compo overning tabolic p sity.	putcome onents and life rocesses, in gy,	KL					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of e structure and function	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and tons, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling,	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo	Lea elop a ho rstandir onment iples go ms, me biodiver	olistic ng of the 's compo- overning tabolic p sity.	putcome onents and life rocesses, in gy, energy	<b>KL</b> 1,2					
	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of c structure and function energy flow and trop	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling, hic chains.	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo ecosy flow,	Lea elop a he rstandir conment iples go ms, me piodiver uire pro- ogical te ystem st , trophic	Ficiency arminologic chains,	putcome onents and life rocesses, in gy, energy and	KL 1,2					
I	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of e structure and function	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling, hic chains.	tion, and Contact Hour 6	Deve unde envir princ syste and t Acqu ecolo ecosy flow, unde	Lea elop a ho rstandir onment iples go ms, me biodiver	Ficiency fructure, chains, he relation	putcome onents and life rocesses, in gy, energy and	<b>KL</b> 1,2					
I	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of c structure and function energy flow and trop	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling, hic chains.	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo ecosy flow, unde betw	Lea elop a he rstandir ronment iples go ms, me piodiver biodiver ire pro- ogical te ystem st , trophic rstand t een eco	Ficiency ficiency for the relation of the relation of the provide the provided the pr	onents and life rocesses, in gy, energy and onships	KL 1,2					
I	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of c structure and function energy flow and trop	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling, hic chains.	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo ecosy flow, unde betw comp	Lea elop a he rstandir conment conment iples go ms, me piodiver dire pro- ogical te ystem st , trophic rstand t een eco ponents	Ficiency arminologic chains, he relations and their and	onents and life rocesses, in gy, energy and onships	KL 1,2					
I	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of e structure and function energy flow and trop Development and eve	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. s and gy and approach, ecosystems; n, mineral cycling, hic chains. olution.	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo ecosy flow, unde betw comp ecolo	Lea elop a harstandir ronment iples go ms, me biodiver biodiver nire proto ogical te ystem st , trophio rstand t een eco bonents ogical ro	Ficiency from the relation system and their ples.	putcome onents and life rocesses, in gy, energy and onships	KL 1,2					
I	the environment. Cont Introduction To Envi Definition and scope environment, atmosp lithosphere and biosp composition, Lifesys eukaryotic organizati principles; types of p Producers, consumer decomposers. Ecology: Terminolog ecosystem, types of c structure and function energy flow and trop	ent ronment: , components of here, hydrosphere, ohere, structure and tems, pro and ions, Metabolic lants and animals. 's and gy and approach, ecosystems; n, mineral cycling, hic chains. olution.	tion, and Contact Hour 6	Deve unde envir princ syste and b Acqu ecolo flow, unde betw comp ecolo	Lea elop a he rstandir ronment iples go ms, me biodiver uire pro: ogical te ystem st , trophic rstand t een eco bonents ogical ro elop the	Ficiency from the relation system and their ples.	putcome onents and life rocesses, in gy, energy and onships r	KL           1,2           2,4,					

r				1
	and control of water pollution, air		sources, causes, effects, and	2,4,
	pollution noise and land pollution.		prevention methods,	5
	Strategies of management, concept of		emphasizing sustainability and	
	sustainability. Energy, environment,		the interplay between energy,	
	and their relationship with human		environment, and human	
	activities. Water Resources and		activities.	
	utilization, forest resources.			
IV	<b>Global Environmental Problems:</b>	6	Gain knowledge of sustainable	
	Human health, settlements,		water and forest resource	
	management of rivers, lakes, forests,		management, understand	2,4,
	wild life and catchments. Role of		human impacts on the	5
	society, NGO and Govt. agencies.		environment, and explore	
	Concept of urbanization and green		concepts related to	
	cities Global Warming, greenhouse		urbanization, global warming,	
	causes and effects, carbon		and carbon sequestration.	
	Sequestration.		•	
V	International agreements and protocols,	6	Develop awareness of	
	National Forest policy and		international agreements and	
	Environmental laws and acts. EIA		protocols addressing global	
			environmental challenges,	2,4,
			understand the roles of society,	5
			NGOs, and government	
			agencies, and familiarize	
			oneself with national	
			environmental policies and	
			laws, including Environmental	
			Impact Assessment processes.	
			impact rissessment processes.	

T1-H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International.

T2-J. G. Henry and G.H. Heinke, Environmental Science and Engineering, Prentice Hall International.

#### **Reference Books:**

R1-G.M. Masters, Introduction to Environmental Engineering and Science, Pearson Education.

R2-R.T. Wright and D.F. Bourse, Environmental Science Towards a Sustainable Future, PHI Learning.

R3-P.A. Vesilind and S.M. Morgan, Introduction to Environmental Engineering, Thomson Books.

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

			SEMESTER	R – II								
Course TitleEngineering DrawingCourse code24BTME123RTotal credits: 2LTPSRO/F												
Course c	ode	24BTME123R	Total credits: 2	L	Т	P	S	R	O/F	C		
			Total hours: 60P	0	0	4	0	0	0	2		
Pre-requi	isite	Nil	Co-requisite				N	il	·			
Program	me	Ba	chelor of Technolog	gy in Mo	echa	nical E	ngine	ering				
Semest	er		Fall/ II semester of f	-		-	-					
Cours	e		bility to communicat	te with	other	s throu	gh the	e langu	age of tec	hnical		
Objectiv	/es	drawing and sl	U									
			udents with various	-				-				
			ed to working drawir	-			-		-			
			udents with various	-				-				
~~~			ed to working drawin							ent.		
C01		-	tiples of engineering	graphics	s and	usage	of drav	wing in	nstruments			
CO2		To discuss orthogra	1 1 5									
CO3			t dimensioning metho					<b>D</b> 1	•			
CO4			onal views for differe	-					-	•		
CO5			f isometric views by	-						KL		
Unit-No.		Conte	nt	Conta Hou		0						
Ι	Prin	ciples of Engineerin	o Graphics and their	mou		ndersta	nd	nrinci	iples of			
1		ificance, usage of D		12	Understand principles of engineering graphics and usage 2,4							
	-	ering, numbering	rawing morainents,	12		of drawing instruments						
II		n, Diagonal and Ve	rnier Scales. Conic			iscuss	0		thographic	2,4,		
		ions - Rectangular I		12		ojectio	ns		81	5		
		cycloid, Hypocyclo										
	-	ection of regular sol										
III	Proj	ections of Points an	nd lines inclined to		C	lassify	differ	ent din	nensioning	2,4,		
	botł	n planes; Projections	s of planes inclined	12	m	ethods	and so	cales.	-	5		
	Plar	nes - Auxiliary Plane	S									
IV		m, Cylinder, Pyrami							views for			
		ws; Development of	-				-		al solids,			
	-	ular Solids - Prism,	Pyramid, Cylinder	12	C	AD dra	wing.			5		
-		Cone										
V		,	sometric Views,				-		isometric			
	Conventions; Isometric Views of lir					-	-		tric scales,			
		· •	compound Solids;	12	ar	notatio	ons an	d layer	ing.	5		
			netric Views to									
	Orth	nographic Views and	V1ce-versa									

## **TEXT BOOKS:**

T1: Venugopal K and Prabhu Raja V, "Engineering Graphics", New AGE International Publishers, 2015. T2: N. D. Bhatt, Engineering Drawing, Charotar publishing House, 2012.

#### **REFERENCE BOOKS:**

R1: Natarajan, K. V., A Text book of Engineering Graphics, Dhanalakshmi Publishers, 2012.

## **OTHER LEARNING RESOURCES:**

	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	R – II							
<b>Course Title</b>	EFFECTIVE	ENGLISH FOR E	NGINE	ERS	(Com	munic	ative E	nglish &		
		Sc	oft Skills	)				-		
Course code	24UBPD123R	Total credits: 2	L	Т	P	S	R	O/F	C	
		Total hours: 60P	0	0	4	0	0	0	2	
Pre-requisite	Nil	Co-requisite			1	N	il	1	1	
Programme	Bac	helor of Technolog	y in Me	chan	ical E	nginee	ring			
Semester		all/ II semester of fi								
Course	This course will enab	ble the students to ac	quire th	e imj	oortant	t know	ledge o	on gramma	ar like	
Objectives	the formation of sent	ences.								
-	To enable the student	s to use vocabulary	meaning	fully	for a s	success	sful cor	nversation.		
	To establish Reputati	on and Rapport, a dr	ess code	sess	ion is 1	much	needed			
CO1	Enable students to un	derstand grammar to	write e	ffecti	vely a	nd spe	ak flaw	lessly, kn	owing	
	correct usage of tense	es and rectifying grau	mmatical	l erro	rs.	_			-	
CO2	Students will acquire	the technique of exp	oanding v	vocał	oulary	and cr	eating	new words	s and	
	use them in different	contexts.								
CO3	Encouraging and he	lping them to shar	pen thei	r list	ening	skills	and to	o become	good	
	listeners.									
CO4	To make them prepar	e for various public	and priva	ate se	ector e	xams d	& place	ement drive	es.	
CO5	To enhance the analy	tical skill and proble	m-solvir	ıg sk	ill of tl	he stuc	lents			
Unit-No.	Cont	Content				t Learning Outcome				
			Hour				-			
	Interchange of I	nterrogative and		St	udents	will b	e able	to analyse	:	
	Assertive Sentences	, Interchange of	12	an	d tra	nsforn	n the	different	1,2	
Ι	Exclamatory and As	ssertive Sentences,		ty	pes of	senten	ces.			
	Analysis of Sentence	s, Types of Tenses,								
	Exercises on Tense									
	Synonyms, Antonym	s, Homonyms	12	He	elpful i	in inte	grating	the skills		
Π				of	readi	ing a	nd spe	eaking in	3,4	
				pr	ofessic	onal co	mmuni	ication.		
	Techniques of Ef		12	He	elps	in	analyz	ing the	:	
III	Gathering ideas and	information from a		teo	chniqu	es of e	effectiv	e reading,	3,4	
	text, The SQ3R Tech	nique, Interpret the		ga	thering	g ideas	and in	formation	J, <b>T</b>	
	text			fro	om a te	ext				
	Introduction to Dres	,	12				•	will boost	:	
	Purpose and Import	· · · · · · · · · · · · · · · · · · ·		the	eir con	fidenc	e.			
IV	Make FIRST IMPRE	SSION iv. What to								
1.	Wear During Intervi	ews or Any Other							3,4	
	Formal Meetings -	Male & Female								
	Activity:									
	Introduction To T	ime Management	12	St	udents	will	learn	to utilize		
Introduction To Time Management 12 Students will learn to utiliz									1	
V	Purpose And Imp	ortance of Time		tin	ne effe	ctively	<i>.</i>		31	
V	Purpose And Imp Management, Basic	ortance of Time		tin	ne effe	ctively	<i>y</i> .		3,4	

## **Textbooks:**

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

## References

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

	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

			SEMESTI	ER –	II							
<b>Course Title</b>		EXT	<b>FRA-CUR</b>	RIC	ULA	R AC	ΓΙνιτ	IES				
Course code	24UBEC121	То	tal credits	: 1	L 0	T 0	P 0	S 4	R 0	0/F	C 1	
Pre- requisite	Nil		<b>Co-requis</b>	site				Ni	il	I		
Programme			B.Tech Mo		nical	Engin	eering					
Semester	Fa					-			ne			
	Fall/ II semester of first year of the programme           1. To develop soft and social skills											
Course 2. To promote a holistic development of the learners												
Objectives	B. To enhance the learning experience in different stages etc.											
	The students will be engaged in different activities headed under different clubs name											
CO1	dance, music, photog										5	
	The students will pa					tivities	s like v	works	hops, c	ompetitio	ons as	
CO2	per their interest and	_	-						¥ /	ł		
	1			esent	ADT	U in v	various	s inter	univer	rsity, stat	e and	
CO3	The students will be trained to represent ADTU in various inter university, state and national level competitions.											
	The students will be			m to	earn	from	invited	expe	rts in t	heir resp	ective	
CO4	fields.	-	-							Ĩ		
<b>CO7</b>	The students will ge	t an ex	posure of	360	degre	e lean	ning m	ethod	ology c	considerii	ng the	
CO5	overall growth along		-				-				-	
Unit-	Content		Contact			Lea	rning	Outco	me		KL	
No.			Hour				_					
Ι	Different types	of	10	1.	AdtU	encou	irages	a rang	ge of ac	ctivities		
	activities outside re	egular			outsic	ie tl	he ro	egular	curi	riculum		
	curriculum				intend	ded	to	me	et le	earner's		
					intere	est. Th	ese act	tivities	s are ai	imed to		
					devel	op the	social	and	soft ski	ills and		
					prom	ote a l	nolistic	devel	lopmen	t of the		
					learne	ers.						
					-	-				degree		
						-				tudents	1,2,3	
										ctivities	,4,5	
										os viz.		
							sic, pl	hotogi	aphy,	drama,		
						ry etc.				1		
									ncourag			
					partic	-	in	-	ular	club		
					activi			kshor		east and		
					hobbi		s as p	er the	ir inter	est and		
							mom	here o	f the o	lub are		
										us inter		
						-				al level		
						etition		. unu	114110116			
					-			lities	are inv	vited to		
						-				efit the		
							-			ng them		
										perts in		
							ve field					
						speed	ve nere	40.				

	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							
<b>Course Title</b>	Biology f	or Engi	inee	ers					
Course code	24BTME211R Total credits:	: 3	L	Т	P	S	R	O/F	C
	Total hours:	45T	2	1	0	0	0	0	3
Pre- requisite Nil Co-requ							Nil		
Programme	Bachelor of Tec							-	
Semester	Fall/ III semeste								
Course	1. To introduce the students about the	e biolo	ogic	al o	conce	epts	from	an eng	ineering
Objectives	perspective.								
	2. To enable the students to have a strong	knowle	dge	of	funct	ionir	ng of a	in ecosys	tem and
	identification of organisms.							•	
	3. To introduce with the concepts of genet				ISMS	s rela	ted to	1t.	
CO1	Discuss biological sciences, its scope and								
CO2	Discuss regarding the ecological energet	tics, its	wo	rkın	g m	echa	nısm,	identific	ation of
GOO	organisms.								
CO3	Analyse the mechanism of transfer of char			pare	ent to	nex	t gene	ration.	
CO4	Explain the genetic code and production o	-				f	1	1	
CO5	Interprets the relation between various phy	-						-	IZI
Unit-No.	Content	Cont			L	earn	ing O	utcome	KL
Ι	Introduction Importance and seems of	Ho	our						
1	Introduction Importance and scope of Biology as an important scientific								
	discipline.								
	<ol> <li>Branches of biological sciences.</li> </ol>								
	<ol> <li>Branches of biological sciences.</li> <li>Fundamental differences between</li> </ol>								
	science and engineering.								
	<ol> <li>Comparison between the working</li> </ol>				Disc	2211	h	oiological	
	mechanism of eye and camera,	10						cope and	
	Bird flying and aircraft.	10			pers			cope and	1,2,5
	<ol> <li>Biological observations of 18th</li> </ol>				pers	peen			
	century that lead to major								
	discoveries in the world								
	<ol> <li>Steps in scientific research works.</li> </ol>								
	6. Brownian motion in biological								
	sciences.								
II	Classification & Ecology								
	1. Classification of organisms, Basis								
	of classification: Morphological,								
	biochemical or ecological, level of								
	organization, symmetry, germ layer								
	organization, segmentation,								
	notochord.								
	2. Concept of unicellular and			D	iscu	SS 1	regard	ing the	
	multicellular organisms;					-	energ	getics, its	
	prokaryotes and eukaryotes; Habitat	10		w	orki	ng	me	chanism,	2,3
	& Adaptations.			ic	lenti	ficati	on	of	·
	3. Concept of Ecosystem: Structure &			0	rgani	isms.			
	Function.								
	4. Energy flow in an ecosystem:								
	Lindemann ten percent law.								
	5. Types of excretion: Ammonotelism,								

	Ureotelism and Uricotelism.			
	6. Animal Kingdom: Characters of			
	phylum with examples.			
III	Genetics & Biomolecules	5		
	<ol> <li>Concept of Allele; Dominance &amp; Recessive; Monohybrid, Dihybrid &amp; Trihybrid cross; Mitosis &amp; Meiosis.</li> <li>Mendel's laws, Concept of Segregation and Independent assortment.</li> <li>Concept of co-dominance and incomplete dominance with illustrations.</li> <li>Sex determination in human.</li> <li>Genetic disorders in human beings.</li> <li>DNA &amp; RNA as genetic material.</li> <li>Enzymes: Classification; Mechanism of enzyme</li> </ol>		Analyse the mechanism of transfer of character from parent to next generation.	
IV	action Information Transfer & Metabolism	10		
	<ol> <li>Genetic code: Properties</li> <li>Structure of DNA</li> <li>Concept of recombination and crossing over</li> <li>Proteins: Primary secondary, tertiary and quaternary structure.</li> <li>Concept of Central dogma</li> <li>ATP as an energy currency of cell. Concept of docking: Protein Ligand interaction</li> </ol>		Explain the genetic code and production of proteins	
V	<ul> <li>Physiology <ol> <li>Human Circulatory System: Heart and its working mechanism; Blood groups; Erythroblastosis fetalis</li> <li>Neuroendocrine system of human: Endocrine glands and their functions.</li> <li>Human Excretory system: Structure of Kidney and Nephron</li> <li>Nervous system of human: Structure of neuron; Resting Membrane Potential; Origin and conduction of nerve impulse.</li> <li>Human Respiratory System: 4Structure of lungs and exchange of gases.</li> <li>Human digestive enzymes: Components and enzymes.</li> </ol> </li> </ul>	10	Interprets the relation between various physiological processes of our body	2,3,5

## **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.

	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		Engineering Me	chanics				
Course code	24BTME214R	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		<b>Bachelor of Technolog</b>					
Semester		Fall/ III semester of se	econd year	r of th	e progra	amme	
Course		uilibrium equations, mon			_		
Objectives		nputing basic skills to use	e to advant	age in	solving	mechani	cs
	problems.						
		on in Engineering Mechar	nics for fur	thering	g the car	eer in	
<u> </u>	Engineering.		1	<u> </u>		1 1 .	<u> </u>
CO1		nalytical techniques for an	nalysing fo	rces in	statical	ly detern	nınate
	structures.		· · · · · ·	1	1	. ·	C
CO2		cepts of kinematics and k	inetics of j	particle	es to the	analysis	of
<u> </u>	simple, practical proble		1 1 .				
CO3		of maths and physics to s					
CO4		ural analysis covering and		-			
CO5	Understanding the conc Bodies	epts of Virtual Work and	introducti	on to K	Inetics	oi kigid	
Unit-No.		tent	Contact	Ιρο	rning ()	utcome	KL
0111-110.	Con		Hour	Lea	i ning O	utcome	KL
Ι	Introduction to Er	gineering Mechanics	10ui	Тол	Indersta	nd force	
•		stems Basic concepts,	10	syste		esultant,	
	•	2-D & 3-D; Rigid Body		-	librium	of	
	-	of Forces, Coplanar		-		tions of	
		omponents in Space –			librium	of	
	Resultant- Moment	of Forces and its		-	lanar sys	stems.	
	Application; Couples	and Resultant of Force					
	System, Equilibrium of	System of Forces, Free					
	body diagrams, Equat	ions of Equilibrium of					
	Coplanar Systems and	Spatial Systems; Static					
	Indeterminancy						
II		Iechanical Vibrations	10	То	une	derstand	
		ction, Limiting friction,		Frict		covering	
		e and Dynamic Friction;		and		chanical	
		ge friction, screw jack &		Vibra	ations co	overing	
	differential screw jack						2,3
		e and forced vibrations,					
		cts; Degree of freedom;					
	-	y and amplitude of free					
	of	ping and single degree					
		ble problems, types of					
	• •	e, compound and torsion					
	pendulums.						
III	*	ysis covering & Review	10	Тот	Indersta	nd basic	
		, sis covering a neview	10			analysis	
	of narticle dynamics						
	<b>of particle dynamics:</b> Equilibrium in three	dimensions: Method of				•	
	Equilibrium in three	dimensions; Method of nts; How to determine if		cove	ering	and	

Mass moment inert         Cone, Sphere, Hool         Virtual       Wor         Method&Introduct         Bodies covering:         Virtual displacement         for particle and id         degrees of freedo         systems with frict         Conservative forc         V         (elastic and gravitate)         equilibrium. Applicate)         equilibrium. Stabilitit	kandEnergy5Understandingthetion to Kinetics of Rigid5Understandingthetion to Kinetics of RigidWorkandits, principle of virtual workintroductiontoeal system of rigid bodies,Kineticsof Rigidm. Active force diagram,Bodieson, mechanical efficiency.Bodieses and potential energytional), energy equation forations of energy method fory of equilibriumal principles in dynamics;1	2,3,4
of beams; Frames & Rectilinear motion (rectangular, path, curvilinear motion motion; Newton's and polar coordina power, potential (linear, angular); Im (Direct and obliqueIVCentroid and Cent Centroid of simple centroid of comp Gravity and its im inertia- Definition, sections from first	Plane curvilinear motion and polar coordinates). 3-D Relative and constrained 2nd law (rectangular, path, ites). Work-kinetic energy, energy.Impulse-momentum pactImage: Constrained and constrainedImage: Constrained constrained and constrained and constrained and constrained and constrained	2,4

T1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
T2. 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:**

R1. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics Pearson Press.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	Use scalar and vector analytical techniques for analyzing 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				

	SEMESTI	ER – III						
<b>Course Title</b>	Basic	Thermodyna	mics					
Course code	24BTME215R Total credi		L	T P	S	R	O/F	C
	Total hours		2	1 0	0	0	0	3
Pre- requisite		Co-requisite				Nil		
Programme	Bachelor of	f Technology i	in Mech	anical	Eng	inee	ring	
Semester		mester of seco	÷		_	-		
Course	1. To learn about work and heat inte	eractions, and b	balance	of ener	gy b	etwe	en syste	em
Objectives	and its surroundings.							
	2. To learn about application of I lav							
	3. To evaluate the changes in proper				-			
	4. To understand the difference betw		le and lo	w grac	le en	ergie	s and II	law
	limitations on energy conversion.							
CO1	After completing this course, the stude			-		alan	ce to sy	stems
	and control volumes, in situations invo							
CO2	Students can evaluate changes in them	• •	-				1 •	
CO3	The students will be able to evaluate t							
CO4	The students will be able to differentia				-		-	
CO5	The students will understand Clausius				oility,	, una	vailabil	ity,
TT *4 NT	Exergy analysis, Brayton cycle, Ranki	÷	•		τ.	•		IZT
Unit-No.	Content	C C	Contact			arnii	-	KL
T	Evendomentale System & Control	1 volumou	Hour		Uu	tcon	ie	
Ι	Fundamentals - System & Contro		10	Stud	lanta			
	Property, State & Process; Exact differentials; Work - Thermodynamic					ahar	can nges in	
	of work; examples; Displacement v				uate mody		-	
		vork and			ertie		of	2,3
	illustrations for simple processes;			· ·	tance		01	2,5
	magnetic, gravitational, spring and sha			5405	curres			
П	Temperature, Definition of thermal e		10					
	and Zeroth law; Temperature scales	•	10	The	stud	ents	will be	
	Thermometers- Definition of heat; ex						ate the	
	heat/work interaction in systems- Fir	-		perf	forma	ince	of	
	Cyclic & Non-cyclic processes; Conc			-	rgy		version	2,3
	energy E; Demonstration that E is a	-		dev	ices			
	Various modes of energy, Internal e	energy and						
	Enthalpy							
III	Definition of Pure substance, Ideal	Gases and	10					
	ideal gas mixtures, Real gases and	d real gas						
	mixtures, Compressibility charts- Pro-	operties of		То	unde	erstai	nd the	
	two phase systems - Const. temper	rature and		prop	oertie	s of	f pure	3,4
	Const. pressure heating of water; Def	finitions of		subs	tance	e		
	saturated states; P-v-T surface; Use	e of steam						
	tables and R134a tables;							
	Saturation tables; Superheated							
	Identification of states & determine	ination of						
	properties, Mollier's chart							
IV	First Law for Flow Processes - Der		10					
	general energy equation for a control							
	Steady state steady flow processes	-			unde			
	throttling; Examples of steady flow	w devices;		conce	ept o	of C	entroid	3,4

	1 0	
Unsteady processes; examples of steady and and	d Centre of	
unsteady I law applications for system and Gra	ravity.	
control volume		
Clausius inequality; Definition of entropy S ; 5		
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; Un	nderstanding the	
Definition of Isentropic efficiency for cor	oncepts of Virtual	
V compressors, turbines and nozzles-	ork and	3,4
Irreversibility and Availability, Availability intr	troduction to	
function for systems and Control volumes Kin	inetics of Rigid	
undergoing different processes, Lost work.	odies	
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 Carnot cycle		

T1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.

T2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India **Reference books:** 

R1. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.

R2. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd

	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					

		SEN	MESTER – I	II						
<b>Course Title</b>										
Course code	24BTME216R	24BTME216R Total credits: 2 L T P		S	R	O/F	С			
		Total hou	rs: 30P	0	0	2	0	0	0	1
Pre-requisite	Nil	Co-	requisite			•		Nil		
Programme		Bach	elor of Tech	nolo	gy in	Mec	hanic	al Engi	neering	
Semester			III semester						-	
Course	1. This course w	-	students to le	earn	abou	it the	differe	ent engi	ineering g	raphical
Objectives	view in 2D as we	ell as 3D.								
	2. Different type	s of machi	ning processe	es us	sed in	n the	indust	ry can	be learnt	through
	this course									
	3. Learn the imp			-						
CO1	Illustrate various pr	•			-	-	graph	nics and	l design.	
CO2	Demonstrate variou		e 1			op.				
CO3	**	Learn real time applications of logic and coding								
<b>CO4</b>	Encourage the stude									
CO5	Effectively commu	nicate scier		nica	l kno			-		
Unit-No.	Content		Contact			Lear	ning	Outcor	ne	KL
			Hour							_
Ι	Different types of		6				-	-	d views of	
		ngineering	objects of engineering graphics and					1 1,2		
	application.				sign.					
II	Different types of	machining	6			istrate			machining	
	processes			processes in workshop.						1,2 f 3,4
III	Applications of 1	logic and 6			Learn real time applications of					
<b>TT</b> 7	coding	11 .	logic and codingEncourage the students towards						2.4	
IV	Critical thinking an	d learning	6			•			s towards	5 3,4
<b>X</b> 7		•	(					inking		2.4
V	Communication	in a	6			-			scientific	
	scientific and pr	oressional						nowled	lge in a	ı
	way			pr	oress	sional	mann	er		

T1. Workshop Technology, Hazra and Choudhury

## **Reference books:**

R1. Fundamentals of C programming, by Abubeker K M

References: www.nptel.ac.in

	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		Design of Fire and		•	Syste	ms				
Course code	24BTME218R	Total credits: 3		T	P	S	R	O/F	ŗ	С
		~	3	0	0	0	0	0		3
Pre- requisite	Nil	Co-requisite					Nil			
Programme		B.Tech Mech				5				
Semester		all/ III semester of f			•	0				
Course		s with an understand						nce, bui	ldin	g
Objectives		lards related to fire a asics of Fire, Active		•		•		oma		
		ed, Role and Aspect			-		•			
C01		Codes & Standards re								
CO2		andards for Fire Brig						5		
CO3	Define the concepts	of Fire Protection in	Building	s, R	esistan	ice Ra	iting, a	nd Rest	trict	ions
CO4		te the effectiveness o				syste	ms in o	differen	ıt	
~~~	<u> </u>	nd identify areas for								
CO5	<b>^</b>	ance of fire and life s	safety sys	tems	s with	releva	int cod	les, stan	Idaro	ls,
Unit- No.	and regulations.	tont	Contac	<b>t</b>	Ιοο	rnina	Outco	ma	T	KL
0111-110.			Hour	L	LCa	i mng	Oute	JIIC	1	XL
I	Basics of Fire Prot	ection System	10		I ist tl	ne dif	ferent		1	,2
	and Life Safety Sys	•	10				Stand		1	,2
		fe Safety Systems,					with f			
	Fire Codes and Star	dards, Building					and lif			
	Characteristics and				safety					
	Study on Life Safet				5					
	an IT Park, Means of Rating Requirement									
	Fire Resistance and									
	Rating, Stages in Fi									
	Resistance Rating S	tandards,								
	Construction Detail									
	walls/structure, Egr	-								
	and their Sizing Fire Buildings, Resistand									
	Restrictions	e Kaung, and								
II	Design of Compart	mentation in a	10		Enun	nerate	the Co	odes	2	2,3
	Building				and S					,
		es, and Aspects of			appli	cable	to Fire	;		
	Compartmentation				~ ~		oparatu			
	Designing of Comp				U	1	1			
	Smoke Control and Fire Zoning, Case S									
	Compartmentation,	•								
	in a Fire Compartm									
	Interfacing with Oth									
III	Fire Fighting Pum		10		-		e princ	-	2	2,4
	Capacity and Pipe						tection			
	Capacity Calculatio	Room, Pump				•	Resist	tance		
	Approvals of Fire P				Rating	0.				
	Sump Calculation,				Assoc					
	Tanks, Piping and I	nstrumentation			Restri	cuon	5.			
	Diagram, Piping and									
	Diagram and Pump									
	Arrangement, Basis Water Distribution	of Design of and Types of Pipes								

	used for Firefighting, Types of Pipe			
	Protection, Codes and Standards,			
	Introduction to Pipe Fittings, types,			
	codes & standards			
IV	Fire Protection, Detection & Alarm	10	Assess and critique	3,5
	Systems, and its Accessories		the efficiency of fire	
	Introduction to Fire		and life safety	
	Hydrants - Introduction to Sprinkler		systems across	
	System, Sprinkler Location, Design		-	
	Calculation of Sprinkler System,		various building	
	Introduction to Foam Suppression		scenarios,	
	Systems, Working Principle of Foam		highlighting areas for	
	Suppression Systems, Types of Foam		enhancement.	
	Suppression Systems, Classification			
	and Types of Extinguishers, Location			
	and Coverage of Fire Extinguishers,			
	Introduction to Fire Safety Signages,			
	Location and Size of Fire Safety			
	Signages, Luminescent Photo Safety			
	signages			
	Fire Detection Systems -			
	Purpose of Fire detection and Alarm			
	System, Types of Fire Detection			
	System, Types of The Detectors Systems, Selection of Detectors Based			
	on the Hazard, Applications of Heat,			
	Smoke, and Aspirating Detectors,			
	Introduction and Terminologies of			
	Fire Alarm Notification Devices,			
V	Location of Notification Devices	~	A (1 11	4.5
v	Special type of fire protection and	5	Assess the adherence	4,5
	fire alarm system		of fire and life safety	
	• Introduction of Local and		systems to applicable	
	Total Flooding Fire trace system –		codes, standards, and	
	Working Principle, Advantages,		regulations.	
	Types and Applications of Fire Trace		C	
	System, Kitchen Hood Fire			
	Suppression System, Application,			
	Description and Operation, Fire			
	Brigade Apparatus, Aspiration Smoke			
	Detection System, Working principle			
	of Aspiration smoke detection,			
	Introduction Gas Suppression System,			
	Regulatory Codes and Types, Clean			
				1
	Agent Fire Suppression System			
	Design with various Cleaning Agents,			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems,			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems,			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems, Design of Water Spray systems, Case			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems, Design of Water Spray systems, Case Study Design of Water Spray systems			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems, Design of Water Spray systems, Case Study Design of Water Spray systems for Transformers, Introduction,			
	Design with various Cleaning Agents, Detection, Actuation, Alarm and Control systems, Introduction to Water Spray systems, Types and advantages of Water Spray systems, Design of Water Spray systems, Case Study Design of Water Spray systems for Transformers, Introduction, Requirement and Types of Water Mist			

## **Reference Books:**

- Marsha P. Geisler (S), Fire & Life Safety, Educator: Principle & practices; SECOND EDITION/2016
- 2. Jones & Bartlett, Fundamentals of Fire Fighter Skills, revised-edition- 2017
- 3. A Handbook of Fire Technology by RS Gupta- 2<sup>nd</sup> edition Universities press
- 4. NFPA, Fundamentals of Fire Fighter Skills and Hazardous Materials Response, 4th EDITION-2018
- 5. Fire & Life Safety (iafc.org), https://www.iafc.org/learn-and-develop/online-learning/
- 6. https://www.dgfscdhg.gov.in/national-building-code-india-fire-and-life-safety
- 7. <u>The NFPA Fire & Life Safety Ecosystem | NFPA</u>

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Recall the various Codes & Standards related to fire protection and life safety	1,2&3
2	List the Codes & Standards for Fire Brigade Apparatus	2,3&4
3	Define the concepts of Fire Protection in Buildings, Resistance Rating, and Restrictions	1,3&4
4	Analyse and evaluate the effectiveness of fire and life safety systems in different building scenarios and identify areas for improvement.	2,3&4
5	Evaluate the compliance of fire and life safety systems with relevant codes, standards, and regulations.	1,3&4

		SEMESTI	CR – III							
<b>Course Title</b>		E	KTRA-CU	RRIC	ULAF	R AC	ΓΙνι	TIES		
Course code	24UBEC211	Total credit	s: 1 I	T	Р	S	R	O/F	7	С
			0	0	0	4	0	0		1
Pre- requisite	Nil	Co-requi	site			l	Nil			
Programme		B.Tech N	Iechanica	l Engiı	neerin	g				
Semester		Fall/ III	semester (	of first	year	of the	prog	ramme		
Course	1. To develop soft									
Objectives	2. To promote a ho	-								
	3. To enhance the	- ·			-					
<b>CO1</b>	The students will					aded	under	r differe	ent c	lubs
	namely dance, mus									
CO2	The students will p		ular club a	ctivitie	s like	work	shops	, compe	titior	ns as
	per their interest an					•		•		1
CO3	The students will	_	resent AD	TU in	variou	is inte	er univ	versity,	state	and
<u> </u>	national level comp			<u> </u>	·	1		41		
CO4	The students will fields.	be given a platto	rm to earr	from	invite	d exp	erts ir	n their re	espec	ctive
CO5	The students will g	at on avragura o	f 360 daar	00 100r	nina n	atha	lalam	u consid	orina	r tha
003	overall growth alo	-	-		ning n	ictio		y consid	CIII	g the
Unit-	Content	Contact		Lear	ning	Outer	me		ŀ	KL
No.	Content	Hour		Lea	mig	oute	, mc		-	
I	Different types		1. Ad	tU enc	ourage	s a ra	nge of	f	1,2	,3,4
	activities outsid			ties ou	-		-			5
	regular curriculu	m	curric	ulum i	ntende	d to n	neet			
			learne	er's inte	erest. 7	These	activi	ties are		
			aimed	to dev	velop t	he soc	cial			
				oft skil		-				
					-			arners.		
				eping i				egree		
				ng met		•••				
				nts are ties hea						
				viz. Da				n		
				graphy				etc		
			-	e stude			•			
				ipate in			-			
			-	-	-			pers of		
				ub are						
				ious in		•				
				ational			•			
			Renev	ved pe	rsonali	ities a	re inv	ited to		
			condu	ct wor	kshops	s that	benef	ït the		
				ers an				-		
				the pla						
			exper	ts in th	e respe	ective	fields	5.		

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Programme 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

		SEN	IESTER – I	II						
Course Title		Eng	lish for Emj	ploya	ability	y Skill	s			
Course code	24UBPD213R	Total cred		L	Τ	P	S	R	O/F	С
		Total hour	's: 60P	0	0	4	0	0	0	2
Pre- requisite	Nil	Co-ree	quisite				N	lil		
Programme	B	achelor of <b>T</b>	echnology i	n Mo	echan	ical E	ngine	ering	g	
Semester			semester of s		•			-		
Course	1. To capacitate the		•			•	•			
Objectives	2. To enable the		communicat	e co	nfider	ntly w	ith a	focus	s on list	ening an
	speaking skills.		0.51							
	3. With the help		es of Phonet	ics,	the st	tudents	s will	be a	ible to p	oronounc
	words correctly		1 .1 1							
<u>CO1</u>	4. To interact such	-			1 /1	4 1		C 1		E 1'
CO1	The mastery of Ba	•	grammar wil	l ma	ke the	e stude	ents co	onfid	ent to us	se Englis
CO2	for all professional The communication		itated in this	0011#		1 halm	thom	make	moonin	aful and
02	successful conversa			cour	se wii	i neip	ulem	Шакс		giui allu
CO3	The students will h		nmunication	imn	roved	in all	doma	ins		
CO3	Develop and delive								ineering	languag
	and communication	-	-	10115	using	, uppit	priac		meering	lunguug
CO5	Analyze and ada			tegie	es for	dive	rse e	engin	eering	workplac
	scenarios, demonst			-				0	0	1
Unit- No.	Conten	-	Contact	<u> </u>		Learn	ing O	utco	ne	KL
			Hour				8			
Ι	I. Parts of Speech I	Articles	12	In	this n	nodule	, stude	ents v	vill mast	er 1, 2
	I. Auxiliary	Verbs		the	e fo	undati	onal	eler	nents	of
	Affirmative and	Negative		gra	amma	r. The	ey wi	ill ey	xplore t	he
	Sentences			-		-			ng nour	
				1	onoun		verbs		adjective	
								-	eposition	
					•	tions,			erjection	
						•			. (defini	
							/		ir corre	
					•		-		l. Studer	
								-	verbs an es, voice	
							-		will al	
					ver	the		nstruc		of
									sentence	
					lping		dents			
						tically		corre	ct a	nd
				-		ful sei		es.		
II	I. Determiners		12		-				nis modu	ıle 2, 3,
	I. Sentence Constru	ction		wi	ll de	lve in	to de	eterm	iners a	nd 4
	I. Types of	Sentences		the	eir f	functio	ons	in	sentence	es.
	Assertive, Imperati	ve, etc.)		Stu	udents	s wi	ll le	earn	senten	ce
	.Degree of Compar							iques	and t	he
	.Comprehension Ex	rcises				t typ	pes	of	sentenc	
				· ·	ssertiv				mperativ	
					-				lamatory	-
				Th	e co	ncept	of 1	the o	degree	of

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			comparison (positivo comparativo	
			comparison (positive, comparative,	
			and superlative) will be explored.	
			The module will also include	
			comprehension exercises	
			designed to enhance students'	
			ability to	
III	I. Introducing yourself I. Self-	12	This module focuses on developing	1, 2
	discovery I. Basics of		students' speaking abilities. They	
	Phonetics, pronunciation		will learn how to introduce	
	. Extempore speech		themselves and engage in self-	
	. Video Recording for Self-		discovery to build confidence.	
	reflection		Basics of phonetics and	
			pronunciation will be covered to	
			ensure clear and correct speech.	
			Students will practice extempore	
			speech to improve their ability to	
			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	
		1.	speaking skills.	
IV	I. Introduction to	12	Students will gain a comprehensive	2, 3,
	Communication,		understanding of communication	4, 5
	I. Importance of		and its significance. The module	
	Communication Skills, I.		will cover the types and purposes	
	Purpose of Communication,		of communication, distinguishing	
	.Types of Communication,		between formal and informal	
	.Formal and informal		contexts. Students will learn about	
	communication I. Importance		the importance of communication	
	of Communication, I. Barriers		skills and the barriers that can	
	to Communication,		impede effective communication.	
	I. How to improve/ tips to		Tips and strategies to improve	
	improve Communication		communication skills will be	
	skills. Responding to different		provided. The module will also	
	questions in various situations		include exercises on responding to	
	(formal/informal)		different questions in various	
			situations, enhancing students'	
			adaptability and effectiveness in	
			adaptability and effectiveness in both formal and informal	
			adaptability and effectiveness in both formal and informal interactions.	

**T1.** Chaturvedi, P.D., Chaturvedi Mukesh, 2011.Business Communication: Concepts, Cases and Applications, second edition, Pearson, Noida.

**T2.** Alex K., Chand, S, 2009. Soft Skills: Know Yourself and Know the World, first edition, S. Chand & amp; Company Ltd.: New Delhi

#### **Reference Books:**

**R1.** Quirk, Randolp. (2010) A Comprehensive Grammar of the English Language by Randolph Quirk, Sidney Greenbaum, Pearson Education India

R2. Marks, Jonathan. (2017) IELTS Advantage Speaking and Listening Skills: A step-by-step guide to a

## Other Learning Resources: https://youtu.be/bEB8-SWMYhI

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	The mastery of Basic English grammar will make the students	6,10
	confident to use English for all professional purposes.	
2	The communication skills facilitated in this course will help	6,10
2	them make meaningful and successful conversations.	0,10
3	The students will have their communication improved in all	( 10
3	domains.	6,10
	Develop and deliver professional presentations using	
4	appropriate engineering language and communication	6,10
	techniques.	
	Analyze and adapt communication strategies for diverse	
5	engineering workplace scenarios, demonstrating cross-	6,10
	cultural competence.	

			SEN	IESTER – I	III						
Cours	e Title			Basic Life	Savin	ıg Skil	s				
Cours	e code			its: 1 Total	L	Т	Р	S	R	O/F	С
<b>D</b>	• • /		ours: 30F		0	0	2	0	0	0	1
Pre- re	•	Nil		quisite		<u> </u>			lil		
Progr				echnology				-	-		
Sem				semester of		· ·			-		
Cou		1. Equip students w			lge ar	nd skil	ls in	basic	life-s	aving te	chniques,
Obje	ctives	including CPR an			•,	<i>.</i> .	1		1	. 1	
		2. Develop the abili				ations	and r	espon	d effe	ectively	to various
		types of injuries a					1			1. 4	·
		3. Foster an underst	-	-						Is to min	imize the
0	21	occurrence of em	-					•	•	• 1	1 .
C	JI	Demonstrate proficie	-		СРК	k, adn	nniste	ering	first	aid, a	nd using
~	22	automated external de							1	f 1	1
CO	92	Exhibit the ability to	- ·	ssess emerg	ency	situati	ons a	na ma	аке 11	iformed	decisions
~	73	to provide immediate		otre masta - 1	a ta r	******	00011	onta	ndl	ndla	organici
CO	55	Understand and apply	ouasic sal	ery protocol	s to p	ievent	accid	ents a	ina na	more em	ergencies
C	74	efficiently. Display confidence a	nd come	tonos in h-	ndlin	T 0 #0/7	ac -4	mad	ioc1 -	morar	ios from
U	<b>J</b> 4	minor injuries to life-	_			g a Tan	ige of	mea		mergend	les, non
C	75	Advocate for and p		-		ntive r	noocu	roc u	vithin	the co	mmunity
C	<b>J</b> 3	contributing to a safer					ncasu	105 W	v I UIIIII	the co	mmunity
Unit-		Content		Contact		I	arnii	ng Ou	teon		KL
No.		Content		Hour			ai 1111	ig Ou		it	
I	Unit 1	: Introduction to Lif	fe-Saving	6	This	unit	cover	s the	imp	ortance	of 1, 2
-	Skills		e se ing	U U						the bas	
							-			cusses tl	
	· 1	mportance of life-savi	ng skills		-	-				providi	
		inportance or me savi	ng skins		lega	i and e	unical	aspec			151
	•	Basic principles of first	-		-			-		-	-
		-	t aid		first	aid, er	nphas	sizing	the i	mportane ne use	ce
	• 1	Basic principles of first	t aid		first of p	aid, er bersona	nphas ıl saf	sizing ety a	the is nd th	mportan	ce of
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III	<ul> <li>Unit 3: First Aid Techniques</li> <li>Managing bleeding, wounds, burns, and fractures</li> <li>Providing first aid for choking, poisoning, and shock</li> <li>Practical sessions for bandaging, splinting, and other first aid procedures</li> </ul>	6	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	<ul> <li>Unit 4: Emergency Medical Conditions</li> <li>Recognizing symptoms of heart attacks, strokes, asthma attacks, and diabetic emergencies</li> <li>Immediate response actions for medical emergencies</li> <li>Ongoing care until professional help arrives Importance of staying calm and effective communication during emergencies</li> </ul>	6	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	<ul> <li>Unit 5: Safety and Prevention</li> <li>1. Home and workplace safety measures</li> <li>2. Fire prevention and electrical safety</li> <li>3. Accident prevention strategies</li> <li>4. Community safety programs Advocating for safety an preventive measures within the community </li> </ul>	6	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:

T1. "First Aid Manual" by British Red Cross, St John Ambulance, St Andrew's First Aid, 2016.

**T2.** "Emergency Care and Transportation of the Sick and Injured" by American Academy of Orthopedic Surgeons (AAOS), 2016.

**T3.** "Advanced First Aid, CPR, and AED" by American Academy of Orthopaedic Surgeons (AAOS), 2011.

## **Reference Books:**

**R1.** "Wilderness First Responder: How to Recognize, Treat, and Prevent Emergencies in the Backcountry" by Buck Tilton, 2010.

**R2.**"Prehospital Trauma Life Support" by National Association of Emergency Medical Technicians (NAEMT), 2014.

R3. "Fundamentals of Basic Emergency Care" by Richard W. O. Beebe, Deborah L. Funk, 2013.

R4. "CPR and AED" by Alton L. Thygerson, Steven M. Thygerson, 2011.

**R5.** "Basic Life Support (BLS) Provider Manual" by American Heart Association, 2020.

	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 measures within the community, contributing to a safer environment.	6,9

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	<ul> <li>Plannin</li> <li>1. Prince Settin</li> <li>2. Budg mana</li> <li>UNIT 2</li> <li>1. Type bond retur</li> <li>2. Portf</li> <li>1. Soc</li> </ul>	g iples of financial plat ng financial goals geting and cash agement 2- Investment Planning s of investments (st s, mutual funds, etc.) Ris n analysis	ancial 6 nning flow tocks, k and es	princip includin creating flow of importa financia financia term fin This un investm mutual risk and strategi techniq manage	les ng g buc effect ance al sta al pla nancia nit fo nents funds d retu es, a ues to e their vely.	of settin lgets, ively. of un atement anning al secu cuses such a s, and und p b help inves	financ g fin and It e dersta nts an g in a g in a g in a grity. on dif s stock real es alysis, ortfoli indivi tment	rial mancia mana mpha nding d th uchiev fferen cs, bo tate. asset o ma duals portfa addro	planni al go ging c asizes g perso e role ving lo ut types onds, It explo allocat anagem s build s olios	ing, als, ash the onal of ng- ores cion ient and the	2, 3,	
II	<ul> <li>Plannin</li> <li>1. Prince Settin</li> <li>2. Budg mana</li> <li>UNIT 2</li> <li>1. Type bond retur</li> <li>2. Portf</li> <li>1. Soc</li> </ul>	g iples of financial plan ing financial goals geting and cash gement 2- Investment Planning s of investments (st s, mutual funds, etc.) Ris n analysis folio management strategio	ancial 6 nning flow tocks, k and es	princip includin creating flow of importa financia financia term fin This un investm mutual risk and strategi techniq manage effectiv Retiren	les ng g buc effect ance al sta al pla nancia nit fo nents funds d retu es, a ues to e their vely. nent s of	of setting lgets, ively. of un atement anning al secu cuses such a s, and rn ana ond p b help inves	financ g fin and It e adersta ats an g in a arity. on dif s stoch real es alysis, ortfoli indivi tment ning g and	rial mancia mana mpha nding d th uchiev fferen as, bo tate. asset o ma duals portfo addro inv	planni al go ging c asizes g perso e role ving lo t types onds, It explo allocat anagem s build s olios esses esting	ing, als, ash the phal of ng- ores cion hent and the for	2, 3, 4	
II	<ul> <li>Plannin</li> <li>1. Prince Settin</li> <li>2. Budg mana</li> <li>UNIT 2</li> <li>1. Type bond retur</li> <li>2. Portf</li> <li>1. Soc</li> </ul>	g iples of financial plan ing financial goals geting and cash gement 2- Investment Planning s of investments (st s, mutual funds, etc.) Ris n analysis folio management strategio	ancial 6 nning flow tocks, k and es	princip includin creating flow of importa financia financia term fin This un investm mutual risk ano strategi techniq manage effectiv Retiren process	les ng g buo effect ance al sta al pla nancia nit fo nents funds d retu es, a ues to e their zely. nent s of ent. I	of setting lgets, ively. of un atement anning al secu cuses such a s, and und p o help inves plant savin t cove	finance g fin and It e adersta nts an g in a rity. on dif s stock real es alysis, ortfoli indivi tment	rial mancia mana mpha nding d th uchiev fferen cs, bo tate. asset o ma duals portfa addro inve	planni al go ging c asizes g perso e role ving lo at types onds, It explo allocat anagem s build s olios esses esting nt savi	ing, als, ash the phal of ng- ores cion hent and the for	2, 3, 4	
Π	<ul> <li>Plannin</li> <li>1. Prince Settin</li> <li>2. Budg mana</li> <li>UNIT 2</li> <li>1. Type bond retur</li> <li>2. Portf</li> <li>1. Soc</li> </ul>	g iples of financial plan ing financial goals geting and cash gement 2- Investment Planning s of investments (st s, mutual funds, etc.) Ris n analysis folio management strategio	ancial 6 nning flow tocks, k and es	princip includin creating flow of importa financia financia term fin This un investm mutual risk and strategi techniq manage effectiv Retirem process retirem	les ng g buc effect ance al sta ance al sta ance al pla nancia nit fo nents funds d retu es, a ues to e their vely. nent s of ent. I s like	of setting lgets, ively. of un atement anning al secu cuses such a s, and po help inves plant savin t cove 401(k	finance g fin and It e aderstants an g in a g in a g in a g in a rrity. on dif s stoch real es alysis, ortfoli indivi tment ning g and ers reti	rial mancia mana mpha nding d th achiev fferen cs, bo tate. asset o ma duals portfe addro inver	planni al go ging c asizes g perso e role ving lo nt types onds, It explo allocat anagem s build s olios esses esting nt savi IRAs,	ing, als, ash the onal of ng- ores cion eent and the for ngs	2, 3, 4	
II	<ul> <li>Plannin</li> <li>1. Prince Settin</li> <li>2. Budg mana</li> <li>UNIT 2</li> <li>1. Type bond retur</li> <li>2. Portf</li> <li>1. Soc</li> </ul>	g iples of financial plan ing financial goals geting and cash gement 2- Investment Planning s of investments (st s, mutual funds, etc.) Ris n analysis folio management strategio	ancial 6 nning flow tocks, k and es	princip includin creating flow of importa financia financia term fin This un investm mutual risk and strategi techniq manage effectiv Retirem vehicle	les ng g buc effect ance al sta al pla nancia nit fo nents funds d retu es, a ues to e their rely. nent s of ent. I s like ing r	of setting lgets, ively. of un atement anning al secu cuses such a s, and und p b help b help c inves plant savin t cove 401(k	finance g fin and It e adersta nts an g in a g in a g in a rrity. on dif s stock real es alysis, ortfoli indivi tment ming g and ers reti-	rial mancia mana mpha nding d th uchiev fferen cs, bo tate. asset o ma duals portfo addro inve addro s and eeds d nav	planni al go ging c asizes g perso e role /ing lo at types onds, It explo allocat anagem a build olios esses esting int savi IRAs, based igating	ing, als, ash the onal of ng- ores con ent and the for ngs on	2, 3, 4	

			optimize retirement income.				
IV	UNIT 4- Tax Planning	6	Tax planning involves strategies to	1, 2			
			minimize tax liabilities and maximize				
	1. Tax-efficient investment strategies		after-tax income. This unit discusses				
	2. Tax deductions and credits		tax- efficient investment strategies,				
	Tax implications of retirement	tions of retirement deductions, credits, and					
	distributions		related to retirement contributions,				
			distributions, and estate planning.				
V	UNIT 5 -Estate Planning	6	Estate planning encompasses the	2, 3,			
	1. Wills, trusts, and probate		process of managing and distributing	4, 5			
	Power of attorney and healthcare		assets in accordance with an individual's				
	directives Charitable giving and		wishes upon death. It covers essential				
	legacy planning		topics such as wills, trusts, probate,				
			power of attorney, healthcare directives,				
			charitable giving, and strategies for				
			minimizing estate taxes.				

## Textbooks:

T1. "Personal Finance" by Jeff Madura, 2016.

**T2. "Personal Financial Planning"** by Lawrence J. Gitman, Michael D. Joehnk, and Randy Billingsley, 2013.

T3. "Fundamentals of Financial Planning" by Michael A. Dalton, James F. Dalton, 2011.

## **Reference Books:**

**R1. "The Bogleheads' Guide to Retirement Planning"** by Taylor Larimore, Mel Lindauer, Richard A. Ferri, Laura F. Dogu, 2009.

**R2.** "The Financial Planning Workbook: A Practical Guide to Creating Your Own Financial Plan" by Coventry House Publishing, 2018.

- "The Millionaire Next Door: The Surprising Secrets of America's Wealthy" by Thomas J. Stanley, William D. Danko, 2010.
- 2. "Your Money or Your Life: 9 Steps to Transforming Your Relationship with Money and Achieving Financial Independence" by Vicki Robin, Joe Dominguez, 2008.
- **3.** "Smart Couples Finish Rich: 9 Steps to Creating a Rich Future for You and Your Partner" by David Bach, 2009.

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 analyzing 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					

			SEMESTE	R – III							
Course Ti	itle	Int	roduction to Electr		lectro	nics	Engi	neerir	ıg		
Course code		24BTME213R	<b>Total credits: 3</b>		L	Т	Р	S	R	O/F	
		<b>.</b>	Total hours: 30T+		2	0	2		0	0	3
Pre-requi		Nil         Co-requisite         Nil									
Program		B.Tech in Mechanical Engineering III semester of the Second year of the programme									
Semeste Course			basic knowledge ab					mme			
Objectiv						npone	cints.				
osjeen	0.5	<ul><li>To learn about various circuit design laws.</li><li>To learn about semiconductor fabrication.</li></ul>									
		<ul> <li>To integrate the different types of Electrical Installation.</li> </ul>									
C01			concepts and circuit					lectric	circ	uits	
CO2			iew of Transformers			-					
CO3								simpl	e A	C circ	uits in
000		Apply the fundamental laws of electrical engineering to solve simple AC circuits in steady-state.									
CO4			ew of Semiconducto	r devices							
C04			e of an Electrical ins		nd thre	e_nh	ase A	Ceve	teme		
Unit-		Conte		<b>Contact</b>				Outc		•	KL
No.		Conte	111	Hour		Leal	mng	Juit	ome		кL
I	Elei	mentary concepts	of DC electric	11041	Und	ersta	nd	and	exn	lain	1,2
	volt Cap and Rula relat and delt deri Nor Sup prot <b>Po</b> <b>ins</b> con vol EL cat	age, current, p acitance, emf; Res parallel; Current an es; Capacitors & tions and energy s Kirchhoff's Law a conversion (resist vation not r ton's theorem, The erposition theor blems. wer converter stallation: DC-DC nverter, single phas ltage source invest CB, MCCB, Ear bles, types of batter	s-Problems; Star- ive networks only- equired)-problems, evenin's Theorem, rem, Numerical <b>and electrical</b> buck and boost se and three phase rter, Fuse, MCB, thing, wires and es	6	pow cont App volta resis circu serie para	er, a ext ly Ol age, itance its. es, pa llel ro	and e of hm's cu e in Analy aralle esisto	nt, re energy DC Law urrent, sim yze ai l, and r netw	v in circt to re ple nd se d ser vorks	the uits. elate and DC olve ries-	
Π	Gen Rep freq and Prob AC sinu AC capa capa capa circu pow Thu of 1 three	resentation of sinu uency, period, Ave form factor of war olems. <b>Circuits:</b> Phasor asoidal quantities. A circuits: Purely res acitive circuits; acitive reactance edance. Average lysis of RL, RC,	rnating voltages- soidal waveforms: erage, RMS values veforms-Numerical representation of Analysis of simple istive, inductive & Inductive and concept of Power factor. and RLC series re, and apparent al problems, ems: Generation es; advantages of star and delta	6	alter how curre Desc wave key j	natin it o ent (I cribe eforn parar litudo	g cur differ DC). sinus ns and neters e, frec	he na rent ( s fron oidal d unde s such quency ase an	AC) m di erstar as y,	and	2,4

	between line and phase voltages, line and phase currents- Numerical problems			
III	<b>Transformer:</b> Magnetic materials, ideal and practical transformer, equivalent Circuit, losses in transformer, regulation and efficiency, auto transformer, three phase transformer connection. <b>Electrical</b> <b>machines:</b> 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	Understand the fundamental principles of electromagnetic induction as they apply to transformers. Explain the concepts of mutual inductance and magnetic coupling.	3,4
IV	Introduction to Semiconductor Devices: Evolution of electronics – Vacuum tubes to nanoelectronics. Resistors, Capacitors, and Inductors (constructional features not required): types, specifications. Standard values, color coding. PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown. Bipolar Junction Transistors: PNP and NPN structures, Principle of operation, the relation between current gains in CE, CB, and CC, input and output characteristics of common emitter configuration.	6	Understand the principles of electromechanical energy conversion. Describe DC generators' and motors' construction, components, and working principles.	4,5,6
V	<b>Basic electronic circuits:</b> Rectifiers and power supplies: Block diagram description of a DC power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Amplifiers: Circuit diagram and working of the common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing.	6	Understand the basic principles of power electronics and power conversion. Differentiate between various types of power converters (AC-DC, DC-DC, DC-AC, AC-AC) and their applications.	5,6

# **TEXTBOOKS:**

T1: D P Kothari and I J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

T2: D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

**T3:** Chinmoy Saha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.

#### **REFERENCE BOOKS:**

**R1:** Del Toro V, "Electrical Engineering Fundamentals", Pearson Education.

R2: T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford Higher Education.

R3: Hayt W H, Kemmerly J E, and Durbin S M, "Engineering Circuit Analysis", Tata McGraw-Hill

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Apply the laws in the analysis of Semiconductor Fabrication.	1,3 & 4
2	Explain the construction and operation of the Diode and Zener Diode.	1,2
3	Understand the construction and operation of transistors and different circuit configurations.	7.9,10
4	Overview of the OPAMP and application.	5,7
5	Outline the principle of an Electronic Digital System.	5,8

	1	SEMESTER								
<b>Course Title</b>		Fluid Mechani	cs and F					1	1	1
Course code	24BTME222R	Total credits: 4		L	Т	Р	S	R	O/F	C
<b>D</b>		Total hours: 45T+3		3	0	2	0	0	0	4
Pre-requisite	Nil	Co-requis					Ni		<u> </u>	
Programme		Bachelor of						-		
Semester		Winter/ IV sen	nester of	seco	ond y	year o	f the	progra	amme	
Course	1 To loom about t	he application of mas	a and ma	man	tum	00000	muntio	n 1011/0	for flu	4
Objectives	flows	ne application of mas	s and mo	men	luiii	conse	Ivatio	li laws	101 114	u
Objectives	2. To understand the importance of dimensional analysis									
		locity and pressure va		-		s tvpe	s of si	mplet	flows	
C01		he importance of vari				• •		-		
C02		e students to classify								
CO3		to choose the veloc	-							bes of
	simple flows.			I					51	
CO4	· ·	students to analyze th	e flow in	wat	er pu	imps a	and tu	bines.		
CO5		thematically to analyz				-				
Unit-No.	Con	tent	Contact	t	-	Lea	rning	Outc	ome	KI
			Hour							
	Definition of fluid	l, Newton's law of	10	Le	earnii	ng ab	oout t	the ty	pes of	
	viscosity, Units			uid, eriva				rement.		
	-	Properties of fluids, mass density,					of		noulli's	
I	-	specific gravity, equation and its application.						ion.	2,4	
	• •	sibility and surface								
		volume- application								
		tion and momentum								
	-	npressible flow,								
	Bernoulli's equatio									
	and its applications	ns in channels and	10	Ic	orni	na ol		tha f	low of	•
		nd Poisuielle flow,	10			U		nd duc		2,4
		gh circular conduits							eisbach	
	and circular an	-			uatic			Cy= ***	cisoden	
П	boundary layer	•			uuuic	, II				
		hickness – Darcy								
	Weisbach	5								
	equation, friction	factor, Moody's								
	diagram	•								
	Need for dimen	sional analysis –	10	Le	earnii	ng abo	out the	e dime	nsional	
	methods of dim	ension analysis –		an	alysi	s t	hroug	h d	ifferent	2,4
	Similitude – ty	pes of similitude		m	ethoo	ls.				5
III	Dimensionless	parameters –								
	11	dimensionless								
	parameters –									
	Model analysis									
	Euler's equation	-				•			ifferent	
	•	chines – various			-	-	imps	and v	vorking	
IV		city components at		-	incip		с <b>г</b> . 1			2,4
	-	the rotor, velocity	10						quation	5
	iriangies – Centrift	igal pumps, working	10	an	a its	applic	cation			1

	principle, work done by the impeller,			
	performance curves - Cavitation in			
	pumps Reciprocating pump – working			
	principle			
	Classification of water turbines, heads	5	Learning about the different	2,4,
	and efficiencies, velocity triangles-		types of turbines and its parts.	5
	Axial, radial and mixed flow turbines-			
	Pelton wheel, Francis turbine and			
V	Kaplan turbines, working principles -			
	draft tube- Specific speed, unit			
	quantities, performance curves for			
	turbines –			
	governing of turbines.			

# **TEXT BOOKS:**

T1. Fluid Mechanics and hydraulic machines, R. K. Bansal

T2. Fluid Mechanics by YunusCengel, JhonCimbala, Tata Macgraw Hill, New Delhi

#### **REFERENCE BOOKS:**

R1. Fluid Mechanics by Streeter & Wylie, Tata McGraw Hill **OTHER LEARNING RESOURCES:** 

	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	R – IV									
Course T	itle	Streng	th of Ma	terials								
Course co	ode 24BTME223R	Total credits: 3		L T	Р	S	R	O/F				
		Total hours: 30T+3		2 0	2	0	0	0	ds. es fo sional ects of beams thei on the $\mathbf{KL}$ f $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$ $\mathbf{I}$	3		
Pre-requi		Co-requis						<u> </u>				
Program		Bachelor of					_	_				
Semeste		Fall/ IV sem		÷			. 0		. 1			
Course Objectiv		1. To understand the nature of stresses developed in simple geometries such as bars										
Objectiv		<ul><li>cantilevers, beams, shafts, cylinders and spheres for various types of simple loads.</li><li>2. To calculate the elastic deformation occurring in various simple geometries for</li></ul>										
	different types of			ing m	vario	us 511	iipic g	comen		101		
C01		ate different types of	of stresses	and st	rains.	inclu	ling a	xial. tor	sior	nal		
001	bending, and shear s				,			,				
CO2	_	properties such as el	lasticity, p	olasticity	y, and	creep	, and t	heir eff	ects	on		
		erials under various l	. –			1						
CO3		te the deformation a	-			al elen	nents, s	such as	bear	ms,		
	columns, and shafts											
CO4		e materials for spe		gineerin	g app	olicatio	ons ba	ased or	n th	neir		
		mechanical properties, durability, and cost.										
CO5		Identify and analyze the different failure criteria of materials and their effects on the										
Unit-No.	performance and sat	-	Contact							1/T		
Unit-No.	Conter	IL	Hour	8						<b>L</b>		
Ι	Deformation in solids-	Hooke's law stress	6	Learn about Hooke's law.								
•		d strain- tension, compression and shear To find the shear stre						1				
		-						raphica		1		
	relations- volumetric,	linear and shear		metho	od (M		Circle)	-				
	strains- principal stres	sses and principal										
	planes- Mohr's circle.											
II	Beams and types, tran	U	6					types o	f			
	beams- shear force a			beam	s and	their a	nalysis	5.				
	diagrams- Types of bea									2		
	supported and over cantilevers. Theory of	r-hanging beams,								Ζ		
	bending stress distribution	•										
	shear stress distribu											
	distributed loads.											
III	Moment of inertia about	t an axis and polar	6	Learn	6	about	М	axwell'	s			
	moment of inertia, def			recipr	ocal t	heorei	ns, mo	oment o	f	3		
	-	egration method,		inertia	a etc.							
	computation of slopes	and deflection in										
	beams, Maxwell's											
137	reciprocal theorems.	Competion in sime-1-	6	Learn about different types of					f			
IV	Torsion, stresses and def and hollow shafts, stepp		0	helica		n ann prings		• •		4		
	of shafts fixed at both			analys		prings	and		•	т		
	deflection of helical sprin			anary								
V	Axial and hoop stre		6	Learn	abou	t thick	cylin	ders and	1			
	subjected to internal pr	•		their a			5 -			6		
	of thick and thin cylind				-							
	spherical shells subj	ected to internal		1					1			

	pressure.			
Practical	Impact Test (Izod) Impact Test (Charpy)	30	Learn about the hardness and	
	Torsion Test of Metal rod		toughness of the materials	1,2,
	Hardness (Rockwell & Brineil)		through different methods.	3,4

# **Text Books/ Reference Books:**

T1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.

R1. Subramanian, Strength of Materials, Oxford University Press, 2007.

R2. erdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGraw Hill Publishing Co. Ltd., New Delhi 2005.

	CO PO Mapping	
SN	Course Outcome (CO)	Mapped Program Outcome
1	Analyze and calculate different types of stresses and strains, including axial, torsional, bending, and shear stresses.	2,3
2	Determine material properties such as elasticity, plasticity, and creep, and their effects on the behavior 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								
<b>Course Title</b>		Engineering Materials	and	Appl	icatio	ns				
Course code	24BTME224R	Total credits: 3	L	Τ	Р	S	R	O/F		С
		Total hours: 30T+30P	2	0	2	0	0	0		3
Pre-requisite	Nil	Co-requisite				Ni				
Programme		Bachelor of Techno	0.				0	0		
Semester		Winter/ IV semester								
Course	-	edge of the correlation bet								
Objectives	-	roperties and various meth	ods to	o qua	ntify 1	their r	necha	nical in	iteg	grity
	and failure criteria			1	1.					
	-	ed interpretation of equilib		-	-					~ ~ ~
		ferent phases and heat trea	tmen	it me	lnoas	to tall	or the	e prope	rue	S 0.
CO1	Fe-C alloys	e crystal structures of diffe	rant	motor		ndun	dorato	nd tha	daf	Contr
COI	in such structures.	e crystal structures of diffe	rent	mater	Tais a	na une	dersta	na the	uer	ects
CO2		t mechanical property me	acur	omon	t met	hode	and	avaluat	o f	hair
02	performances.	i meenamear property m	asui	cinci	it met	nous	anu	c valuat	ι	nen
CO3	*	the material properties of f	errou	s and	non-f	ferrou	s allo	vs.		
<u>CO4</u>		d understand different hea							ne t	heir
001	-	in different manufacturing			-					
CO5		e performance of alloying s	-			turing	g appli	ications	5.	
Unit-No.		Content		ontac	-		Lear		-	KL
			1	Hour			Outc	ome		
Ι	Crystal Structure	: Unit cells, Metallic		6	Lea	ırn to	iden	tify th	e	
	crystal structures, C	eramics. Imperfection in			cry	stal	struct	ures c	f	2,4
	solids: Point, line, in	nterfacial and volume			diff	ferent	mater	rials an	d	
	defects; dislocation	strengthening			und	lerstar	nd the	defect	s	
	mechanisms and slip	p systems, critically			in s	such st	tructu	res.		
	resolved shear stres									
II	<b>^</b>	rty measurement: Tensile	·	6	Lea			differer		
	*	torsion tests; Young'						propert		
	modulus, relation							method		
	0 0	strain curves, generalized			and		aluate	e thei	r	5
	-	lding and yield strength			per	forma	nces.			
	-	e, toughness and elastic								
		s: Rockwell, Brinell and	1							
III	Vickers and their re	ories: Ductile and brittle		6	Log	m ho	w to t	ailor th	-	
111		ns, Tresca, Von-mises		0				erties o		
		stress, Mohr-Coulomb and	·			ous	and			
		alomb; Fracture mechanics				ous a		non		
		ss-intensity factor approach				u				2,4,
		ion. Fatigue failure: High								2, i, 5
		s-life approach, SN curve								-
		gue limits, effects of mean	·							
		odified Goodman diagram								
	Fracture with f									
	nondestructive testin	-								
	(NDT)									
IV	Alloys, substitutio	nal and interstitial solid	1	6	Lea	ırn to	iden	tify an	d	

	binary phase diagrams and microstructure		heat treatment	
	development; eutectic, peritectic, peritectoid		processes and	5
	and monotectic reactions. Iron Iron-carbide		determine their	
	phase diagram and microstrctural aspects of		specific application in	
	ledeburite, austenite, ferrite and cementite,		different	
	cast iron.		manufacturing	
			processes.	
V	Heat treatment of Steel: Annealing,	6	Learn to evaluate the	
	tempering, normalising and spheroidising,		performance of	
	isothermal transformation diagrams for Fe-C		alloying steels in	
	alloys and microstructure development.		manufacturing	
	Continuous cooling curves and interpretation		applications.	
	of final microstructures and properties-			
	austempering, martempering, case hardening,			2,4,
	carburizing, nitriding, cyaniding, carbo-			5
	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			

# **TEXT BOOKS**

•

T1:Willam Calliister, 2002, Materials Science and Engineering.

# **REFERENCE BOOKS**

• V. Raghavan, 1974, Materials Science and Engineering.

	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 methods and evaluate their performances.	3,4
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	R – IV								
Course T	itle		Instrumer	ntation and	d Cor	trol						
Course c	ode	24BTME225R	Total credits: 3		L	Т	P	S	R	O/F	Τ	С
			Total hours: 30T+3	30P	2	0	2	0	0	0		3
Pre-requi	isite	Nil	Co-requ	isite				Nil				
Program	me		Bachelor of									
Semest	er		Winter/ IV se	mester of	secon	d yea	r of t	he pr	ogra	mme		
Cours			with the knowledge		-		-					
Objectiv	ves	-	stems, focusing on k	tey parame	ters s	uch as	accu	racy,	rang	e, reso	olu	ition
		and potential er		C ( 1		1.				1	1	1
			amental principles of					-	-			
		representing con	tions and guied students	udents thr	ougn	the o	Jesig	11 01	DIOC	ск 018	ıgr	ams
			<b>^</b>	selecting	and i	nteora	tina	actua	tors	(nner	ım	atic
		3. Provide hands- on experience in selecting and integrating actuators (pneumatic, hydraulic, electric) for correction elements and in choosing and tuning control										
			PID) to achieve desi					5 uii			.01	10101
C01			rement systems and	-	•							
CO2			of the Instrumentation	-		ts						
CO3		Analysis of the Signal processing and conditioning; correction elements										
CO4		Outlining the Cont	rol systems									
CO5		To learn the other	Controlling methods									
Unit-No.		Conter	nt	Contact		L	earn	ing O	outco	me		KL
				Hour								
Ι		surement system	-	6		uses o						2,4
		racy, range, resoluti				ems an	-					
II		rumentation syste		6		gener				e		2,3,
	for c	ommon engineering	measurement			ument	ation	syste	em			4,5
	<b>C</b> •		1		elem		<u>C (1</u>	<u>a</u> .	1			2.4
III	-	al processing and	-	6		ysis o		•				2,4,
		aulic, electric	uators, pneumatic,		•	essing ection			tioni	ng;		5
IV	Con		asic elements,	6		ining t			lavet	ama		2,4,
1 1		closed loop, design		U	Juil	inng i		onuo	i syst	C1115	1	2,4, 5
V		1 - U	PI,PID, when to	6	To le	earn th	e oth	er Co	ntrol	ling		5
, ,		,	controllers, system		meth							2,4,
		els, transfer func										5
		onse, frequency	•									
	-	ram and their uses										

# **Text Books/ Reference 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

	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						

			SEMESTEF	R – IV								
Course	Title		Ambience C	ontrol Sys	stem l	Desig	n		_			
Course code		24BTME226R	24BTME226R Total credits: 3			L T P S R C				0/1	)/F	
			Total hours: 45T		3	0	0	0	0	0		3
Pre-requ	isite	Nil	Co-requ	isite			1	Nil	l	1		
Program	nme		Bachelor of	Technolog	gy in ]	Mech	anica	l En	ginee	ering		
Semest			Winter/ IV se						-	-	•	
Cours		1. Recall the	fundamental princip			-			-			and
Objecti		various heat		[	]	[		r			J	
o »jeee		<ol> <li>Understand the concepts of HVAC system design for buildings</li> </ol>										
			oncepts of HVAC ec									
CO1	L		concept of psychron	netric, sig	nifica	nce o	f var	ious	air p	roper	ties	an
		psychrometric proce		1	1 .	1 1.		1 1.	.1	0		.1
CO2			ts of HVAC system	i design fo	or bui	Idings	s, inc	ludin	g the	e fact	ors	tha
CO3	2	affect design decision	of HVAC equipmen	t's such as	chille	rs cou	aling	towe	ra ni	imne	21	d ai
COS	,	handling units to so		is such as	CHINC	13,000	Jung	10 00	13, pt	mps,	all	u a1
CO4	ł		of lift well & lift lot	by pressu	rizatio	n syst	em f	or a g	iven	build	ing	5
		layout as per code s	tandard NBC 2016									
CO5	5	Evaluate the heat lo	ad calculation for an	office bui	lding	using	stand	ard c	odes	, such	as	
	1	ASHRAE, ISHRAE		r								
Unit-No.		Conter	nt	Contact Learning Outcom				ome		KL		
				Hour								
Ι		lamentals of Air-co		5	-	ain th						1,2
		igeration & Heat lo			ept of							
	•			impo	ortance	e of v	variou	ıs air				
		refrigeration, Prov vapor, Psychromo		prop	erties,	and	the k	ey				
		importance, Infilt		psyc	hrome	etric p	proce	sses.				
			ible & Latent Heat,									
		· · · · · · · · · · · · · · · · · · ·	sidered to calculate									
		Heat load, Extern	al & Internal Heat									
		gains, Heat load e										
		Heat Load Calcul										
II		ilation & Life safet		10		ribe t	-	-				1,3
	Extra	action system, Pipir				AC sys		0				
	•	system, Air flow	ypes of Ventilation			lings,						
		Life Safety in a B			facto	ors inf	luenc	ing d	esigr	ı		
			ation System, Lift		decis	sions.						
		well and lift lobb										
		system, Smoke ex										
		Chilled water pip	e sizing, Duct									
		system and design										
		Methods, Pressur										
	<u></u>	Distribution Syste		10	<b>T</b> T. • • •	.4		• 1	0.7	<b>IX</b> 7 4 -	$\downarrow$	<u> </u>
III		er & Cooling tower		10		ze the	-	-				2,4
		<b>lling Units &amp; Chille</b> ept of Chiller perfor				pment		-	-			
		tion, Vapor absorption				ing to		· ·	-			
		m and absorption ch				lling u			dress	real-		
		n, Air Handling Uni			worl	d chal	lenge	es.				
		and characteristics										
		Pumping Arrangemen										
	Term	inologies in Pump H	-									
	Pipin	g Circuit in HVAC.									$\square$	
IV		and Control Ventila		10	Dem							2,5

<ul> <li>Fans, External Static Pressure, High and Low Side Equipment's         <ul> <li>Applying DCV to CAV system, Fan Performance curves, Velocity Pressure and Total Pressure, Friction Loss and Dynamic Losses in Duct System, Loss of Coefficient for Duct Fittings, Critical Path in Static Pressure Calculation, Introduction - High Side Equipment's, Need of Air Distribution system, Components of air distribution system, Ductwork, Duct &amp; Pipe Accessories.</li> </ul> </li> </ul>		well and lift lobby pressurization system for a specified building layout in compliance with NBC 2016 standards.	
V Valves, VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS • Introduction to Valves, Valve Fundamentals, Globe Valve, Gate Valve, Ball Valve, Butterfly Valve, Check Valves, Balancing Valves, Multi-Purpose Valves, Y - strainers, PIBCV, Motorized valves, VRF system, Evolution of VRF system, Need for VRF system, Selection of VRF Systems, VRF Salient features	10	Assess the heat load calculation for an office building based on standard codes, such as ASHRAE, ISHRAE, and others.	3,5

# **Reference Books:**

- R S Khurmi, Refrigeration & Air conditioning, S Chand, Revised Edition/2018
   C P Arora, Refrigeration & Air conditioning, McGraw Hill, Fourth Edition/2019
   Free Online Course: Refrigeration and air-conditioning from Swayam | Class Central

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Describe the basic concept of psychrometric, significance of various air properties and psychrometric processes.	2,3					
2	Explain the concepts of HVAC system design for buildings, including the factors that affect design decisions	1,2					
3	Apply the concepts of HVAC equipment's such as chillers, cooling towers, pumps, and air handling units to solve real	1,3&4					
4	Illustrate the design of lift well & lift lobby pressurization system for a given building layout as per code standard NBC 2016	1,4&5					
5	Evaluate the heat load calculation for an office building using standard codes, such as ASHRAE, ISHRAE etc.	1,3&4					

		SEMESTER	- IV									
<b>Course Title</b>		Applied 7		dyna	amics							
Course code	24BTME221R	Total credits: 3	L	T	Р	S	R	O/F		С		
	Total hours: 45T			0	0	0	0	0		3		
Pre-requisite	Nil	Co-requisite				Ni	il					
Programme	Ba	achelor of Technolo	gy in N	lecha	anical H	Engine	ering					
Semester	F	all/ IV semester of s	econd y	year	of the <b>p</b>	orogra	mme					
Course	1. To understand the application of 1st law and 2nd law of thermodynamics											
Objectives		the conversion of ava		-	•							
		lge between theory as					therm	odynam	ics			
CO1		gy balance to system										
CO2	_	e changes in thermo	-		-		stances					
CO3		e performance of ener										
CO4		te between high grade		-		-						
CO5		work and heat intera	actions,	and	the bal	ance of	of ener	gy betw	vee	n the		
	system and its surro	-										
Unit-No.	Cont	tent	Conta			Learn	ing O	utcome		KL		
			Hou									
Ι	•	Available and			Learn to		-					
	unavailable energy		10	t	o systen	ns and	contro	l volum	les	~ .		
	referred to a cycle,	•								2,4		
	flow or closed sy	• •										
	Availability of ste											
		Gibb's functions,										
	Irreversibility and 1 Effectiveness.	oss in availability,										
II	<b>Boiler:</b> Classifica	tion of boilers,		T	Learn to		nuta th	a ahana	100			
11	mountings, access	<i>,</i>			n therm	-			- 1	24		
	capacity, equivalent	-	5		ubstanc		-	-	01	2, <del>1</del> , 5		
	efficiency, selection	-	0		uostane	05				5		
	feed water treatmen											
	troubles.											
III	Basic steam power	cvcles: Carnot and	10	I	Jearn	to	class	ify 1	the	2,4,		
	Rankine cycles,	•			erforma		of	ener		5		
	cycle, Regenerative			1.1	onversi		vices					
IV	Steam nozzles: E	xpansion of steam		I	Learn to	diffe	rentiate	e betwe	en			
	through nozzles, ve	locity and pressure		h	igh g	rade	and	low-gra	ıde	2,4,		
	variation in nozzle	s, Critical pressure	10	e	nergies					5		
	ratio, mass flow r	ate and maximum										
	mass flow rate, Rep	presentation of heat										
	drop in nozzles ir	n Mollier diagram,										
	Nozzle efficiency.											
V	Steam turbines	& condensers:	10	Ι	Learn to	o asso	ciate	work a	nd			
	Classification, Flov	-				iteracti			the			
	impulse and reaction	-			alance				the			
	diagrams, Reheating			S	ystem a	nd its	surrou	ndings				
	factor, Compoundin									2,4,		
	steam turbines, Bac	-								5		
	Pass out turbines,											
	condenser, Elemen	ts 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/ Reference 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"

	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 T	ïtle	BASIC ACCLIMA	TIZIN	G SK	ILLS (BA	AS)			
Course c	ode 24UULS221R	24UULS221R Total credits: 3			P S	R	O/F	C	
		Total hours: 30P	0	0	2 0	) 0	0	1	
Pre-requi	isite Nil	<b>Co-requisite</b>			I	Nil	•	1	
Program	me	Bachelor of T	echnolo	gy in	Mechani	ical Engi	neering		
Semeste	er	Fall/ IV seme	ester of s	econ	d year of	the prog	ramme		
Course	·	owledge of the fu	indament	tals	of Hospi	itality in	ndustry ar	nd its	
Objectiv									
		able to familiarize w					Utensils.		
~~.		able to handle differ				ons.			
C01	Students will have ba	2	-						
CO2	Students will gain the		-		-	ooms.			
CO3	Students will be able	-	-		_	1.1	: <u></u>		
<b>CO4</b>	Students will be able	to acquire the know	leage of	basic	e househo	ids amen	ities for da	ay- to-	
C05	day use.	work and hast interes	otions	nd +1	na halana	a of one	row hatara	on the	
COS		Learn to associate work and heat interactions, and the balance of energy betwee system and its surroundings							
Unit-No.	Conten		Contac	t	Lea	arning O	utcome	KL	
UIIIt-1\0.	Conten	ι Ι	Hour	·		ti iling O	utcome		
Ι	Introduction to Acc	commodation	5	L	earn the a	rt of hand	dling		
_	Management		-		lephone,		-	2,4	
	1. Telephone handling	technique			leaning eq	-	-		
	2. Organizing of Room	-			aking.				
	3. Cleaning agents.								
	4. Cleaning equipment'	s and uses.							
	5. Bed making Process.								
II	Fundamentals of Cookin	-	5		earning the				
	1. Definition of co	•			-	-	cooking	2,4,	
	Objectives of cook	•		e	quipment'	s.		5	
	2. Use of basic Cooking								
	3. Personal Hygiene and	d Safety							
111	4. Use of Fire & Fuels	Cast Cast	10			lin = +1 1	:		
III	Methods of Cooking: Di		10		nderstand tethods of	•		21	
	loo of Harbs and Ve	01000		1 100		x $uukmy$	, cuung	2,4,	
	1. Use of Herbs and Sp 2 Basic Food and Bey					•	•		
	2. Basic Food and Bev	verage Preparation.		te	chniques	and learn	ing the	5	
	-	verage Preparation.		te fc	chniques ood habits	and learn	ing the	5	
IV	<ol> <li>Basic Food and Bev</li> <li>Regional food Habi</li> </ol>	verage Preparation. ts.	10	te fo re	chniques ood habits egions.	and learn in differ	ing the ent	5	
IV	<ol> <li>Basic Food and Bev</li> <li>Regional food Habi</li> </ol> Forms & Format's: C –format's: C –format's: C –formation of the second	verage Preparation. ts.	10	te fo re L	chniques ood habits	and learn in differ	ing the ent		
IV	<ol> <li>Basic Food and Bey</li> <li>Regional food Habi</li> </ol> Forms & Format's: C – food 1. Reservation form	verage Preparation. ts.	10	te fo re L	chniques ood habits egions. earning di	and learn in differ	ing the ent	2,4,	
IV	<ol> <li>Basic Food and Bey</li> <li>Regional food Habi</li> </ol> Forms & Format's: C –food 1. Reservation form	verage Preparation. ts.	10	te fo re L	chniques ood habits egions. earning di	and learn in differ	ing the ent	2,4,	

- 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.

	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					

<b>C –</b>	<b>D1</b> / <b>3</b>		SEMESTER				D ====	on	<b>ED</b> C		
Course 7			SH LANGUAGE P			-		1			6
Course code		24UBPD223R	Total credits: 2 Total hours: 60P	L 0	T 0	P 4	<b>S</b>	R 0	0/F 0	_	C 2
Pre-requ	isite	Nil	Co-requisite	0	U	4	N	-	U		2
Program		111	B.Tech Mec	hanica	l Engi	neerir					
Semest		F	all/ IV semester of se		-		-	mme			
Cours			nts' abilities in tech	-			_		presentati	ons	s to
Objecti	ves	<ul><li>applications in infrastructure.</li><li>2. Focus on craft positions, impr</li><li>3. Strengthen tea</li></ul>	onvey engineering a civil engineering ing professional rest oving students' chanc mwork abilities and ises and targeted trai	for de umes a es of se l prepa	nd co ecuring are stu	ng, co ver let g empl udents	nstruc tters ta oymer for jo	ting, a ailored at. ob inte	for engineerviews t	itair neer hro	ring
C01			and concise technical	comm	unicat	ion in	both w	ritten a	and oral f	orm	nats,
			stry-specific terminol								,
CO2		Develop expertise	in crafting resumes, o	cover l	etters,	and te	echnica	al repo	rts to effe	ectiv	vely
		showcase engineer	ng qualifications.								
CO3		Acquire proficiency in creating and delivering impactful presentations, utilizing visual									
		aids to convey engineering concepts to diverse audiences.									
<b>CO4</b>		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.									
TL. 4 NL	1		<u> </u>			I quest			-		1/1
Unit-No.		Conte	11	Conta Hou			Learr		utcome	1	KL
Ι	Wri	ting Skills			D	evelop	profic	ciency	in variou	S	
		ragraph Writing & N	Varratives	12	fo	rms o	of wi	iting,	includin	g	
	ii. L	etter Writing			pa	iragrap	h	and	narrativ	e	
	iii. T	echnical Writing			co	onstruc	tion, le	etter w	riting, an	d	
	Pipe	e and cistern			te	chnical	l docu	nentati	ion.		1,2
	ii.	Introduction of	pipes and cistern								
	iii.S	olving different type	s of questions								
	iv. V	Vorksheet1 and Wor	ksheet 2								
II	Self	-Management Skill	S		G	ain co	ompete	ency i	n solvin	g	
	1. SV	WOT Analysis		12	pr	actical	prob	lems	related t	0	
	Goa	l Setting and Person	al Hygiene <b>Mixture</b>		pi	pes an	d ciste	rns, mi	xtures an	d	
	alleg	gation and Clock	i.Introduction of		al	ligation	ns, clo	ocks, a	ind profi	t,	
	basi	cs			lo	ss, ar	nd di	scounts	s throug	h	
	Solvi	• •	n mixture and			rgeted	-	oractice	e an	d	1,2
		tionion.			W	orkshe	ets.				
		orksheet1 and Work									
III		• •	ent i.Understanding	12			-		ectivenes		
		-	ord (such as the use			-			ysis, goa		
		ay, tell, speak).				tting,	and		naintainin	g	
			develop vocabulary		pe	ersonal	hygie	ne.			
	iii C	ontextual vocabular	vlearning		1						
			-								
	iv.		os and idioms in a								

	<ul> <li>v. Effectively using dictionary, thesaurus</li> <li>Statement and Course of action i.Revision of syllogism</li> <li>ii.Statement and conclusion</li> <li>Iii. Course of action based on statement Iv.</li> <li>Worksheet1 and Worksheet 2</li> </ul>			1,2
IV	Interview Skills & Dress Code EthicsTypes of interview- telephonic, virtual &face to faceonline interview, personal interview, Panelinterview, Group interviewCommon interview questions and answeringstrategiesi. Dress Code Ethics during Interviewsii. Mock Interview SessionSitting arrangement (puzzle)i.Lineararrangement puzzle ii.Circular arrangementpuzzle iii.MatrixIv. Worksheet1	12	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.	
V	Grammar (Flipped Classroom)1.Word-stress, SyllablesPractice 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	12	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

- 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 EditionA Modern Approach to Logical Reasoning All Exams
- 3. General Mental Ability & Logical Reasoning Compendium

# **Reference Books:**

- Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction
- Fast track Objective mathematics for Competitive exam by Arihant
- General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
	Demonstrate clear and concise technical communication in						
1	both written and oral formats, incorporating industry-	5, 7					
1	specific terminology.						
	Develop expertise in crafting resumes, cover letters, and						
2	technical reports to effectively showcase engineering	8					
2	qualifications.	0					
	Acquire proficiency in creating and delivering impactful						
3	presentations, utilizing visual aids to convey engineering	7.9,10					
3	concepts to diverse audiences.						
	Cultivate effective interpersonal skills for collaborative						
	teamwork, emphasizing active listening, conflict	11,12					
4	resolution, and clear communication within engineering	11,12					
	contexts.						
	Prepare for engineering job interviews by articulating						
5	qualifications, experiences, and career goals, addressing	10					
3	both technical and behavioral questions confidently.	10					

		SEMESTER	R - V							
Course T	<b>`itle</b>	Не	at Transfe	er						
Course c	ode 24BTME311R	Total credits: 2		L T	P	S	R	O/F		С
		Total hours:45T+3	30P	3 0	2	0	0	0		4
Pre-requi	isite Nil	Co-requis	site			Nil				
Program	me Ba	achelor of Technolo	gy in Mec	hanical	Engin	eering	5			
Semest	er	Fall/ V semester of	3rd year o	of the p	rogran	nme				
Cours		the course is to bui							-	•
Objectiv		he three basic modes	•							
	-	atment of governing	-		-					
		be provided, along wi	th solution	n of pra	ctical p	roblen	ns usi	ng en	pir	rical
	correlations.									
		will also briefly cove	-	ind cond	densatio	on hea	t tran	sfer, a	ind	the
~~~		design of heat excha								
C01		asic modes of heat tra			~					
CO2		on heat transfer for sto	-	-						
CO3		orrelations for forced			on.					
CO4	1	ction of radiations wi								
CO5		by applying gained th		nowled	-	•	0 4			171
Unit-No.	Conte	nı	Contact		Lear	ning	Juic	ome		KL
Т	Tutus hasting to thus	- madea of boot	Hour	A a 1-		1		1	r i	1.2
Ι	Introduction to three		10	-	yze the transfer		c mo	des o	I	1,2
	transfer, Derivation			neat	Iransier					
	equation- Steady one of for conduction heat tr									
		herical geometry,								
	concept of conduction									
		thickness, lumped								
	system approximation	· •								
	heat transfer through									
	dimensional conductio	1								
	steady and unstead									
	approximate solution	-								
	conduction	2								
	heat transfer by the use	of Heissler charts								
II	Heat convection, basic			Analy	ze dif	ferent	typ	es o	f	
	layers- Forced convec	ction, external and	10	conve	ction m	ethods	5			
	internal flows- Natura	al convective heat								
	transfer- Dimensionles	ss parameters for								
	forced and free conve	ction heat transfer-								
	Correlations for forced a	and free convection-								3,4
	Approximate solutions									
	layer equations (momentum and energy) for									
	both internal and extern	-								
	heat transfer rates in la									
		ising appropriate								
	correlations for free and									
III	Interaction of radiation	,		-	in the					
	definitions of radiative		10	radiati	ons wit	h mat	erials	•	-	3,4
	Boltzmann's law, black									
	radiation, Calculation of	· · · · · · · · · · · · · · · · · · ·		1					1	

IV	Types of heat exchangers, Analysis and design of heat exchangers using both LMTD and ε-NTU methods.	10	Design devices such as heat exchangers and also estimate 5 the insulation needed to reduce	5,6
	LWID and 6-WIC methods.		heat losses where necessary.	
V	Boiling and Condensation heat transfer, Pool boiling curve. Introductionmass transfer, Similarity between heat and mass transfer.	5	Students will learn to understand boiling and 5 condensation phenomenon	5,6
Practical	<ul><li>1.Emissivity measurement</li><li>2.Heat transfer through composite wall</li><li>Natural convection and forced convection</li></ul>	30	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.	

T1. A. Bejan, Heat Transfer John Wiley, 1993

T2. J.P.Holman, Heat Transfer, Eighth Edition, McGraw Hill, 1997.

T3. F.P.Incropera, and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley, Sixth Edition, 2007.

#### **Reference Books:**

R1. MassoudKaviany, Principles of Heat Transfer, John Wiley, 2002

R2. Yunus A Cengel, Heat Transfer : A Practical Approach, McGraw Hill, 2002

	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 numericals by applying gained theoretical knowledge.	1,2,3					

		SEMESTE	R – V								
Course Title	1	Manufa	otuning I	)							
Course Thie Course code	24RTMF312R	Total credits: 4	cturing F	L	T	Р	S	R	O/F		С
Course coue	24D1 WIE512K	Total hours: 45T+	30P	<u> </u>	0	2	0	<u>к</u> 0	0/1	_	4
Pre-requisite	Nil									<b>T</b>	
Programme	Bachelor of Technology in Mechanical Engineering										
Semester		Fall/ V semester of 3rd year of the programme									
Course	1 To motivate a	nd challenge student			-			-		oft	the
Objectives		orrelation with mate					•	• •			
Objectives	-						-		-		
		form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.									
		e application of mac		ocess	es						
		the non-convention				ses.					
CO1		ent casting processe					for p	roduc	ing di	ffere	ent
	products				11		1		U		
CO2	<b>^</b>	nt forming processe	s and their	r app	licatio	n					
CO3		chanism of metal c					appli	cation	n in di	ffere	ent
	machining operation										
CO4		dditive manufactur	ring and	the	weld	ing	princi	ples,	design	n a	nd
	application		-					-	-		
CO5	Distinguish betwee	n different non-conv	ventional	manı	ıfactur	ring p	roces	ses ar	nd stud	y th	eir
	working										
	principle, mechanis	sm of metal removal	and the e	ffect	of var	ious p	proces	s par	ameter	s	
Unit-No.	Content		Contac	t		Lear	ning	Outco	ome	K	L
			Hour								
Ι	Casting and mold	ing: Metal casting		Le	earn th	e dif	ferent	t proc	cess of		
	processes and	equipment, Heat		ca	sting, 1	moldi	ng an	d forr	ning	1,	,2
	transfer and solidi	fication, shrinkage,	10								
	-	sting defects and									
	residual stresses.										
II		lk and sheet metal	-						orming	5	
	0.1	formation and yield		pro	ocesse	s and	their	applio	cation		
		als of hot and cold									
		load estimation for								3,	,4
	-	(forging, rolling,									
		) and sheet forming									
		drawing, bending)									
	principles										
	of powder metallur		10		1 /	1 (1		1	. ,	_	
III	-	gle and multi-point							ism of	-	
		al cutting, various		me	etal cu	ung	proces	5565			
	-	Force components: Chip formation,									
		Tool wear and tool life, Surface finish3,4and integrity, Machinability, Cutting3,4									
		ting fluids, Coating;									
	Turning, Drilling,	ing nuius, Coating;									
		nishing processes,									
	Introduction to CN	<b>e</b> 1									
IV		facturing: Rapid	10	I.c	arn	the	annl	icatic	on of	5 5	,6
1 V	prototyping and	rapid tooling,	10		ditive	uic	appi	Teatio	/11 UI	J,	,0
	Prototyping and	rapid tooning,	1	au	annve						

	Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding		manufacturing, and different joining processes	
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 &maskant, process parameters, MRR and surface finish, Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining	10	Application of non- conventional machining processes	5,6

T1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014

T2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems **Reference Books:** 

R1 Degarmo, Black & Kohser, Materials and Processes in Manufacturing

	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					

			SEMESTE	R – V							
Course 7	Fitle		Kine	matics an	nd D	ynamics o	of Mac	chines	5		
Course o	code	24BTME313R	Total credits: 4		L	T P	S	R	O/F		С
			Total hours: 45T+3	30P	3	0 2	0	0	0		4
Pre-requ	isite	Nil	Co-requis	site			Ni	1			
Progran	nme		Bachelor of	Technolo	gy i	n Mechan	ical E	ngine	ering		
Semest	ter		Fall/ V s	emester o	f 3re	d year of t	he pr	ogran	ıme		
Cours	se	1. To understand	d the kinematics an	d rigid- b	ody	dynamics	of ki	nema	tically	dri	iven
Objecti	ves	machine comp									
			d the motion of lin				ms of	the o	displac	em	nent,
		-	cceleration at any po	-	-						
			o design some link	age mech	anis	sms and c	am sy	ystems	s to g	ene	erate
		specified outp									
			the kinematics of g								-
CO1			t static and dynamic	ic force a	naly	ysis and e	quilib	rıum	of for	ces	foi
~~~		mechanical system									
CO2			ples of mechanisms								
CO3		-	of rotating and recip	procating n	nass	es.					
CO4		Illustrate gear oper									
CO5	)	Know the various		G ( )	-	T		0 /		<u> </u>	
Unit-No.		Conter	nt	Contact Hour		Lea	rning	Oute	ome		KL
Ι	Class	sification of m	echanisms- Basic	Hour	A 1	aility to a	andu	t sta	tio on	4	
1			definitions- Degree			oility to c mamic fo					
		-	- Grashof's law,			uilibrium		force			
		•	four bar chain and		-	echanical s			-5 10		1,2
	slide		-Limit positions-	5	1110	senamear s	ystem	5.			1,2
			Fransmission angle-	5							
		-	mmon mechanisms-								
		k return									
			line generators-								
		ersal Joint-Rocker	e								
II			and acceleration		Ar	oply basi	ic pi	rincip	es o	f	
			chanisms, graphical		-	echanisms	•		hanica		
	velo	-	ing instantaneous			stems.					
	cente	• •	cceleration analysis								1,2
			uations- kinematic								3,4
			anisms- slider crank								ŕ
	-	-	Coincident points-								
	Cori	•	of acceleration-								
		1	e synthesis three								
		ion graphical	-								
	-	nesis for motion and	path generation.								
III			is and followers-		Pe	rform bal	ancing	g of 1	rotatin	g	
	Term	ninology and definit	tions- Displacement	0			-				
	diag	rams-Uniform ve	locity, parabolic,				-				
sim		le harmonic and								3,4	
			motions- specified								
			and tangent cams-								
	press	sure angle and und	ercutting, sizing of								
	anma	oraphical and a	nalytical disc cam								

	profile synthesis for roller and flat face followers.			
IV	Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting- helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics.		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.	10	Know the various link mechanism	3,4, 5,6

T1. Thomas Bevan, Theory of Machines, 3rd edition, CBS Publishers & Distributors, 2005. T2. Cleghorn W.L., Mechanisms of Machines, Oxford University Press, 2005.

# **Reference Books:**

R1. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill, 2009.

R2. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East- West Pvt. Ltd, New Delhi, 1988.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Ability to conduct static and dynamic force analysis and	1 2 8 2					
1	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					

			SEMESTE	R – V							
Course 7	ſitle		Utility Systems	s in Indus	stria	l Fac	cilities	5			
Course o	code	24BTME314R	Total credits: 3		L	Т	P	S	R	O/F	C
			Total hours: 45T		3	0	0	0	0	0	3
Pre-requ	isite	Nil	Co-requis	ite	U	v	v	Ni	-	v	U
						N/	1			•	
Progran			Bachelor of		0,				0	0	
				emester o				he pro	ogran	nme	
Cours	<b>Course</b> 1. Differentiate the equipment										
<b>Objectives</b> 2. Select the material of construction of the components of the utility syst				ystems							
601			utility system of Che			s Indu	istries				
<u>C01</u>			hent involved in a giv			6.1					
<u>CO2</u>			of construction of the				e utili	ty sysi	tems		
<u>CO3</u>			stem of Chemical Pr				<u>( 1</u>	•			
<u>CO4</u>			ired engineering doc				-	-			
<u>CO5</u>			yout considerations,			nent s			0 /		TZT
Unit-No.		Conte	nt	Contact	t		Lea	rning	Oute	ome	KL
				Hour							
		duction, Compress	ed Air & Nitrogen	5	Aı	nalyz	e the	equip	ment	used in	
	Syste			a s	specit	fied ut	tility.				
	•		ontinuous & Batch								
			ypes of Utilities and								
		their Schematics	a								
	•	-	Systems: Sizing of								
		Air Compressors	-								
		Specifications for									
		Compressed Air									
			ial of Construction;								
			pressed Air system								
		in the Plot Plan; I									
		Documents for D Nitrogen System									
	•	Standards; Usage									
		•	gen; Overall & Cost								
		Comparison of th									
		Technologies En									
		Documents for D									
II	Fuel	and Thermic Fluid	e e	10	Cł	100se	. 1	the	ann	ropriate	
	i uci	Fuel Systems: U		10					• •	ing the	
		•	ved in Solid; Liquid							-	
		and Gaseous Fue			0	mpoi	lents		ny sys	stems.	
			Disadvantages; Fuel								
			Pollution Control								
	•	Thermic Fluid S									
			el Selection; Flow								
		Schematics; Sche									
		Fuel Systems; Bu	-								
		Blowers; Procure	ment Strategy;								
		Pollution and its	Abatement								
III	Wate	er and ETP System	S	10	De	evelo	p the	e des	ign f	for the	
	•	-	Sources of Water;		uti	ility	syste	em i	n Cl	hemical	
		Types of Water S	ystems; Water			-	-	stries.			
		Composition & it			- 1						
		Sources, MOC, &									
		Raw Water, Pota									
			r, Fire Water, & Sea								
		Water; Standards									
		Procurement Stra	tegy for Equipment								

	9 De 1-2 - 2 - 2			
	& Packages			
	• ETP Systems: Codes & Regulations;			
	Effluent Sources; Primary,			
	Secondary, & Tertiary Treatment;			
	Recycling in Zero Liquid Discharge			
	(ZLD) Plant; MOC; Inputs for			
	Design, & Deliverables			
IV	Steam, Condensate, Safety Relief & Flare,	10	Classify the necessary	
	and Other Systems		engineering documents for	
	• Introduction to Steam and		utility system design.	
	Condensate System: Steam Pressure		utility system design.	
	& temperature levels; Codes, &			
	Regulations;			
	Steam System; BFW, & Condensate			
	treatment; MOC of Burners;			
	Pollution and Abatement; Steam			
	Velocities; Design Input;			
	Deliverables; Procurement Strategy			
	Safety Relief & Flare Systems:			
	Codes, Standards & Regulations;			
	Equipment; PSV Types; Flare Types;			
	Components; MOC; Control of Flare			
	System; Piping Network;			
	Procurement Strategy; Design Input;			
	Deliverables			
	Miscellaneous Utilities: Co-Gen			
	Plant - Codes & Regulations,			
	Configuration, Equipment; OWS –			
	Codes, Schematics, MOC; CBD –			
	Codes, Schematics, MOC; CRWS –			
	Codes, Schematics, MOC; Sewage			
	System - Codes, Schematics, MOC;			
	RWHS - Codes, Schematics, MOC,			
	Waste Incinerators, Case Studies on			
	Sugar Plant			
V	<b>Refrigeration, HVAC &amp; Electrical Power</b>	10	Incorporate layout	
	Systems		considerations and procurement	
	Refrigeration Systems: Codes, &		strategy into the design.	
	Regulations; Refrigerant Types;		strategy into the design.	
	Refrigeration Methods; Equipment			
	Used; MOC; Insulation; Location of			
	Refrigeration Package; Procurement			
	Strategy; Design Inputs; Deliverables			
	<ul> <li>HVAC Systems: Psychrometric</li> </ul>			
	Chart; Codes; Design Criteria;			
	Refrigeration Cycles; HVAC			
	Systems; Load Calculation; AC Duct			
	Design; MOC for HVAC;			
	Procurement Strategy; Design Inputs;			
	Deliverables			
	Electrical Power Systems:			
	Electrical Power System in CPI;			
	Sources of Power; Power			
	Requirements; Load Types, &			
	Analysis; Classification; Layout;			
	Electrical Equipment Selection;			
	Cathodic Protection; Electrical Heat			
	Tracing			
L	11001115			

# **Reference Books:**

- 1. Y. V. C. Rao, "Chemical Engineering Thermodynamics," University Press, India, 1997
- 2. Yunus A. Çengel & Michael A. Boles "Thermodynamics *An Engineering Approach*," McGraw-Hill, New York, 2015
- 3. Sathiyamoorthy M., "Chemical Plant Utilities," Lambert Academic Publishing, London, 2016
- 4. <u>Mostafa A. Radwan</u>, and <u>Hany El.</u>, "Chemistry for Engineers," Lambert Academic Publishing, London, 2019

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Interpret the equipment involved in a given utility	1&2					
2	Select the material of construction of the components of the utility systems	1,2,3					
3	Design the utility system of Chemical Process Industries	1,2,3,4					
4	Categorize the required engineering documents for the utility design	1&2					
5	Integrate with the layout considerations, and procurement strategy.	1,2,3					

			SEMESTE	R – V									
Course 7	ſitle		Industrial Piping	and Pipe	eline	e Eng	ginee	erir	ıg				
Course o	code	24BTME315R	Total credits: 3			Т	P	,	S	R	O/F		С
			Total hours: 45T		3	0	0		0	0	0		3
Pre-requ		Nil	Co-requis						Ni				
Program			Bachelor of		0.					0	0		
Semest	er		Fall/ V se			-				-			
Cours	se		the liquid & gas two										
Objecti	ves	<b>A</b>	the pressure, drop of		0						0	ne j	pipe,
			s, orifice, nozzle, ver uish the set forth e									he	safe
			construction of pipi										
		31.4 codes		81						-	) -	- )	
C01		Explain the liquid &	z gas.										
CO2			drop of both single										
CO3			forth engineering										
CO4		Judge the two.	ng systems covered	III ASME	BUI	.ı, В	51.5	, ai	10 3	1.4 CO	ues (B	ι4)	
C04 C05			g system for the	given pr	oces	s re	quir	em	ent.	and	comnl	v	with
		international codes		e e pi			1		,		p1	,	
Unit-No.		Content			t		Le	ear	ning	Outc	ome	]	KL
				Hour									
		e-Phase: Pipe Hyd	raulics, Sizing &	10	Cl	•			-		liquid	S	1,3
		essure Drop			an	-	gases			luding		r	
	•	Regimes: Flow Regime     Identification			pr	opert	ties a	and	beha	aviors	•		
	•	<ul> <li>Pressure Drop: Derivation of</li> </ul>											
		Pressure Drop in											
		Fanning Friction											
		Factor Correlatio											
			lculation in Piping										
		Components, Pre Calculations in P	-										
			llculation in Header										
		& Branching Pip											
	•		ree categories (1, 2										
		& 3) of practical	-										
			single-phase fluid										
		through an iterati	es (Demonstration										
		categories 2 & 3)											
Π	Two-	• · · · · · · · · · · · · · · · · · · ·	imes, Notations &	5	Est	timat	te th	e p	ress	ure d	rop foi	•	2,3
	Press	ure Drop Models						-		and t	-		
	•	-	tion of Two-Phase		pha	ase f	low.	•					
		-	in Horizontal &										
			nfluence of Bend on Instream Two-Phase										
		Flow Regime For											
	•	Notations:	Two-Phase										
			Relationships for										
			neters, Flow Pattern										
		-	cation of Two-Phase										
	•	flow Regimes	eneous Model, Two-										
			er, Evaluation of										
		-	Separated Model,										
		-	odel, Slip Ratio										

•	Correlations, $K\alpha_H$ Correlations, Drift Flux Correlations <i>Case Studies:</i> Practical problems to identify the flow regimes in a pipe for a given geometrical size and operating parameters using flow pattern maps when it is subjected to a two-phase flow			
	Pressure Drop: Sudden Enlargement & Contraction, Orifice, Nozzle, Venturi, Bend, Fittings, Parallel Pipes, Series Pipes & Pipe Network Pipes & Fittings: Pipe End Connections, Pipe Size & Schedule Numbers, Pipe Types based on Manufacturing, Materials, Ends & Joints, Fitting Types & End Connections Flanges: Flanges (Types, End Connections, Facing, Materials, Temperature & Pressure Rating), Gaskets & Bolting	10	Identify and differentiate the engineering requirements essential for the safe design and construction of piping systems as outlined in the ASME B31.1, B31.3, and B31.4 codes (BT4).	
Wate	bility Analysis, Transient Analysis, er & Steam Hammer		Compare and evaluate the two.	4,5
V Pine	Supports, ASME B31 Standards,	10	Develop the piping system	3,5

Pipeline Construction	based on the given process
<ul> <li>Supports &amp; Hangers: Pipe Supports, Expansion Joints, Design of Jacketed Piping, Vibration, Insulation, Buried Pipe, Cathodic Protection</li> <li>ASME B31 Code: Interpretation of the various ASME codes such ASME 31.1 - Power Piping, ASME B31.3 - Process Piping, and ASME B31.4 - Pipeline Transportation</li> <li>Pipeline Construction: Right of Way, Stringing, Trenching, Bending, Coating, Lowering, Back Filling, Markers, Clan-up, HDD Method, Thrust Boring, Micro Tunneling, Hot Tapping Work</li> </ul>	requirements, ensuring compliance with international codes and standards (BT6).

# **Reference Books:**

- 1. Mohinder L. Nayyar, "Piping Handbook," McGraw-Hill, New York, 2000
- 2. Yunus A. Çengel, and John M. Cimbala, "Fluid Mechanics: *Fundamentals and Applications*," McGraw-Hill, New York, 2014
- 3. Robert W. Fox, Alan T. McDonald, and Philip J. Pritchard, "Introduction to Fluid Mechanics," John Wiley & Sons, Inc. NJ, 2020
- 4. Subramanyam, "Strength of Materials," Oxford University Press, 2010
- 5. ASME B 31.1: Power Piping, The American of Society of Mechanical Engineers, New York, 2018
- 6. ASME B 31.3: Process Piping, The American of Society of Mechanical Engineers, New York, 2020
- 7. ASME B 31.4: Liquid Transportation, The American of Society of Mechanical Engineers, New York, 2002

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	Explain the liquid & gas.	1&2				
2	Predict the pressure drop of both single & two.	1,2,3				
3	Distinguish the set forth engineering requirements necessary for the safe design and construction of piping systems covered in ASME B31.1, B31.3, and 31.4 codes (BT4)	1,2,3,4				
4	Judge the two.	1&2				
5	Design the piping system for the given process requirement, and comply with international codes & standards (BT6)	1,2,3				

	SEMESTE								
Course Title	Extra-cu	rricula	r Acti	vities					
Course code	24UBEC312 Total credits: 1	L	Т	P	S	R	O/F	C	
	Total hours: 15P	0	0	0	4	0	0	1	
Pre-requisite	Nil Co-requisite	:			N	il			
Programme	B.Tech Me	chanica	l Eng	ineerin	ıg				
Semester	Fall/ V semester of	third ye	ear of	the pr	ogran	nme			
Course	Equip students with effective time	manager	ment	and p	rioritiz	zation	skills, fos	sterin	
Objectives	leadership qualities and a commitment	to their e	endea	vors.					
	Encourage exploration of interests bey	ond aca	demi	cs and	partic	ipation	in co-cur	ricula	
	activities, cultivating well-rounded	individ	luals	capab	le of	maki	ng mear	ingfu	
	community contributions.								
	Enhance students' abilities to express ic		-	-	-	-			
	analysis, while integrating learning e	xperienc	ces to	practi	ce tra	insferat	ole skills	acros	
	various activities.								
<b>CO1</b>	Learn to a plan so that they can make r	neaning	ful co	ntributi	ons, n	naintair	n a commi	tment	
	and manage their time and priorities.								
CO2	Transform passionate students who de	monstra	te lea	dership	and p	oursue	interests b	eyon	
	their academics.								
CO3	Learn to participate in various co-cu	ırricular	activ	vities l	eading	g to th	eir multif	acete	
	personality development.								
CO4	Express their ideas, views, In-depth evaluation and analysis clearly in the topic of their								
	interest.								
CO5	Demonstrate and practices different a	ctivities	, by	Integra	ting le	earning	experience	ces by	
	demonstrating transferable skills.	1							
Unit-No.	Content	Conta			Learı	ning O	utcome	KL	
		Hou							
Ι	AdtU encourages a range of activities		Pa	articipa		n dive			
				tivities	s to de	-	social and		
	outside the regular curriculum								
	intended to meet learner's interest,		so	oft sk	ills,		holistic		
	intended to meet learner's interest, These activities are aimed to develop		so de	oft sk evelopr	ills, nent,	and	l gain	L	
	intended to meet learner's interest, These activities are aimed to develop the social and soft skills and promote a		so de ez	oft sk evelopr xposure	ills, nent, e thro	anc ough v	l gain workshops	1	
	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,		sc de ez ai	oft sk evelopr xposure nd co	ills, nent,	anc ough v	l gain	5	
	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		sc de ez ai	oft sk evelopr xposure	ills, nent, e thro	anc ough v	l gain workshops	5	
	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		sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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		sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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,		sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	5	
	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		sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	5	
	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		sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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,	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	1	
	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	15	sc de ez ai	oft sk evelopr xposure nd co	ills, nent, e thro	anc ough v	l gain workshops	5	

	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	5,7					
-	time and priorities.						
	Transform passionate students who demonstrate leadership						
2	and pursue interests beyond their academics.	8					
	Learn to participate in various co-curricular activities						
3	leading to their multifaceted personality development.	7.9,10					
	Express their ideas, views, In-depth evaluation and						
4	analysis clearly in the topic of their interest.	11,12					
	Demonstrate and practices different activities, by						
5	Integrating learning experiences by demonstrating transferable skills.	10					

		SEMESTER	k - V							
Course Title		Competent E	nglish	for Er	ngineer	S				
Course code	24UBPD315R	Total credits: 2	L	Т	P	S	R	O/F		С
		Total hours: 30P	0	0	4	0	0	0		2
<b>Pre-requisite</b>	Nil	Co-requisite				N	il			
Programme		B.Tech Mech	hanical	Engi	neerin	g				
Semester	I	Fall/ V semester of T	hird ye	ear of	the pr	ogran	nme			
Course	1. Develop stud	ents' abilities in tecl	hnical	writin	ng, spe	aking.	and	presentat	ion	ns to
Objectives	-	convey engineering				-	-	-		
-	applications	in civil engineering	g for d	lesign	ing, co	onstruc	cting, a	and mair	ntai	ning
	infrastructur	·e.								
	2. Focus on craf	fting professional res	umes a	and co	ver let	tters ta	ailored	for engi	nee	ering
	positions, in	nproving students' cha	inces of	f secu	ring en	nployn	nent.			
	3. Strengthen te	amwork abilities and	d prepa	are st	udents	for j	ob inte	erviews	thrc	ough
	practical exe	ercises and targeted tra	aining,	enhai	ncing th	heir re	adiness	for engi	nee	ering
	careers.									
CO1	Demonstrate clear a	and concise technical	comm	inicat	ion in ł	ooth w	ritten a	nd oral f	òrn	nats
	incorporating indus	try-specific terminolo	ogy.							
CO2	Develop expertise	in crafting resumes, c	cover le	etters,	and te	chnica	l repoi	ts to effe	ecti	ively
	showcase engineeri	ng qualifications.								
CO3	Acquire proficiency	y in creating and del	ivering	; impa	ctful p	oresent	tations,	utilizing	g vi	isual
	aids to convey engi	neering concepts to di	iverse a	udien	ces.					
CO4	CO4 Cultivate effective interpersonal skills for collaborative teamwork, emphasizin					phasizing	g ac	ctive		
	listening, conflict re	esolution, and clear co	ommun	icatio	n withi	n engi	neering	g context	s.	
CO5	Prepare for engine	ering job interviews	by art	iculati	ng qua	alificat	ions, e	xperienc	es,	and
	career goals, addres	ssing both technical ar	nd beha	viora	l questi	ons co	onfiden	tly.		
Unit-No.	Con	tent	Conta	ct		Learn	ing O	utcome		KL
			Hou							
Ι	Writing Skills				-	-		in variou		
	<b>1.</b> Paragraph Writin	g & Narratives					-	includin	-	
	2. Letter Writing			-	iragrap		and	narrativ		
	3. Technical Writin	ng						riting, an	ıd	
	Pipe and cistern			te	technical documentation.					
		pipes and cistern	6							
	iii.Solving different	• •								
	iv. Worksheet1 and				•				$\perp$	
II	Self-Management	Skills				-	•	n solvin	~	
	<b>1.</b> SWOT Analysis			1 -		-		related 1		
	-	Personal Hygiene		1 -	-			xtures an		
	Mixture allegat				-			nd profi		
	i.Introduction of ba							throug		
				rgeted	-	oractice	e an		1.0	
	alligationior		6 worksh			ets.				1,2
	2. Worksheet1 and				.1			· ·	+	
III	Vocabulary	Development				-		ectivenes		
	-	fferent aspects of a			-			ysis, goa		
	word (such as the use of say, tell, setting, and mainta						aıntaının	g		
		5, ,			-	1 .				
	speak).			pe	ersonal	hygie	ne.			
	speak). ii. Learning stra	tegies to develop		pe	ersonal	hygie	ne.			
	speak). ii. Learning stra			pe	ersonal	hygier	ne.			

	<ul> <li>iv. Use of phrasal verbs and idioms in a conversation</li> <li>v. Effectively using dictionary, thesaurus Statement and Course of action i.Revision of syllogism</li> <li>ii.Statement and conclusion</li> <li>Iii. Course of action based on statement</li> <li>Iv. Worksheet1 and Worksheet 2</li> </ul>	6		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	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.	
V	Iv. Worksheet1 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	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.	

- Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
- McDowell, Gayle Laakmann.2008. Cracking the Coding Interview (Indian Edition)
- A Modern Approach to Logical Reasoning All Exams
- General Mental Ability & Logical Reasoning Compendium

#### **Reference Books:**

- Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction
- Fast track Objective mathematics for Competitive exam by Arihant
- General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
	Demonstrate clear and concise technical communication in						
1	both written and oral formats, incorporating industry-	5,7					
1	specific terminology.	5, 7					
	Develop expertise in crafting resumes, cover letters, and						
2	technical reports to effectively showcase engineering	8					
Z	qualifications.	8					
	Acquire proficiency in creating and delivering impactful						
3	presentations, utilizing visual aids to convey engineering	7, 9&10					
3	concepts to diverse audiences.	7, 3810					
	Cultivate effective interpersonal skills for collaborative						
	teamwork, emphasizing active listening, conflict						
4	resolution, and clear communication within engineering	11,12					
	contexts.						
	Prepare for engineering job interviews by articulating						
5	qualifications, experiences, and career goals, addressing	10					
3	both technical and behavioral questions confidently.	10					

Course Title	SEMESTER – VI Advanced M	anufactur	ina Pr	1005505		
Course code	24BTME321R Total credits: 4		T P	S R	O/F	C
Course coue	Total hours: 60T		$\begin{array}{c c} \mathbf{I} & \mathbf{I} \\ \hline 0 & 0 \end{array}$	0 0	0/1	4
Pre- requisite	Nil Co-requisite		0 0	Nil	U	-
Programme	Bachelor of Technolog	v in Mech	anical l		ring	
Semester	Fall/ VI semester of t			-	-	
Course	1. Understanding about the operating principle					turir
Objectives	technologies.					
3	2. Learn how to machine parts by use of appropri-	ate manufa	cturing	technic	que.	
	3. Enable students to learn the use of rapid pro-		-		-	oway
	processing of materials.			-		
CO1	Enable to understand an overview of manufactur	ring system	IS			
CO2	Enable to understand the use of advanced metal	cutting pro	cesses			
CO3	Enable to understand the interdisciplinary conce	pts of adva	nced m	achining	g proces	ses
CO4	Enable to understand advanced welding process	es				
CO5	Enable to understand microwave processing of r	naterials				
Unit-No.	Content	Contact	Lear	ning O	utcome	K
		Hour				
Ι	Introduction: Manufacturing and	12	To u	nderstan	d and	
	Manufacturing systems, Manufacturing Trends			mber va		
	and challenges, Manufacturing aspects, selection			ıfacturir	-	
	and classification, Description and Taxonomy of			ıfacturir	ng	1,2
	the Manufacturing processes		syste			
II	Advanced Metal casting processes: Metal	12		nderstar		
	casting basics, gating and risering design,			mber th		
	Evaporative pattern casting processes (EPC),			s of adv		1,
	Continuous, Permanent mold, Centrifugal and Pressure die casting			l casting	5	
III	Advanced Machining Processes: Abrasive	12	proce	esses	n and	
111	flow machining, Mechanism of material removal			rstand v		
	in AFM, Abrasive Jet Machining (AJM),		adva		arrous	
	Abrasive water jet machining (AWJM),			nining		
	Ultrasonic machining processes (USM),		proce	-		1,2
	Mechanism, Process variants, applications of		proc			1,-
	USM, Electric Discharge machining (EDM)					
	Processes, Electro chemical discharge					
	machining (ECDM), Laser beam machining,					
	electron beam, plasma beam, ion beam					
	machining					
IV	Advanced Welding processes: Submerged arc	12	To ren	nember	and	
	welding, Resistance welding processes, Solid		unders	tand not	n-	
	state welding processes, Friction welding		conver	ntional v	velding	1,2
	Process, Electron beam and Plasma welding		proces	ses		
	process, Laser beam welding and Diffusion					
	welding process					
V	Other Advanced Processes: High energy rate			member		1
	forming processes, Rapid prototyping			stand ra	pid	1
	technology, Microwave processing of materials,		_	typing		1
	Applications and new trends in Microwave			ologies	and	1,2
	material processing		micro	wave		

### **Text Books:**

- 1. Advanced Manufacturing Processes, Prashant K. Ambadekar
- 2. Manufacturing Science, Ghosh and Mallick

#### **Reference Books:**

1. Advanced Manufacturing Processes, Yashvir Singh

	CO PO Mapping								
SN	Course Outcome (CO)	Mapped Program Outcome							
1	Enable to understand an overview of manufacturing systems	1,3							
2	Enable to understand the use of advanced metal cutting processes	3,4,8							
3	Enable to understand the interdisciplinary concepts of advanced machining processes	6,8,12							
4	Enable to understand advanced welding processes	4,6							
5	Enable to understand microwave processing of materials	7,11,12							

		SEMESTER – VI							
Course Title		Machine eleme	nts an	id sys	stem	desig	gn		
Course code	24BTME322R	Total credits: 4	L	Τ	P	S	R	O/F	С
		Total hours: 45T+30P	3	0	2	0	0	0	4
Pre-requisite	Nil	Co-requisite				Ni	l	•	
Programme		<b>Bachelor of Technology i</b>	n Meo	<b>chan</b> i	ical I	Engir	neerin	ıg	
Semester		Fall/ VI semester of this	rd yea	r of t	the p	rogr	amm	e	
Course	1. To introduce the p	principles and techniques us	ed to d	desig	n ma	chine	com	ponen	ts.
Objectives	2. To provide an u	inderstanding of stress and	l strai	n an:	alysi	s and	the the	selec	tion of
		ials for machine design.							
		s how to apply failure cri					-		epts to
	Ţ	omponents that meet specifi							
CO1		nachine components that me	_				_		
		as material selection, loadin	-						
CO2	-	lubrication and wear of ma	achine	elen	nents	and	how	it affe	ects the
	design process.	· · ·							
CO3		ower transmission systems.			• •				
CO4		er manufacturing and asse	mbly	cons	ıdera	tions	ın t	he de	sign of
	machine elements.	. 1 1 1		1	111	•			
CO5	An ability to apply the	e concepts learned in class to	o a rea			-			TZT
Unit-No.		Content		Con			Learn	0	KL
T					our		Dute		1.2.2
Ι	Unit I: Introduction	iona limita fita	and	1(	J		CC	) ]	1,2,3
	Design considerati	ions - limits, fits ew of failure theories for s	and						
		(including fatigue failure)	static						
II	Unit II: Design of Jo	, , , ,		1(	<u> </u>		CC	12	1,2,3
11	U	aded fasteners, pre- loaded	bolts	П	,		CC		1,2,3
		alysis and applications of p							
	screws and couplings	• • • •							
III	Unit III: Design of S			1(	)		CC	) 3	1,2
	Design of shafts under	_		- (	-			-	,3
	-	nd design of sliding and ro	olling						,
	contact bearings	0 0							
IV		ears, Brakes & Clutches	-+	1(	)		CC	) 4	1,2,3
	0	on elements: spur, helical, b	bevel						, ,-
	and worm gears; Ana	A							
	clutches and brakes								
V	Unit V: Design of Be	elt Drives & Springs		5	,		CC	) 5	1,2,3
	Design of belt and c	hain drives, Design of spr	ings:						
	helical compression.	, tension, torsional and	leaf						
	1 -	,,							

### **Text Books/ Reference 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.
- 3. Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley, 1994.
- 4. Spottes, M.F., Design of Machine elements, Prentice-Hall India, 1994.
- 5. R. L. Norton, Mechanical Design An Integrated Approach, Prentice Hall, 1998.

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
	An ability to design machine components that meet specific						
1	functional requirements and consider factors such as material	1,2,3					
	selection, loading conditions, and failure criteria.						
2	An understanding of lubrication and wear of machine	1 2 3					
2	elements and how it affects the design process.	1,2,3					
3	An ability to design power transmission systems.	2,3					
4	An ability to consider manufacturing and assembly	124					
4	considerations in the design of machine elements.	1,2,4					
5	An ability to apply the concepts learned in class to a real-	234					
3	world design project.	2,3,4					

		SEMESTER – VI							
<b>Course Title</b>		Mechatronics, robotics a	nd c	ontr	ol				
Course code	24BTME323R	Total credits: 3	L	T	Р	S	R	O/F	С
		Total hours: 45T	3	0	0	0	0	0	3
Pre-requisite	Nil	Co-requisite				Nil			•
Programme		Bachelor of Technology	n M	echa	nical	Engi	neerii	ng	
Semester		Fall/ VI semester of thi	rd ye	ear o	f the	prog	ramm	e	
Course	1. Learn about the a	pplication of mechatronics							
Objectives	2. Understand the in	nportance of mechatronic syst	ems						
	3. Comprehend the	interdisciplinary nature of med	chatro	onics					
CO1	Explain the core of M	echatronic systems							
CO2	Reproduce the device	s of mechatronic system							
CO3	Develop and utilize the	e automated systems							
<b>CO4</b>	Classify the various s	mart materials							
CO5	Devise the facilities f	or application of mechatronic	syste	ms					
Unit-No.		Content	(	Cont	act	Ι	earni	ng	KL
			Ho	ur	(	Jutcol	me		
Ι	Unit I: Sensors and	transducers:		10		(	C <b>O</b> 1		1,2,3
	classification, Dev	velopment in Transduce	er						
	technology, Optoele	ctronics- Shaft encoders, C	D						
	Sensors, Vision Syste	m, etc.							
II	Unit II: Drives and A	Actuators:		10			CO 2		1,2,3
	Hydraulic and P	neumatic drives, Electric	al						
	Actuators such as se	rvo motor and Stepper moto	r,						
	Drive circuits, ope	n and closed loop contro	l;						
	· ·	Hardware Structure, Software							
	-	nication, Programmable Log							
		Control and Real Time Control	ol						
	Systems								
III	Unit III: Smart mat			10			C <b>O 3</b>		1,2,3
	Shape Memory	Alloy, Piezoelectric ar							
	e	tuators: Materials, Static ar							
		ics, illustrative examples for	or						
	positioning, vibration								
	isolation, etc.								
IV		pts of robot technology		10			C <b>O 4</b>		1,2,3
	Direct and invers	, I							
		and statics, Path plannin	g,						
	Dynamics and control		_				~~		
V	Unit V: Control syst			5			C <b>O 5</b>		1,2,3
		ntrol, Independent joint contro	ol,						
	Independent joint con	trol, Force control,							

T1: Richard Paul, Robot Manipulators: Mathematics, Programming and Control, MIT Press, 1981. Robert Shilling, Fundamentals Robotics, Prentice-Hall, 2003

## **REFERENCE BOOKS:**

R1: M. Felix Orlando, Ashish Dutta, Anupam Saxena, Laxmidhar Behera, Tomoya Tamei and Tomohiro Shibata, "Manipulability Analysis of Human Thumb, Index and Middle Finger in Cooperative 3D

	CO PO Mapping							
SN	Course Outcome (CO)	Mapped Program Outcome						
1	Explain the core of Mechatronic systems	2&3						
2	Reproduce the devices of mechatronic system	1,2&4						
3	Develop and utilize the automated systems	2,3						
4	Classify the various smart materials	2&3						
5	Enable to understand drives and actuators, embedded systems, programmable logic devices	2&3						

	SEMESTER – VI							
<b>Course Title</b>	Introduction to Ne						1	
Course code	24BTME324R Total credits: 3	L	Т	P	S	R	O/F	C
	Total hours: 45T	3	0	0	0	0	0	3
Pre- requisite	Nil Co-requisite				Ni			
Programme	Bachelor of Technolo	0,				0	0	
Semester	Fall/ VI semester of					-		
Course	1. Grasp the basic principles and mathem							
Objectives	including their structure, learning processes,						-	
	2. Explore various architectures, such as feed neural networks (CNNs), recurrent neural							
	models.	i net	WUIKS		115),	anu	ucep	ICarinin
	3. Learn how to handle challenges such a	s laro	re da	itasets	im	haland	red da	ita an
	scalability issues.	5 iuig	se u	lusen	, 1111	Juluin	i de de	itu, ull
CO1	Demonstrate a solid understanding of the the	oretic	al fo	undat	ions	of ne	ıral ne	etworks
001	including perceptron's, activation functions, and							
CO2	Design and construct various neural netwo			•		•	•	
	convolutional, and recurrent networks, tailored							
CO3	Train neural networks effectively using backpro					ation	echnic	jues
	like stochastic gradient descent (SGD), Adam, a	and R	MSP	op. o	f iner	tia		•
CO4	Apply advanced techniques like transfer	learı	ning,	atter	ntion	mec	hanisn	ns, an
	reinforcement learning to complex problems.							
CO5	Evaluate the ethical implications of neural ne	tworl	c app	licatio	ons, e	nsurii	ng resp	oonsibl
	use in areas like privacy, fairness, and societal i	mpac	t.					
Unit-No.	Content		Cor	ntact		Lear	ning	KL
			Н	our		Outc	ome	
Ι	Unit I: Introduction to Artificial Net	ıral	1	0		<b>CO</b> 2	1	1,2,3
	Network							
	Artificial Neuron Model and Linear Regress							
	Gradient Descent Algorithm, Nonlinear Activa							
	Units and Learning Mechanisms, Learn	ning						
	Mechanisms-Hebbian, Competitive, Boltzman							
II	Unit II: Associative memory	6	1	)		CO	2	1,2,3
	Associative Memory Model, Condition for Per							
	Recall in Associative Memory, Statistical Asp							
	of Learning, V.C. Dimensions: Typical Examp							
	Importance of V.C. Dimensions Structural H Minimization	CISK						
			1/	n		<u> </u>	•	1 2 2
III	Unit III: Single-Layer Perceptions	anla	1	J		CO 3	)	1,2,3
	Unconstrained Optimization: Gauss-Newt Method, Linear Least Squares Filters, Least M							
	Squares Algorithm, Perceptron Converge							
	Theorem, Bayes Classifier & Perceptron:							
	Analogy,	All						
IV	Unit IV: Back Propagation Algorithm		1	)		CO	1	1,2,3
1 1	Practical Consideration in Back Propaga	tion	1			0.0	•	1,2,3
	Algorithm, Solution of Non-Linearly Separa							
	Problems Using MLP, Heuristics For Ba							
	Propagation, Multi-Class Classification Us							
	Multi- layered Perceptrons							1

Theorem, Radia	l Basis Function	Networks:
Separability &	Interpolation, S	Solution of
Regularization	Equation: Greens	Function,
Regularization N	etworks and Gener	alized RBF,
Comparison Betw	een MLP and RBF,	Learning
Mechanisms in R	3F	

"Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall "Pattern Recognition and Machine Learning" by Christopher M. Bishop

## **REFERENCE BOOKS:**

"Introduction to Artificial Neural Networks and Deep Learning: A Practical Guide with Applications in Python" by Daniel Graupe

#### **OTHER LEARNING RESOURCES:** NPTEL, Science Direct

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Demonstrate a solid understanding of the theoretical foundations of neural networks, including perceptron's, activation functions, and the principles of learning algorithms	2&3					
2	Design and construct various neural network architectures, such as feedforward, convolutional, and recurrent networks, tailored to specific tasks.	1,2&4					
3	Train neural networks effectively using backpropagation and optimization techniques like stochastic gradient descent (SGD), Adam, and RMSProp. of inertia	2,3					
4	Apply advanced techniques like transfer learning, attention mechanisms, and reinforcement learning to complex problems.	2&3					
5	Evaluate the ethical implications of neural network applications, ensuring responsible use in areas like privacy, fairness, and societal impact.	2&3					

Course Title	SEMESTER – VI		lart	F ~	in	•			
	Design and Simulation of Proce			-	· ·		O/F	C	
Course code	24BTME325R Total credits: 3 L		T	P	S	R	O/F	C 2	
<b>D</b> • • •	Total hours: 45T 3		0	0		0	0	3	
Pre- requisite	Nil Co-requisite	• •		•	Nil		•		
Programme	Bachelor of Technology					0	0		
Semester	Fall/ VI semester of th		-		-	-			
Course	1. Recall, understand & demonstrate the thermal eng					in Oil	& Ga	.S	
Objectives	Industry and other Chemical Process Industries (BT			BT3)	)				
	<ol> <li>Explain and design the Distillation Column (BT2</li> <li>Analyse &amp; compare the thermal design of various</li> </ol>			ahan	aara h	and a			
	international standards and perform their thermal de							ement	
	(BT4, BT5, BT6)	Joigi	1 101	a giv	ch pro		equir	cilicii	
<b>CO1</b>	Recall, understand & demonstrate the thermal engin	neeri	ing c	once	pts in	Oil &	Gas I	ndust	
	and other Chemical Process Industries (BT1, BT2, I				L				
CO2	Explain and design the Distillation Column (BT2, B								
CO3	Analyse & compare the thermal design of various here								
	standards and perform their thermal design for a given process requirement (BT4, BT5,								
	BT6)		-						
<b>CO4</b>	Implement the mechanical design methodology and								
CO5	process equipment and comply with the international						13, B	16)	
CO5 Unit-No.	Perform the design, analysis, and evaluation using P Content	1	Cont		1 <b>``</b>	Learr	ina	KI	
Unit-No.	Content		Сош Но			Outco	0	KL	
т									
Ι	HMT Concepts, Conduction & Convection Hea Transfer	I	10			leviev	·		
	• HMT Concepts: Recap of Heat & Mas	c				nprehe			
	Transfer Concepts	6				show			
	Conduction Heat Transfer: Heat	ıt				pplic			
	Conduction in Cartesian, Cylinder, &				of	thern	nal		
	Spherical Coordinates; Boundary & Initia				eng	gineer	ing		
	Conditions; Transient Analysis; Lumped				conc	epts i	n the		
	Capacitance; Insulation				Oi	1 & C	las		
	Convection Heat Transfer: Forced				Ind	ustry	and		
	Convection; Correlations; Free Convection	ı;			other	Chei	nical		
	Correlations				Р	roces	s		
	Case Studies:						(BT1,		
	Thermal contact resistance calculation method					2, BT			
	<ul> <li>Problem Solving:</li> <li>Industrial Problem on Forced Convection</li> </ul>					2, D1	5).		
	<ul> <li>Industrial Problem on Free Convection</li> </ul>								
II	Shell and Tube Heat Exchangers		10		Des	cribe	and		
	• Shell and Tube Heat Exchangers	:			d	esign	а		
	Classification based on TEMA Standards					stillat			
	Thermal Design – Tube Side Design &	è				olum			
	Shell Side Design; End Connections Sizing						·		
	Fouling Effect & Control; Economic				1	oplyir elevaı			
	Penalties; Material Selection; Corrosion &								
	its Monitoring Methods; Liquid-Liquid	I,			princ	-			
	Gas-Gas & Gas-Liquid Heat Exchangers					BT6)			
	Case Examples:     Material Selection based on Process								
	Requirement								
III		_	10		Eva	luate	and		
111	Condensers, Evaporators, and Non-Tubula	r	10			ntrast			
	Heat Exchangers <ul> <li>Condensers:</li> <li>Classification;</li> </ul>	1				nal de			
	Condensers: Classification; Therma				l merr	nai de	sign	1	

			1	
	<ul><li>Design; Applications</li><li>Evaporators: Classification; Laminar</li></ul>		of different heat	
	Falling Film & Wavy Falling Film		exchangers	
	Evaporation; Falling Film Evaporator;		according to	
	Climbing Film Evaporator		international	
	Non-Tubular Heat Exchangers: Air		standards, and	
	Cooled Heat Exchangers; Plate Type Heat		perform their	
	Exchangers		thermal design	
	Problem-Solving:		based on a	
	Thermal Design of Evaporators			
	• Inclinal Design of Evaporators		given process	
			requirement	
			(BT4, BT5,	
			BT6).	
IV	Mass Transfer, Reboilers, and Distillation	10	Apply	
	Column		mechanical	
	Mass Transfer: Vapor Liquid Equilibrium;		design	
	Absorption; Stripping; Distillation;		methodology	
	Azeotropic Distillation; Liquid-Liquid		and conduct the	
	Extraction			
	• <b>Reboilers:</b> Classification; Thermosyphon		mechanical	
	Reboiler; Case Study; Kettle Type Reboiler		design of	
	<ul> <li>Distillation Column: Types; Components;</li> </ul>		process	
	Basic Design; Selection of Operating		equipment,	
	Parameters; Minimum Reflux Ration		ensuring	
	Calculation; Theoretical Stages;		compliance with	
	Correlations; Tower Selection; Tray		international	
	Selection; Design of Tray Tower; Total		codes and	
	Pressure Drop in Tray Tower; Design of			
	Downcomers; Tray Efficiency; Height		standards (BT3,	
	Equivalent Theoretical Plate of Packings		BT6).	
	Problem-Solving:			
	Industrial Practices in Sizing Typical			
	Thermosyphon Reboiler			
	Case Studies:			
	Operation Difficulties in Distillation			
	Column			
	• Trouble Shooting of Distillation Column			
	• Process Design of Light & Heavy Crude			
	Distillation Column			
V	Mechanical Design of Process Equipment, and	5	Conduct the	
	Process Simulation		design, analysis,	
	<ul> <li>Mechanical Design of Process</li> </ul>		and evaluation	
	Equipment: Design Parameters; Design of		processes using	
	unfired Pressure Vessels: ASME Section		PV Elite	
	VIII Division 1; Design of Pressure		software (BT6).	
	Vessels; Types of Vessel Supports & their		sonware (D10).	
	Design; Atmospheric Pressure Storage Tank			
	– API 650 International Standard; Low			
	Pressure Storage Tank – API 620			
	International Standard; Types; Design of			
	Storage Tanks; Introduction on Agitated			
	Vessels; Types of Agitators; Agitator Power			
	Requirement; Design of Heat Exchangers			
	Process Simulation: Simulation of     Charging Decades using ASDENIDLUS			
	Chemical Process using ASPENPLUS or			
	equivalent Software			
	Problem Solving:			
	Mechanical Design of			

<ul> <li>Pressure Vessel</li> <li>Vessel Support</li> <li>Storage Tank</li> <li>Agitated Vessel, and</li> <li>Heat Exchanger</li> <li>Demonstration of ASPENPLUS Software of equivalent SW, and</li> <li>Hands on Practice using Pipe Stress and Vessel Analysis Software of Bentley Product</li> </ul>	r	
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---	--

## **Reference Books:**

- 1. P. Chattopadhyay, "Engineering Thermodynamics," Oxford University Press, 2015
- 2. Y. V. C. Rao, "Chemical Engineering Thermodynamics," University Press, India, 1997
- 3. Yunus A. Çengel & Michael A. Boles "Thermodynamics *An Engineering Approach*," McGraw-Hill, New York, 2015
- 4. B. C. Punmia, A. K. Jain, and A. K. Jain, "Strength of Materials," Laxmi Publications, 10<sup>th</sup> Edition, 2018
- S. S. Rattan, "Strength of Materials," Tata McGraw Hill Education Publication Pvt. Ltd, 2<sup>nd</sup> Edition, New Delhi, 2011
- 6. Yunus A. Çengel, and John M. Cimbala, "Fluid Mechanics: *Fundamentals and Applications*," McGraw-Hill, New York, 2014
- 7. Robert W. Fox, Alan T. McDonald, and Philip J. Pritchard, "Introduction to Fluid Mechanics," John Wiley & Sons, Inc. NJ, 2020
- 8. R.C. Hibbeler, "Fluid Mechanics," Pearson India Education Services Pvt. Ltd., 2017
- 9. G. F. Hewitt, G. L. Shires, and T. R. Bott, "Process Heat Transfer," CRC Press, Taylor & Francis Group LLC, NewYork, 1994
- 10. Frank P. Incropera, David P. Dewitt, Theodere L. Bergman, and Adrienne S. Lavine, "Principles of Heat and Mass Transfer," Wiley India Pvt. Ltd., New Delhi, 2019
- 11. S. Kakaç, H. Liu, and A. Pramuanjaroenkij, "Heat Exchangers Selection, Rating, and Thermal Design," CRC Press, Taylor & Francis Group LLC, NewYork, 2012

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Recall, understand & demonstrate the thermal engineering concepts in Oil & Gas Industry and other Chemical Process Industries (BT1, BT2, BT3)	2&3					
2	Explain and design the Distillation Column (BT2, BT6)	1,2&4					
3	Analyse & compare the thermal design of various heat exchangers based on international standards and perform their thermal design for a given process requirement (BT4, BT5, BT6)	2,3					
4	Implement the mechanical design methodology and perform the mechanical design of process equipment and comply with the international codes and standards (BT3, BT6)	2&3					
5	Perform the design, analysis, and evaluation using PV Elite software (BT6)	2&3					

Course T Course c Pre-requ Program			CORPORATE								
Pre-requ	ode				FICIE	ENCY	FOR	ENGI	NEEI	RS	
-		24UBPD324R	Total credits: 2	L	Τ	P	S	R	0	/ <b>F</b>	C
-			Total hours: 30P	0	0	4	0	0	(	0	2
Program		Nil	Co-requisite				N	il			
	nme		<b>B.Tech Mec</b>		0		0				
Semest	er		Fall/ VI sen								
Cours		<b>^</b>	dents' abilities in teo			•	•		•		
Objectiv	ves	<ul> <li>applications infrastructure</li> <li>2. Focus on cra positions, im</li> <li>3. Strengthen to</li> </ul>	convey engineering in civil engineering c. afting professional re- proving students' cha eamwork abilities ar rcises and targeted tra	sumes a nces of nd prep	and co secur are s	ing, co over le ing em tudents	onstruc etters t ploym s for j	eting, ailored ent. ob int	and r for e	naint engin ws th	ainin; eerin; 1rougl
C01			and concise technical		inicat	ion in	both w	ritten	and o	ral fo	rmats
CO2		Â	stry-specific terminolo in crafting resumes, o ing qualifications.		etters,	and te	echnica	ıl repo	orts to	effec	tivel
CO3		Acquire proficienc aids to convey engi	y in creating and del neering concepts to d	liverse a	udier	nces.	-				
CO4		listening, conflict re	interpersonal skills esolution, and clear c	ommun	icatio	n with	in engi	neerir	ng con	texts.	•
CO5			ering job interviews ssing both technical a							ience	s, and
Unit-No.		Conter	nt	Conta Hou			Learr	ing O	utcor	ne	KL
Ι	i. Pa	<b>ting Skills</b> ragraph Writing & N etter Writing	Jarratives		fo	evelop rms ( tragrap	of wi		inclu		;
	iii.T <b>Pipe</b> iii. In iii.S	echnical Writing and cistern	•	7	cc	onstruc	tion, le	etter w	vriting		
II Self i. SV ii. Mix i.Int		-Management Skills VOT Analysis Goal Setting and ture allegation roduction of basics	s Personal Hygiene and Clock	7	pr pi al	ain co actical pes and ligation ss, ar	prob d ciste ns, clo nd dis	lems rns, m ocks, scount	relate ixture and p s thr	ed to s and profit, cough	1,2
III	allig 2	olving questions ationion. iii.Worksh abulary Developme	eet1 and Worksheet		W	rgeted orkshe nhance	ets.	practic		and	
	i Une (suc ii Le iii C iv. V	derstanding differen h as the use of say, to arning strategies to o ontextual vocabular	t aspects of a word ell, speak) . develop vocabulary	7	th se	rough tting, ersonal	SWO	Tana I r		goal	

	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		Improve vocabulary through	
	i. Types of interview- telephonic, virtual &		understanding word usage,	
	face to face		contextual learning, and	
	online interview, personal interview, Panel		effective dictionary use, and	
	interview, Group interview		strengthen logical reasoning	
	ii. Common interview questions and		with practice in syllogisms,	
	answering strategies		statements, conclusions, and	
	iii. Dress Code Ethics during Interviews		courses of action.	
	iv. Mock Interview Session	7		1,2
	Sitting arrangement (puzzle) i.Linear			
	arrangement puzzle ii.Circular arrangement			
	puzzle iii.Matrix			
	Iv. Worksheet1			
V	Grammar (Flipped Classroom)		Master interview techniques for	
	i. Word-stress, Syllables		various formats, understand	
	Practice Session: Common Errors (testing	7	dress code ethics, and improve	
	the students' grammar already learnt)		performance through mock	1,2
	Profit loss and discount i.Introduction to		interviews and puzzle- solving	
	basics ii.Introduction to discount		exercises in linear, circular, and	
	iii.Probems related on the topics Iv.		matrix arrangements.	
	Worksheet1 and Worksheet 2			

### **Text Books:**

- Barrett, Grant. 2016. *Perfect English Grammar: The Indispensible Guide to Excellent Writing and Speaking*, Zephyros Press.
- McDowell, Gayle Laakmann.2008. Cracking the Coding Interview (Indian Edition)
- A Modern Approach to Logical Reasoning All Exams
- General Mental Ability & Logical Reasoning Compendium

#### **Reference Books:**

- Zinsser, William. (2006) On Writing Well: The Classic Guide to Writing Nonfiction
- Fast track Objective mathematics for Competitive exam by Arihant
- General Mental Ability & Logical Reasoning Compendium By R.S. Agarwala

	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								
<b>Course Title</b>		Extra-cui	ricular A	Acti	vities						
Course code	24UBEC321	Total credits: 1	L	Т	P	S	R	O/F	С		
		Total hours: 30P	0	0	0	4	0	0	1		
Pre-requisite	Nil	Co-requisite				Ni	il				
Programme		B.Tech Mec	hanical l	Engi	neerin	g					
Semester	Fall/ VI semester of third year of the programme										
Course	1. Equip students	with effective time	manager	nent	and p	rioriti	zation	skills, fo	ostering		
Objectives		ties and a commitmer									
		loration of interests	-				-	-			
		vities, cultivating v		ded	indivi	duals	capal	ble of	making		
		munity contributions									
		ts' abilities to express		-				-			
	· · ·	while integrating lear	nıng exp	erie	nces to	o prac	tice tra	ansferable	e skills		
	across various a			1					•		
CO1	_	that they can make m	eaningfu	l cor	ntributi	ons, n	aintair	n a comm	iitment,		
COA	and manage their the	-		1	1 1 .	1		•	1 1		
CO2	their academics.	ate students who den	nonstrate	leac	iersnip	and p	ursue	interests	beyond		
CO3		to in vonious of ou		ativ	itian la	o din a	to th	ain marriti	facetad		
COS	personality develop	te in various co-cu	ricular a	activ	ities ie	ading	to th	eir mutu	laceled		
CO4	· · ·	s, views, In-depth eva	Justion	und a	maluci		ly in t	ha tonia	of their		
004	interest.	s, views, in-deput eva	iluation a	inu a	anarysis	s cicai	Iy III t	ne topic	or men		
CO5		practices different ac	tivities	by I	ntegrat	ing le	arnina	evnerier	nces hu		
003	demonstrating tran	•	uvines,	Uy I	megrai	ing ic	arning	experier	ices by		
Unit-No.		ntent	Contact	t		Learn	ing O	utcome	KL		
	COL	itent	Contac	•			ing O	uttome	INL		
			Hour								
I	AdtU encourages	a range of activities	Hour		rticipa	te in	dive	erse clu	b		
Ι		a range of activities egular curriculum	Hour	Pa	urticipat tivities			erse clu social an			
I	outside the r		Hour	Pa ac	tivities	to de	velop	erse clu social an e holisti	d		
I	outside the r intended to mee	egular curriculum	Hour	Pa ac so	tivities	to de lls, a	velop achieve	social an e holisti	d c		
I	outside the r intended to mee These activities a	egular curriculum t learner's interest,	Hour	Pa ac so de	tivities ft ski velopn	to de lls, a nent,	velop achieve and	social an e holisti	d c n		
Ι	outside the r intended to mee These activities a the social and sof	egular curriculum t learner's interest, re aimed to develop	Hour	Pa ac so de ex	tivities ft ski velopn posure	to de lls, a nent, thro	velop achieve and	social an e holisti 1 gai workshop	d c n		
I	outside the r intended to mee These activities a the social and sof a holistic develop	egular curriculum t learner's interest, re aimed to develop t skills and promote	Hour	Pa ac so de ex an	tivities ft ski velopn posure	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n os		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodo	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are	Hour	Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n os		
I	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in differe	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, ad the 360 degree logy the students are ent activities headed	Hour	Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n os		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance,	Hour	Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n os		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different under different music, photograp	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to	Hour 30	Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n os		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities,		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, id the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, petitions as per their		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, etitions as per their obies, The student		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, etitions as per their obies, The student		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, petitions as per their obies, The student e club are trained in various inter		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU University student	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, etitions as per their obies, The student e club are trained in various inter at and national level		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU University studen competitions, Re	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, betitions as per their obies, The student e club are trained in various inter at and national level newed personalities		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU University studen competitions, Re- are invited to con	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, etitions as per their obies, The student e club are trained in various inter at and national level newed personalities duct workshops that		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU University studen competitions, Re are invited to con benefit the memb	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, betitions as per their obies, The student e club are trained in various inter and national level newed personalities duct workshops that pers and students by		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		
Ι	outside the r intended to mee These activities a the social and sof a holistic develop Keeping in min learning methodol engaged in different music, photograp etc., The students participate in reg workshops, comp interest and hol members of the represent AdtU University studen competitions, Re are invited to con benefit the memb giving them the	egular curriculum t learner's interest, re aimed to develop t skills and promote ment of the learners, d the 360 degree logy the students are ent activities headed clubs viz. Dance, ohy, drama, literary s are encouraged to gular club activities, etitions as per their obies, The student e club are trained in various inter at and national level newed personalities duct workshops that		Pa ac so de ex an	tivities ft ski evelopn posure id co	to de lls, a nent, thro	velop achieve and ugh v	social an e holisti 1 gai workshop	d c n ss y		

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
	Learn to a plan so that they can make meaningful						
1	contributions, maintain a commitment, and manage their	5, 7					
1	time and priorities.	5, 7					
	Transform passionate students who demonstrate leadership						
2	and pursue interests beyond their academics.	8					
	Learn to participate in various co-curricular activities						
3	leading to their multifaceted personality development.	7.9,10					
	Express their ideas, views, In-depth evaluation and						
4	analysis clearly in the topic of their interest.	11,12					
	Demonstrate and practices different activities, by						
5	Integrating learning experiences by demonstrating	10					
3	transferable skills.	10					

		SEMESTER	– VII						
<b>Course Title</b>		Power P	lant En	ginee	ering				
Course code	24BTME411R	Total credits: 3	L	Т	P	S	R	O/F	C
		Total hours: 45T	3	0	0	0	0	0	3
Pre-requisite	Nil	Co-requisite			-	Ni	il		1
Programme		Bachelor of	Techno	logy	in Mec	hanica	al Eng	ineering	
Semester		Fall/ VII s	emester	of 3	rd year	of the	e prog	ramme	
Course	1. To provide an o	verview of power pla	ints and	the a	ssociate	ed ener	rgy coi	nversion.	
Objectives	2. To understand the	he concept of renewa	ble ener	rgy fo	or sustai	inable	develo	pment	
	3. To understand b	asics of thermodynar	nics						
CO1	Illustrate the worl	king of steam power	plants a	nd its	differe	nt con	nponen	ıts.	
CO2	Explain the work	ing of gas turbine and	l combi	ned c	ycle po	wer pl	ants.		
CO3	Analyze the basic	s of nuclear energy c	onversi	on an	d its di	fferent	reacto	ors.	
CO4	Classify various h	ydroelectric power p	lants.						
CO5	Understand vario	us energy, economic	and env	ironn	nental i	ssues.			
Unit-No.	Con	tent	Conta	ct		Learn	ing O	utcome	BL
			Hou	r					
Ι	Coal based thermal	power plants, basic		U	pon co	mpleti	on of t	the course,	
	Rankine cycle and	d its modifications,		th	e stude	ents ca	n unde	erstand the	
	layout of modern	coal power plant,		pi	rinciple	s of	oper	ation for	
	super critical boi	lers, FBC boilers,	5	di	ifferent	power	r plant	s and their	
	turbines, conden	sers, steam and		e	conomi	cs.			1,2
	-	systems of thermal							
		and ash handling,							
		ed water treatment,							
	binary								
	cycles and cogener	÷							
II		mbined cycle power	10	th		lents		understand	
		cycle analysis and	10	p	ower pl	ants ec	conom	ICS	1.2
	· ·	nponents of gas nts, combined cycle							1,2
	· · ·	rated Gasifier based							
	Combined Cycle (I								
	systems.								
III	•	energy conversion,		T	earn a	nd de	velon	skills for	
		ystems of nuclear	10		perating		-	SKIIIS IOI	
		ling Water Reactor	10		peranie	,	•		
		ed Water Reactor							
		Reactor, Pressurized							1,2
	× //	ctor (PHWR), Fast							
	Breeder Reactors	(FBR), gas cooled							
	and liquid meta	l cooled reactors,							
	safety measures	For nuclear power							
	plants.								
IV	Hydroelectric	power plants,		E	nable to	o unde	rstand	the setting	
	classification, ty	pical layout and	10	սլ	p of an	boiler	indust	ry	
	components, princ	iples of wind, tidal,							1,2
	solar PV and	solar thermal,							
	geothermal, biogas	and fuel cell power							
	systems								
V	Energy, economic	and environmental		D	emonst	rate p	ower	generation	

iss	sues, power tariffs, load distribution	10	in power plants.	
pa	arameters, load curve, capital and			1,2
op	perating cost of different power			
pl	lants, pollution control technologies			
in	cluding waste disposal options			
fo	or coal and nuclear plants.			

T1 Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.

T2 El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

#### **REFERENCE BOOKS:**

R1: 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:**

https://www.sciencedirect.com/science/article/abs/pii/S0360319923006523

	CO PO Mapping						
SN	Course Outcome (CO)	Mapped Program Outcome					
1	Illustrate the working of steam power plants and its different components.	1,2, 3,4					
2	Explain the working of gas turbine and combined cycle power plants.	5, 6, 7					
3	Analyze the basics of nuclear energy conversion and its different reactors.	3,4,5					
4	Classify various hydroelectric power plants.	1,2,3					
5	Understand various energy, economic and environmental issues.	1,2,3					

	SEM	IESTER – VII									
<b>Course Title</b>		Production	a & Oper	ation N	Aana	gem	ent				
Course code	24BTME412R Tota	l credits: 3	]	L T	P	S	R	O/F	С		
	Tota	l hours: 45T		3 0	0	0	0	0	3		
Pre- requisite	Nil	Co-requisit	te		•	Nil		•			
Programme	Bache	lor of Techno	ology in	Mecha	nical	Engi	neeri	ng			
Semester	Fall/ VI semester of third year of the programme										
Course	1. To develop a thorough understanding of the role and scope of production and										
Objectives	<b>Objectives</b> operations management in both manufacturing and service organizations.										
	2. To understand workflow man	agement, cap	acity pla	nning, a	ind la	yout	plann	ing.			
	3. To study methods to optimize	e the use of re	esources	such as	labo	r, ma	terial	s, mac	hines,		
	and capital.										
	4. To analyze real-world proble	ms using tech	nniques s	uch as t	forec	asting	g, scho	eduling	g, and		
	production planning.										
CO1	To demonstrate a clear underst	tanding of the	e basic	concept	s, pr	incip	les, ai	nd see	pe of		
	linear programming.										
CO2	To comprehend the structure, as	ssumptions, a	nd objec	tives of	tran	sport	ation	proble	ms in		
	optimization.		1.1	1.			•		1 1		
CO3	To formulate real-world tran			as lin	ear j	orogr	ammi	ng m	odels,		
COA	including supply, demand, and c				1			C	•		
CO4	To understand the fundamental	-				ompo	nents	of qu	leuing		
C05	systems, such as arrival rates, se			discipli	nes.						
CO5	Learn the fields of application of			I.	:						
Unit-No.	Content	Contac Hour		earni utcor	-		KL				
Ι	Unit I: Linear Programming		10		0 1	ne	<b>D</b> o	memb	or		
L	Introduction, Requirements for	or a linear	10		01			dersta			
	programming problem, Assur							pply a	-		
	Linear Programming	Problems,						analyz			
	e e	rogramming					1		.e		
	Problems, General Linear Pr	0									
	Problem, Canonical and Standar	0									
	of Linear Programming Problem										
	Simplex Method	· ·									
II	Unit II: The Transportation M	lodel	10	C	02		Re	memb	oer,		
	Introduction, Assumptions	in the					Un	dersta	ınd,		
	Transportation Model, Definit	ion of the					A	pply a	&		
	Transportation Model, Matrix T	erminology,					8	nalyz	e		
	Formulation and Solution										
	of Transportation Models, V	Variants in									
	Transportation Problems										
III	Unit III: The Assignment Mod		10	<b>C</b>	03			erstar			
	Definition of the Assignme							Apply	7		
	Mathematical Representation										
	Assignment Model, Comparison										
	Transportation Model, Soluti	on of the									
<b>XX</b> 7	Assignment Models		10		<u>0 1</u>		<b>T</b> 7	1 -	-		
IV	Unit IV: Queuing Models	N # 1 1	10		04			dersta	-		
	Applications of Queuing							Applya			
	Introduction, Elements of System, Operating Characteri	< U					P	Analyz	e		
						1					

	Queuing System, Waiting Time and Idle Time Costs, Transient and Steady States of the System		
V	Unit V: Inventory Models Necessity for Maintaining Inventory, Inventory Costs, Inventory Control Problem, Forecasting of Demand, Forecasting Methods, Selective Inventory Management Techniques	CO 5	Understand, Apply & Analyze

T1. Operations Research by Prem Kumar Gupta, D.S. Hira Operations Research by R. Panneerselvam

## **REFERENCE BOOKS:**

R1. Operations Research Theory and Applications by J K Sharma

# OTHER LEARNING RESOURCES: NPTEL, Sciencedirect

	CO PO Mapping				
SN	Course Outcome (CO)	Mapped Program Outcome			
1	To demonstrate a clear understanding of the basic concepts, principles, and scope of linear programming.	1,2, 3,4			
2	To comprehend the structure, assumptions, and objectives of transportation problems in optimization.	5, 6, 7			
3	To formulate real-world transportation problems as linear programming models, including supply, demand, and cost constraints.	3,4,5			
4	To understand the fundamental concepts, characteristics, and components of queuing systems, such as arrival rates, service rates, and queue disciplines.	1,2,3			
5	Learn the fields of application of optimization tools	1,2,3			

	Semester -							
Course Title								
Course code	24BTME413R Total credits: 3			Р	S	R	O/F	C
	Total hours: 4	T 3	3 0	0	0	0	0	3
Pre-requisite	Nil Co-requ	site			Nil			
Programme	Bachelor of Te	chnology ii	n Mech	anical	l Engi	ineer	ing	
Semester	Fall/ VI semester of third year of the programme							
Course	1. To Explain Upstream, Refinery,							
Objectives	Equipment, and apply the Mech			cepts	in De	esigni	ng the	Stati
	<ul><li>Equipment for a given Process Requirement (BT 2)</li><li>2. To Explain Upstream, Refinery, Petrochemical and Fertilizer Processes and their</li></ul>							
	Equipment, and apply the Mech							
	Equipment for a given Process Re			1		U	U	
	3. To Explain Upstream, Refinery,							
	Equipment, and apply the Mech		-	cepts	in De	esigni	ng the	Stati
CO1	Equipment for a given Process Ro Demonstrate a comprehensive understar			refine		etroc	hemice	al an
COI	fertilizer processes, and their associated e	<b>•</b> •						
	optimization.	laipinent, ei	luoing	011000	ne pi		, and y	oio uii
CO2	Apply mechanical design concepts to	<b>1</b>		-			-	
<b>CCCCCCCCCCCCC</b>	requirements, ensuring functionality and s	afety in con	npliance	e with	indus	stry st	andard	s.
<u>CO3</u>	Gain proficiency in manual and software					- 1 - +		
CO4	Design storage tanks adhering to AP techniques with ANSYS software to ensu							
CO5	Develop expertise in designing reaction v							
	while performing advanced stress analysis			-				
	pads using ANSYS.							
Unit-No.	Content Contact Learning KL				KL			
		Hour		utcon	ne			
Ι	Introduction & Codes	. 10		now a			1,2	
	Processes, Concepts & Star Equipment Description: Basics			orough				
	Oil & Gas, Chemical Processes			stand	0			
	Equipment – Upstream Process			ostrea				
	Refinery Processes, Petrochemic			inery,				
	Processes and Major Equipment		-	chemi fertiliz				
	All Processes; Concepts Description of Reactors; Concept	& to						
	& Description of Distillation		-	cesses				
	Column; Concepts & Description			ng wit relate				
	of Packed Tower Distillati	on		ment,				
	Column; Concepts & Descripti			cilitate				
	of Heat Exchangers; Selection Material	of		ective				
	Theory of Elasticity & Finite	te		ocess				
	Element Method: Theory		-	ysis ai	nd			
	Elasticity – Stress Analysis, Stra			nizatio				
	Analysis, Stress & Stra		opun					
	Relations, Plastic Deformatio	/						
	Criterion for Failure & Stra Hardening; Finite Element Meth							
	– Formulation Method							
	Interpolation Functions, Eleme	·						
	Interpolation Functions. Frence							
	Matrix, Assembly, Loadings a							
	Matrix, Assembly, Loadings a Boundary Conditions, Generation	nd n,						
	Matrix, Assembly, Loadings a	nd n, h,						

	FEM, Typical FEAs of various			
	Components			
	ASME BPVC & Other Codes:			
	ASME BPVC Codes –			
	Introduction, Development of			
	ASME BPVC Codes, ASME			
	Section VIII Division 1:			
	Structure/Layout; ASME Section			
	VIII Division 1: General			
	Requirements – UG, UHX, UCS,			
	ASME Section VIII Division 2 &			
	3, ASME Section II: Material			
	Specification, ASME Section V:			
	Nondestructive Examinations;			
	Other Codes – BS PD 5500,			
	European Standard EN 13445,			
	ASME B16.5, ASME B16.47,			
	ASME B16.2, API 579, EN 1591			
TT		10	Utilize	1.2
II	Design Procedure of Pressure Vessels	10		1,3
	Design Procedure of Pressure     Vaggela Design of Pressure		mechanical	
	Vessels: Design of Pressure Vessel		design	
	Shell – Internal Pressure, External		principles to	
	Pressure; Design of Pressure		create static	
	Vessel Heads – Hemispherical		equipment for	
	Head, Ellipsoidal & Torispherical		• •	
	Heads, Conical, Toriconical & Flat		different	
	Heads, and Covers; Design of		process	
	Nozzle – Circular Hole - Stress		requirements,	
	Concentration, Reinforcement,		ensuring	
	Nozzles; Design of Flange Joints –		functionality,	
	Flange Types & Design, Gasket		•	
	Types & Design, Nut & Bolts;		safety, and	
	Other Aspects – Buckling of		compliance	
	Cylindrical Shell, Vessel &		with industry	
	Components of Vessel Weight		standards.	
	Calculation, Tall Towers –			
	Vibration Analysis, Fabrication;			
	Partial Liquid Volume			
	Determination – Horizontal			
	Cylinder & Various Horizontal			
	Heads, Various Vertical Heads			
	• Design of Pressure Vessels:			
	Design of Vertical Pressure Vessel			
	– Problem Statement & Data, Shell			
	Design, Head Design, Nozzle			
	Design, Flange Joint Design;			
	Design of Horizontal Pressure			
	Vessel – Problem Statement &			
	Data, Shell Design, Head Design,			
	Nozzle Design, Flange Joint			
	Design, Mechanical Datasheet			
	• Design of High-Pressure (Thick			
	0 0			
	Wall) Vessels: Design Procedure			
	of High Pressure Vessel – Radial,			
	Hoop, Axial Stresses, Distribution			
l	of Radial & Hoop Stresses through			
	Cylinder Wall, Design Procedure -			
	Single Shell & Multi Shell, Types			
	of Closures; Design of Vertical			

	High-Pressure Vessel			
	ę			
III	Case Studies     Design of Storage Tanks and Vessel	10	Develop	2.4
111	<u> </u>	10		2,4
	Supports <ul> <li>API &amp; Other Codes &amp;</li> </ul>		expertise in	
			both manual	
	<b>Description of Storage Tanks:</b>		and software-	
	Codes & Standards for Design of Storage Tenk – Layout of A PL 650		based	
	Storage Tank – Layout of API 650,		techniques.	
	Layout of API 620, Layout of API 653, Layout of - API 579, Layout		1	
	of UL 142; Description of Storage			
	Tank – Classification of Storage			
	Fluids and Storage Tanks, Layout			
	of Tank Farm & Criteria to Select			
	Tank Type, Tank Components,			
	Spills, Leaks, Prevention, Material			
	Selection, Tank Corrosion,			
	Corrosion Prevention Methods,			
	Seismic Analysis & Retrofitting of			
	Existing Tanks, Storage Tank			
	Erection			
	Design of Storage Tanks, Safety			
	& Other Important Aspects:			
	General Design of Storage Tank –			
	Design of Bottom Plate & Shell,			
	Wind Girder and Roof, Design of			
	Storage Tanks & Analysis –			
	Design of Open Roof Cylindrical			
	Tank, Fixed Conical Roof			
	Cylindrical Tank, Fixed Umbrella			
	Roof Cylindrical Tank, Floating			
	Roof Cylindrical Tank and			
	Stainless Steel Storage Tanks,			
	Mechanical Datasheet; Safety &			
	Other Important Aspects of Storage			
	Tanks – Tank Fire Protection, Tank			
	Emission, Settlement of Tank,			
	Storage Tank Farm Dyke, Flexible			
	Piping System for Roofs, Weld			
	Inspection & Testing			
	Design of Vessel Supports:			
	Introduction – Types of Supports			
	& their Description, Loads on			
	Supports; Design of Saddle			
	Support – Design Methodology;			
	Design of Lug Support – Design			
	Methodology; Design of Leg			
	Support – Design Methodology;			
	Design of Skirt Support – Design			
	Methodology			
	Case Studies			
IV	Design of ST Heat Exchangers, Reaction	10	Design storage	4,5
	Vessels, Agitators, DT & NTD		tanks in	
	Design of Shell & Tube Heat		compliance	
	Exchanger: TEMA Mechanical		with API	
	Standards for Class R C B –		standards,	
	Design Parameters, Corrosion		employing	
	Allowance, Service, Tube			
	Dimensions & Arrangement, Shell		advanced	

Design, Geometrical Shape, Orientation & Arrangement of Baffles & Support Plates, Floating Heads & Construction, Gaskets, Tube Sheet Design and Joints, Flexible Shell Elements, Channels, Covers & Bonnets; Design of Fixed Tubesheet Shell & Tube Heat Exchanger – Design Data, Design of Channel Shell, Cover Head, Main Shell, Tube, Tube Sheet, Nozzle, Flange Joint; Design of Floating Head Shell & Tube Sheet & Floating Head, Procedure Kellow Elements, Design Data, Design of Channel Shell, Cover Head, Main Shell, Tube, Tube Heat Exchanger – Design Data, Design of Channel Shell, Cover Head, Main Shell, Tube, Tube Sheet, Nozzle, Flange Joint; Data Sheet & Fabrication – Mechanical Datasheet for Fixed Tubesheet & Floating Head, Procedure Fabricationstress analysis methods using structural integrity and procedure Fabrication•Design of Reaction Vessels & Agitators: Reaction Vessels & Agitators, Determination of Power Consumption of Agitator, Design Methodology, Design of Agitation SystemSystem•Measurements, DT, NDT & Foundation Design for Static Equipment: Measurement, Advance Measurement Techniques, OpticalStress analysis	
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Foundation Design for Static         Equipment: Measurements –         Concepts of Measurement,         Advance Measurement	
Equipment: Measurements – Concepts of Measurement, Advance Measurement	
Concepts of Measurement, Advance Measurement	
Advance Measurement	
l echniques, Optical	
Measurements; Destructive Testing	
– Tensile, Bend, Impact, Hardness,	
Fatigue, Fracture Toughness,	
Corrosion & Creep Tests; Non	
Destructive Testing Test Test –	
Radiography, Ultrasonic, Magnetic	
Particle / Dye Penetrate, Eddy	
Current Tests; Foundation Design	
– Types, Description, Design and	
Anchorage; Design of Lifting Lug	
for Equipment	
Case Studies	
VDesign of Static Equipment using PV5Gain expertise2,5	
Elite Software in designing	
Design, Analysis & Evaluation of reaction	
Pressure Vessels using Software: vessels,	
Exploring Software Tool Bar;	
Design of vertical Pressure vessel	
- Input to Create Pressure Vessel, equipment	
Error Check & Analysis (ASME foundations,	
Section VIII Div 1, Div 2, PD while	

•	5500, EN 13445), 'Reports - Review & Generation' <b>Design, Analysis &amp; Evaluation of</b> <b>Heat Exchanger using Software:</b> Design of Fixed Tubesheet Shell & Tube Heat Exchanger - Horizontal Orientation; Design of Floating	conducting advanced stress analysis for saddle supports and nozzle	
	Head Shell & Tube Heat Exchanger - Horizontal Orientation <b>Design, Analysis &amp; Evaluation of</b> <b>Vessel Supports using Software:</b> Saddle Support – Input to Create Saddle Support, Error Check & Analysis, Reports - Review & Generation; Lug Support – Input to Create Lug Support, Error Check & Analysis, Reports - Review & Generation; Leg Support – Input to Create Leg Support, Error Check & Analysis, Reports - Review & Generation; Skirt Support – Input to Create Skirt Support, Error Check & Analysis, Reports - Review & Generation <b>Case Studies</b>	reinforcing pads using ANSYS.	

#### **Reference Books:**

- 1. Keith E. A., "Mechanical Design of Process Systems," Vol. I & II, Gulf Publishing Company, Houston, 1986
- Joshi M. V., "Process Equipment Design," The Macmillan Company of India Limited, Delhi, 1976
- 3. Gavin T., and Ray S., "Chemical Engineering Design," Elsevier, New York, 2008
- 4. Somnath C., "Pressure Vessels Design and Practice," CRC Press, 2005
- 5. Dennis M., "Pressure Vessel Design Manual," Elsevier, Burlington, MA, 2004
- 6. Subhash R. G., Design of Pressure Vessels," Taylor & Francis, CRC Press, 2021
- 7. James R. F. and Maan H. J. "Guide Book for the Design of ASME Section VIII Pressure Vessels," ASME Press, New York, 2001
- 8. Lloyd E. B., and Edwin H. Y., "Process Equipment Design,' John Wiley & Sons, Inc., 1959
- 9. "ASME BPVC Section VIII Division I & II," American Society of Mechanical Engineers, New York, 2019
- 10. "API 650: Welded Steel Tanks for Oil Storage," Americal Petroleum Institute, 2007
- 11. "API 620: Design and Construction of Large, Welded, Low-Pressure Storage Tanks," Americal Petroleum Institute, 2013

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	Demonstrate a comprehensive understanding of upstream, refinery, petrochemical, and fertilizer processes, and their associated equipment, enabling effective process analysis and optimization.	1,2, 3,4				
2	Apply mechanical design concepts to develop static equipment for various process requirements, ensuring functionality and safety in compliance with industry standards.	5, 6, 7				
3	Gain proficiency in manual and software	3,4,5				
4	Design storage tanks adhering to API standards, utilizing advanced stress analysis techniques with ANSYS software to ensure structural integrity and operational reliability.	1,2,3				
5	Develop expertise in designing reaction vessels, agitators, and equipment foundations while performing advanced stress analysis for saddle supports and nozzles with reinforcing pads using ANSYS.	1,2,3				

		SEMESTER –VII							
<b>Course Title</b>									
Course code		Total credits: 3	L	T	Р	S	R	O/F	С
	24BTME414R	Total hours: 45T	3	0	0	0	0	0	3
<b>Pre-requisite</b>	Nil	Co-requisite				Nil	[		
Programme	Bachel	or of Technology in Mec	hanic	al Ei	ngine	ering			
Semester	Fall/ 1	st semester of fourth year	r of tl	ie pr	ograi	mme			
Course		oncepts of statistics and da							
Objectives	2. Apply descriptive and	inferential statistical method	ods to	anal	yze d	ata.			
	3. Interpret statistical resu	lts and make data-driven	decisi	ons.					
	4. Utilize statistical software for data analysis.								
CO1	Summarize and visualize	Summarize and visualize data using descriptive statistics.							
CO2	Apply probability concep	ts to real-life scenarios							
CO3	Perform hypothesis tests								
<b>CO4</b>	Conduct simple linear reg								
CO5	Use statistical tools and s	oftware for data analysis.							
Unit-No.	Content				ntact [our		Learni Outcor	<u> </u>	BL
п	Introduction to Statistics:Definition and scope of statistics, Types of data and scales of measurement, Sampling methods and data collection techniques, Organizing data: tables and chartsDescriptive Statistics:				5		CO1		1,2
	Measures of central tendency: mean, median, mode, Measures of dispersion: range, variance, standard deviation, Data visualization: histograms, box plots, scatter plots				10		CO1		2,3
III	<b>Probability and Probability Distribution:</b> System integration and optimization, Case studies of hybrid systems Basic probability concepts, Probability rules and counting techniques, Discrete and continuous probability distributions, Binomial and normal distributions				10		CO2		3.4
IV	Inferential Statistics Sampling distributions, Central Limit Theorem, Estimation: confidence intervals for means and proportions				10		CO3		3,4
V	proportionsHypothesis Testing, Co-relation and RegressionAnalysisNull and alternative hypotheses, Type I and Type IIerrors, t-tests, chi-square tests, and ANOVA,Correlation coefficients and interpretation, Simplelinear regression: model building and analysis				10		CO5		3,4

### **Recommended Textbooks:**

- 1. Statistics for Business and Economics by Paul Newbold, William L. Carlson, Betty Thorne
- 2. Introduction to the Practice of Statistics by David S. Moore, George P. McCabe, Bruce Craig
- 3. Elementary Statistics by Mario F. Triola

#### **Additional Resources:**

- Online statistical tools and data repositories for hands-on practice.
- Supplementary readings from academic journals and case studies.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	Summarize and visualize data using descriptive statistics.	2&3				
2	Apply probability concepts to real-life scenarios	1,2&4				
3	Perform hypothesis tests and interpret results.	2,3				
4	Conduct simple linear regression analysis.	2&3				
5	Use statistical tools and software for data analysis.	2&3				

		SEMESTER -	- VIII								
Course T	itle	Total Qua	lity Ma	nagei	nent						
Course co	ode 24BTME421R	Total credits: 4	L	Т	P	S	R	O/F		С	
		Total hours: 60T	4	0	0	0	0	0		4	
Pre-requi	site Nil	Co-requisite				Ni					
Program	me	<b>Bachelor of T</b>	echnolo)	ogy in	n Mech	nanica	l Engi	neering			
Semeste	r	Fall/ VIII se	mester	of 4t	h year	of the	e progr	amme			
Course		understanding of total	· ·		•	-	ciples a	and proces	sses	s.	
Objectiv		understanding of TQN			chniqu	ies.					
		understanding of Qual									
CO1		asic components of to	-		-						
CO2		ality and the processe	s of con	tinuo	us imp	orovem	nent				
CO3	To summarize the c										
CO4		arious tools and techn	iques of	TQN	Λ						
CO5	To distinguish diffe	÷	<u> </u>	<u>,  </u>		T	• •		1 -	пт	
Unit-No.	Conte	nt	Contac			Learn	iing O	utcome		BL	
Ι	Introduction mod for	quality avalution of	Hour	•   To		dersta	nd 41	ne basio	+		
I	<b>Introduction</b> , need for quality; Definitions o		12					ie dasic il quality			
	quality and service qua		14		anager		51 1012	u quality			
	of TQM, TQM framewo			111	anagei	nem					
	Deming, Juran and C								1	1,2	
	TQM; Quality statemen	•								1,2	
	customer orientation										
	customer complaints,	,									
	costs to	,									
	quality.										
II	<b>TQM</b> principles; le	adership, strategic		To	o disc	uss ab	out qu	uality and	ł		
		Quality councils-	12				-	ontinuous			
	employee involvem	ent, motivation;		in	nprove	ment					
	Empowerment; Team	and Teamwork;									
	Quality circles, recogn	nition and reward,							2	2,3,	
	performance appraisal;	-								4	
	improvement; PDCE	•									
	Supplier partnership, I	Partnering, Supplier									
	rating &										
	selection.										
III	TQM tools and techn	-					the c	oncept of	ť		
	traditional tools of	1 97	12	S12	x sigm	a					
	management tools; Siz								1	5,6	
	•••	plications to									
	manufacturing, service s including IT, Bench										
	FMEA- stages, types.	marking process,									
IV	TQM tools and tech	niques II control			unde	rstand	the voi	rious tools			
1 V	charts, process capabili	-	12				of TQ		"		
	sigma, Quality Func	-	14			inques	. ur 1Q	TAT		1,2,	
	(QFD), Taguchi quality	-								1,2, 5,6	
	concepts, improvement									2,0	
	measures.	· , r ••••••••••									
V	Quality systems, need		12			1	. 1:66	erent ISC	+	1,2,	

9001-9008; Quality system elements, systems	3,4
documentation,; Quality auditing, QS 9000,	
ISO 14000- concepts, requirements and	
benefits; TQM implementation in	
manufacturing and service sectors.	

T1 Besterfield D.H. et al., Total qualityManagement, 3rd ed., Pearson Education Asia, 2006. T2 Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.

### **REFERENCE BOOKS:**

R1: Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	To understand the basic components of total quality	2,9,10				
1	management	2,3,10				
2	To discuss about quality and the processes of continuous	3680				
2	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		<b>Renewable Energy E</b>	ngine	ering					
Course code	24BTME422R	Total credits: 4	L	Т	P	S	R	O/F	C
		Total hours: 60T	4	0	0	0	0	0	4
Pre-requisite	Basic Electrical	Co-requisite				Ni	1		
	Engineering,								
	Thermodynamics								
Programme	Bachelor of Technology in Mechanical Engineering								
Semester	Fall/VIII semester of fourth year of the programme								
Course	1. Understand the fundamental concepts of renewable energy sources.								
Objectives	2. Analyze the working principles of various renewable energy technologies.						1.		
	<ol> <li>Design basic renewable energy systems considering efficiency and sustainabil</li> <li>Evaluate the environmental and economic impacts of renewable energy system</li> </ol>						-		
601			<u> </u>				energ	y systei	ms.
<u>CO1</u>	Explain the scientific principles behind renewable energy sources. Apply mathematical and engineering principles to design renewable energy systems								
<u>CO2</u>							ergy	system	S
<u>CO3</u>	Assess the feasibility and						1. 1 .		
CO4	Discuss the environmenta		- <b>^</b>			-			
Unit-No.	Co	ntent		Cont Hot			Learı Dutco		BL
Ι	Introduction to Renewa	hle Fnergy and Fnergy		101	11		Juic	JIIIC	
1	Fundamentals:	able Ellergy and Ellergy	y						
	Energy demand and supply trends, Importance of						CO	1	1,2
	renewable energy, Energy units and conversions,						00	1	1,2,
	Thermodynamics and en								
II	Renwable Energy Tech								
	<ul> <li>Solar Energy:</li> <li>Solar radiation principles, Photovoltaic (PV)</li> <li>systems, Solar thermal energy and applications</li> <li>Wind Energy:</li> <li>Wind energy principles, Wind turbine design and</li> <li>operation, Site selection and resource assessment</li> <li>Hydropwer:</li> <li>Types of hydropower systems, Design of small-scale hydro plants, Environmental impacts</li> <li>Biomass Energy:</li> <li>Biomass resources and conversion technologies,</li> <li>Biofuels production and applications</li> <li>Geothermal Energy:</li> <li>Geothermal resources and extraction methods,</li> <li>Power generation and direct-use applications</li> <li>Ocean Energy:</li> <li>Tidal, wave, and ocean thermal energy conversion,</li> <li>Technology and deployment challenges</li> </ul>						СО	1	2,3
III	Hybrid Renewable Ene System integration and o of hybrid systems	rgy Systems	s	12			CO2		2, 3,4,
IV	Battery technologies and	<b>Energy Storage and Smart Grids</b> Battery technologies and energy storage solutions, cole of smart grids in renewable energy integration			12 CC			03	4.5
V	Policy, Economics, and Future Trends Renewable energy policies and incentives, Economic analysis and sustainability assessment, Emerging technologies and future perspectives						CO	94	2.3

### **Recommended Textbooks:**

- 1. Renewable Energy: Power for a Sustainable Future by Godfrey Boyle
- 2. Fundamentals of Renewable Energy Processes by Aldo V. da Rosa
- 3. Solar Engineering of Thermal Processes by John A. Duffie and William A. Beckman

## **Additional Resources:**

- Research papers, case studies, and government reports on renewable energy advancements.
- Software tools for system design and simulation (e.g., HOMER, RETScreen)

	CO PO Mapping					
SN	Course Outcome (CO)	Mapped Program Outcome				
1	Explain the scientific principles behind renewable energy sources.	1,2, 3,4				
2	Apply mathematical and engineering principles to design renewable energy systems	5, 6, 7				
3	Assess the feasibility and performance of renewable energy projects.	3,4,5				
4	Discuss the environmental, economic, and social implications of renewable energy.	1,2,3				