SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

8th UG - Board of Studies Meeting in the department of
Civil Engineering

for the programme
B.Tech – Civil Engineering

Venue
Seminar Hall
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

04.09.2024 at 03.00 pm

AGENDA OF THE MEETING

Item No. 1 : BoS / UG / CIVIL 8 .1

Welcome Address by BoS Chairperson.

Item No. 2 : BoS / UG / CIVIL 8 .2

Review and confirm of 7th BoS Minutes of Meeting.

Item No. 3 : BoS / UG / CIVIL 8 .3

To apprise on the curriculum structure of Regulation 2023 for I to IV Semesters.

Item No. 04 : BoS / UG / CIVIL 8 .4

To discuss and approve the R2023 curriculum and syllabi for V & VI Semester under Regulation 2023 for B.Tech. Civil Engineering.

Item No. 05 : BoS / UG / CIVIL 8 .5

To discuss and approve on the Curriculum and syllabus related to award of Honours/Minors Degree under Regulation 2023.

Item No. 06 : BoS / UG / CIVIL 8 .6

To apprise and approve the following chosen Elective Courses,

i) Professional Elective courses for V & VII Semester under Regulation 2020 for the batches 2022 – 2026 and 2021-2025

ii) Open Elective courses for V & VII Semester under Regulation 2020 for the batches 2022 – 2026 and 2021-2025.

Item No. 07 : BoS / UG / CIVIL 8 .7

To apprise and approve on the following chosen Employability Enhancement Courses, mandatory course and Certificate course

i) Skill Enhancement courses for III semester under Regulation 2023 for batch 2023 - 2027 and Skill Development courses for V semester under Regulation 2020 for the batches 2022 -2026.

ii) Mandatory Courses for III semesters under regulation 2023, and mandatory courses for V & VII semesters under regulation 2020

iii) Certificate courses for III Semester under Regulation 2023 for the Batch 2023-2027 and for V semester under Regulation 2020 for the batch 2022-2026.

iv) NPTEL / MOOC & online certification courses of batches 2023 – 2027 and 2022-2026.

Item No. 08 : BoS / UG / CIVIL 8 .8

To apprise and approve the Academic Calendar for odd Semester 2024 - 2025

i) Quality Circle Meeting (QCM)

ii) Continuous Assessment Test (CAT)

iii) Model Exam and End Semester Examination

iv) Redo / Discontinue students.

ITEM No.9 : BoS / UG/ CIVIL 8.9

To apprise and approve the End Semester Examinations July 2024 Results and Graduation details of the batch 2020-2024 students under Regulation 2020.

Item No. 10 : BoS / UG / CIVIL 8 .10

To apprise and approve the Industry Institute Interaction

i) Guest Lecture/Seminar/ Workshop

ii) Industrial Visit

iii) Internship

iv) Value Added Courses

v) Student Achievements

Item No. 11 : BoS / UG / CIVIL 8 .11

To apprise the members on the training activities conducted for Placement for the batch 2021-2025.

Item No. 12 : BoS/ UG / CIVIL 8.12

To apprise and approve the Department Research activities

i) Publications

ii) Ph.D Full time/ Part time program progress

Item No. 13: BoS / UG / CIVIL 8 .13

To discuss and approve the panel of examiners

Item No. 14: BoS / UG / CIVIL 8 .14

Any other item with the permission of chair

Dr.S.Sundararaman

Chairperson - BoS

Minutes of the Meeting

Dr. S.Sundararaman, Chairperson, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for valuable presence in this 8th Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairperson.

<table>
<tr><td>Item No. 1: BoS / UG / CIVIL 8.1</td><td>The Chairperson declared the meeting open and welcomed all the members. He highlighted on the group of colleges in SMVE Trust with the names of Management Representatives & Director cum Principal. The Vision and Mission Statement of the Institution and the Department was also apprised to all the members present in the meeting.</td></tr>
<tr><td>Item No. 2 : BoS / UG / CIVIL 8.2</td><td>Chairperson BoS, apprised the minutes of 7th BoS, its implementation and then it is confirmed with the approval for the incorporation of minor revisions needed as mentioned below.
<table>
<tr><th>S.No</th><th>Suggestions</th><th>Action Taken</th></tr>
<tr><td>1</td><td>Suggestion given not to use course titles with Part I and II such as Mechanics of solids-I & II, Geotechnical Engineering – I & II.</td><td>As the mechanics of solids - I course was already approved in the 6th BoS and the End Semester was completed and grade sheets were issued the continuation of the course namely Mechanics of solids – II is retained.
However courses Geotechnical I and II are renamed as soil mechanics and Foundation Engineering respectively.</td></tr>
<tr><td>2</td><td>To include Artificial Intelligence and Data analytics in the higher semester of the existing civil Engineering courses.</td><td>As suggested, for the regulation 2020 of batch 2021-2025 the open elective “IoT and its applications” was chosen by the students. For the batch of regulation 2023 in the higher semesters, Open elective such as Essentials of Data Science, Principle of Artificial Intelligence and Machine Learning, Artificial Intelligence, Data Science using Python, Data Science Application of NLP, Artificial Intelligence applications are offered from IV to VII Semesters.</td></tr>
<tr><td>3</td><td>Project work alone can be in the Eight semester rather than 3 Theory courses and a Project work. This will make the final year students to for internship program or employment opportunity.</td><td>It was decided to have 3 theory courses along with a project in the 8th semester for all the undergraduate courses in the institution. However, there is a plan to complete the syllabus as per the allotted hours and permit the students for internship and project works.</td></tr>
<tr><td>4</td><td>Suggested that instead of having a separate course for computer-oriented programs</td><td>It was decided to have common computer oriented courses for all Undergraduate programs, so that students can have a</td></tr>
</table></td></tr>
</table>

		there can be a course with a title "Program for Problem solving" which can have the python and C Programming	chance to incorporate the coding skills in their respective domains.
	5	Course on Research methodology is not needed and insisted to have a core course in VI semester	In order to instill and enhance the creativity and innovation amongst the students, there is a course on Design thinking and idea lab in first semester. Also, the micro and mini projects in V and VII Semester will be an added advantage for making the idea to product. The course Research Methodology will help the students to have an in depth attraction towards innovation and hence retained.
	6	Change of title in the internship course floated in the 7th semester to Community Connect so as to serve the community as a Civil Engineering profession.	A common course title of Internship has been retained so as to serve the purpose of both technology as well as community connect.
	7	Building Material and Construction can be renamed as Building Materials inbuilt Environment	This course was approved in the 6th BoS meeting and students have already completed their end semester examination. Hence renaming of this course will be done in the next regulation.
	8	Renaming the course of Construction Management in 7th semester to Construction Technology and Management so that student can have the knowledge on technology as well management techniques.	The course is renamed to Construction Techniques and Management and the syllabus will be placed before the members in the 9th BoS Meeting.
	9	Building Information Modeling is one of the emerging technologies and more job opportunities are flourishing the same can be incorporated in International Certificate Course	As the International Certification courses are handled by third party, it is insisted to see the feasibility of including Building Information Modeling course. The work is in progress for approval.
	(The details of suggestion and action taken of the meetings is attached in Annexure I)		
Item No.3: BoS / UG / CIVIL 8.3	Chairperson BoS, Apprised on the Regulations and curriculum structure of Regulation 2023 for I to IV Semesters. **(The details of R23, Curriculum I to IV Semesters is attached in Annexure II).**		

<table>
<tr><td>Item No. 4:
BoS / UG / CIVIL 8.4</td><td>Discussed and approved the R2023 Regulation, curriculum and syllabi for V & VI Semester under Regulation 2023 for B.Tech. Civil Engineering.
(The details related to Curriculum and Syllabus for V & VI Semesters of Regulation 2023 is attached in Annexure III).</td></tr>
<tr><td>Item No. 5:
BoS / UG / CIVIL 8.5</td><td>Discussed and approved on the Curriculum and syllabus related to award of Honours/ Minors degree under Regulation 2023.
(The details of syllabus related to award of Honours/Minors Degree under Regulation 2023 is attached in Annexure IV).</td></tr>
<tr><td>Item No. 6:
BoS / UG / CIVIL 8.6</td><td>The board Chairperson apprised the following chosen Elective Courses and the same were approved by the BoS Members.
I. Professional Elective courses for V & VII Semester under Regulation 2020 for the batches 2022 – 2026 and 2021-2025
II. Open Elective courses for V & VII Semester under Regulation 2020 for the batches 2022 – 2026 and 2021-2025.
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<table>
<tr><th>S.No</th><th>Regulation</th><th>Sem</th><th>Batch</th><th>Category</th><th>Course code</th><th>Course Name</th></tr>
<tr><td>1</td><td>2020</td><td>V</td><td>2022-2026</td><td>Professional Elective</td><td>U20CEE506</td><td>Ground Improvement Techniques</td></tr>
<tr><td>2</td><td>2020</td><td>VII</td><td>2021 - 2025</td><td>Professional Elective</td><td>U20CEE716</td><td>Site Investigation Methods and Practices</td></tr>
<tr><td>3</td><td>2020</td><td>V</td><td>2022 - 2026</td><td>Open Elective</td><td>U20HSO504</td><td>Project Management for Engineers</td></tr>
<tr><td>4</td><td>2020</td><td>VII</td><td>2021-2025</td><td>Open Elective</td><td>U20ECO705</td><td>IoT and its Applications</td></tr>
</table>
(The list of professional & open elective courses and syllabi for the chosen course has been attached in Annexure V).</td></tr>
</table>

Item No. 7: BoS / UG / CIVIL 8.7

Discussed and approved the following chosen Skill Development Courses & Certification Course for B.Tech. Civil Engineering program.

I. Skill Enhancement courses for III Semester under Regulation 2023 for Batch 2023 - 2027 and Skill Development Courses for V semester under Regulation 2020 for the Batch 2022 -2026.

II. Mandatory Courses for III Semester under Regulation 2023, and Mandatory courses for V & VII Semesters under Regulation 2020.

III. Certificate courses for III Semester under Regulation 2023 for the Batch 2023-2027 and for V Semester under Regulation 2020 for the Batch 2022-2026.

S.No	Regulation	Sem	Batch	Category	Course code	Course Name
1	2023	III	2023 - 2027	Skill Development Course	U23CES301	Basic Vasthu
2	2020	V	2022 - 2026	Skill Development Course	U20CES504	Career and professional Skill Development program 1
3	2020	V	2022 - 2026	Skill Development Course	U20CES505	Presentation Skills Using ICT
4	2023	III	2023- 2027	Chosen Mandatory Courses	U23CEM303	Climate Change
5	2020	V	2022- 2026	Chosen Mandatory Courses	U20CEM505	Indian Constitution
6	2020	VII	2022- 2025	Chosen Mandatory Courses	U20CEM707	Professional Ethics
7	2023	III	2023 - 2027	Certification Course	U23CEC360	Total Station
8	2020	V	2022 - 2026	Certification Course	U20CEC585	STAAD PRO V8i

Discussed and approved the B.Tech. degree NPTEL / MOOC & online certification courses of Batches 2023 – 2027 and 2022-2026.

(The list of Skill Development Courses and syllabi for the chosen course, list of Certification Course and List of NPTEL / MOOC has been attached in Annexure VI)

Item No. 8 : BoS / UG / CIVIL 8.8

Discussed and approved the B.Tech. Degree Academic Calendar for Odd Semester 2024 -2025. The board Chairperson apprised on the schedule for Quality Circle Meeting (QCM), Continuous Assessment Test (CAT), Model Exam and End Semester Examination before the committee. The Redo & Discontinue students' details also apprised to the members.

a) Quality Circle Meeting (QCM)

QCM / Year	II Year	III Year	IV Year
QCM – 1	22.08.2024	22.08.2024	22.08.2024
QCM – 2	25.09.2024	25.09.2024	25.09.2024
QCM - 3	18.10.2024	18.10.2024	18.10.2024

b) Continuous Assessment Test (CAT)

CAT/Year	II Year	III Year	IV Year
CAT – 1	26.08.2024	26.08.2024	26.08.2024
CAT - 2	27.09.2024	27.09.2024	27.09.2024

c) Model Exam and End Semester Examination

Particulars	II Year	III Year	IV Year
Model Exam	21.10.2024	21.10.2024	21.10.2024
Model Practical	28.10.2024	28.10.2024	28.10.2024
End Semester Practical Exam	04.11.2024	04.11.2024	04.11.2024
End Semester Exam	11.11.2024	11.11.2024	11.11.2024

d) Redo / Discontinue students

S.No	Name of the Student	Reg. No	Year/Sem	Category
Nil				

Item No. 9 : BoS / UG / CIVIL 8.9

Discussed and approved the End Semester Examinations July 2024 Results and Graduation details of the batch 2020-2024 students under regulation 2020.

Batch	Year/Semester	No. of Student Appeared	No. of Student Passed	Pass percentage (%)
Regulation 2023				
2023-2027	I / II	26	13	50.00
Regulation 2020				
2022-2026	II / IV	12	06	50.00
2021-2025	III / VI	29	23	79.31
2020-2024	IV / VIII	39	37	98.68

Batch	No. of Student	First Class with Distinction	First Class	Second Class	Not yet to be clear	Graduated percentage (%)
Regulation 2020						
2020-2024	39	07	27	01	03	35/39 = 89.7%

Item No. 10: BoS / UG / CIVIL 8.10

The board Chairperson apprised the members that 08 Guest Lecture/Seminar/ Workshop & 3 value added course have been organized to all the students and understand the latest technology in the field of civil engineering.

Apart from this, the student's underwent Internship from 29 different companies and 6 Industrial Visits were arranged.

Item No. 11 : BoS / UG / CIVIL 8.11

The board Chairperson apprised the members on the training activities conducted for Placement for the batch 2021-2025.

S.No	Name of the Company	Training Program	No.of Students Attended	Date
1	Innate Talent Next	Aptitude	24	03.06.2024 to 14.06.2024
2	Consensus	C Program	24	22.07.2024 to 01.08.2024
3	Face Academy	Aptitude / Verbal / Reasoning	24	02.09.2024 to till now
4	Innate Talent Next	Aptitude	24	02.09.2024 to till now

Item No.12 : BoS / UG / CIVIL 8.12

a) Board Chairperson apprised the members that the faculty & students have published 15 papers in international conferences & journals for the academic year 2023 – 2024.

b) Discussed and approved on the details of the Ph.D. registered candidates and presented their progress of the research activities carried out so far.

Item No.13 : BoS / UG / CIVIL 8.13

The revised list of question paper setters and Evaluators (given in **Annexure VII)** was presented and recommended by the BoS members to the Academic Council.

Item No. 14 : BoS / UG / CIVIL 8.14	• Members suggested that for the course Design of Steel Structures, Unit - I can be split into 2 units namely bolted and welded connections, Unit- III can have the tension members and the IV and V unit can be with compression members and design of beams respectively. • In the panel of Examiner list the criteria for selection of examiners can alone be presented instead of the specialization and college/ University Name. • It is also suggested by industrial expert to Incorporate Building Services Engineering as one of the core paper or elective paper which will be of more important for students getting jobs in future.

The Meeting was concluded with vote of thanks by Dr.S.Sundararaman, Head of the Department, Department of Civil Engineering.

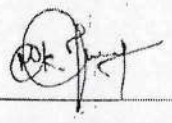
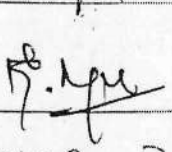
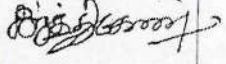
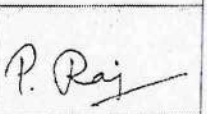
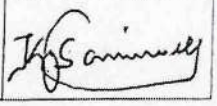
Dr. S.Sundararaman

Chairperson - BoS

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

Sl.No	Name of the Member with Designation and official Address	Members as per UGC norms	Signature
1	Dr. S.Sundararaman Professor and Head Department of Civil Engineering, SMVEC, Madagadipet – 605107.	Chairman	
2	Dr.K.Baskar Professor, National Institute of Technology, Tiruchirappalli	Subject Expert (Pondicherry University Nominee)	
3	Dr. P. T. Ravichandran Professor & Head, Department of Civil Engineering, Faculty of Engineering and Technology, SRM Institute of Science and Technology, Kattankulathur	Subject Expert (Academic Council Nominee)	
4	Dr. A. Latha Professor Department of Civil Engineering Panimalar Engineering College Chennai.	Subject Expert (Academic Council Nominee)	
5	Dr. K. Srinivasamoorthy, Professor, Department of Earth Science, Pondicherry University, Puducherry – 605014	Subject Expert (Academic Council Nominee)	
6	Dr. S. Virapan Chairman & Managing Director Sanvir Associates Chennai	Industry Representative	
7	Er. K.Surya, (Alumni) Er. Surya Civil Engineering & Contractor Pudhucherry.	Alumni	
8	Dr.S.Jayakumar Controller of Examinations Professor in Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
9	Mr.J.Subash Chandra Boss Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
10	Mrs.A.Kalyani Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
11	Mr.C.Raj Govind Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
12	Mr.K.Srinivasan Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
13	Mrs.S.Banupriya Assistant Professor Department of Civil Engineering SMVEC, Madagadipet – 605107	Internal Members	

14	Mr.S.Sivaprasath Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
15	Ms.G.Yamuna Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
16	Mrs.K.Nivedita Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
17	Mrs.D.Sathiyasree Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
18	Mr.G.Senthilraj Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
19	Ms.B.Pallavi Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
20	Mr.R.Badhrinadhan Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
21	Mrs.S.Sinthanagorky Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
22	Mr.S.Tiroumalai Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
23	Mrs.V.Sivasankari Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
24	Mr.G.Anandhanarayanan Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
25	Mr.S.Manikandan Assistant Professor Department of Civil Engineering SMVEC, Madagadipet – 605107	Internal Members	
26	Mr.V.Murugappan Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
27	Ms.J.Jayapriya Assistant Professor SMVEC, Madagadipet – 605107	Internal Members	

28	Mr.MCK.Jamenraja Assistant Professor Department of Civil Engineering SMVEC, Madagadipet - 605107	Internal Members	
29	Mr. K. Raja Associate Professor Department of Mathematcis SMVEC, Madagadipet - 605107	Internal Members	
30	Dr.K.Kathikeyan Associate Professor Department of Chemistry SMVEC, Madagadipet - 605107	Internal Members	
31	Dr.P.Rajeswari Associate Professor Department of English SMVEC, Madagadipet - 605107	Internal Members	
32	Dr. K. Samuel Assistant Professor Department of Physics SMVEC, Madagadipet - 605107	Internal Members	

ANNEXURE I

Department	Civil Engineering	Programme : B.Tech.						
Semester	III	Course Category Code: PC			End Semester Exam Type: TE			
Course Code	U23CET305	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Mechanics of Solids II	3	0	0	3	25	75	100

Prerequisite	Mechanics of Solids I	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Determine the deflection of various types of beams	K3
	CO2 Calculate the strain energy for materials.	K3
	CO3 Analyse the indeterminate structures and draw the shear force and bending moment diagrams for continuous beam.	K3
	CO4 Determine the deflection of trusses and frames.	K3
	CO5 Discuss the theories of failure and also to find the unsymmetrical bending and shear centre of the sections.	K3

UNIT- I	DEFLECTION OF BEAMS	Periods: 09
Slope and Deflection – Deflection of cantilever and simply supported beams – Macaulay's method and conjugate beam method.		CO1
UNIT- II	**ENERGY PRINCIPLES**	**Periods: 09**
Strain energy due to application of gradual, sudden and impact load- Principle of virtual displacement- Castigliano's theorem – Simply supported beam		CO2
UNIT - III	**INDETERMINATE BEAMS**	**Periods: 09**
Introduction – Degree of static indeterminacy for beams and frames. Theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.		CO3
UNIT - IV	**DEFLECTION OF TRUSSES AND FRAMES**	**Periods: 09**
Introduction – Deflection of Trusses – Simply supported and Cantilever - Deflection of Frames - Simply supported and Cantilever – Unit load method/ Strain energy method		CO4
UNIT - V	**THEORIES OF FAILURE AND UNSYMMETRICAL BENDING**	**Periods: 09**
Various theories of failure – Unsymmetrical bending of beams – 'L' and 'T' sections. Shear centre – Channel and I sections		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1.R.K.Bansal, "A Text Book of Strength of materials", Laxmi Publications, Sixth Edition, 2018.

2.R.K.Rajput, "Strength of materials", S. Chand publishers, 7th edition, 2018

3.R. S. Khurmi, "Strength of Materials", S. Chand and Company Ltd, New Delhi, 26th Edition, 2019.

Reference Books

1. Ramamrutham, S., "Strength of Materials", DhanpatRaiand Sons, 18th Edition, 2014

2. V.N. Vazirani, M.M.Ratwani, "Analysis of Structures, Vol-1", Khanna Publishers, New Delhi, 2015.

3. Bhavikatti S S, "Structural Analysis II", Vikas Publishing House Pvt. Ltd, New Delhi, 4rd Edition, 2013

4. Subramanian R. "Strength of materials", 3rd Edition, Oxford University Press, New Delhi, 2016.

5. Dr. R. P. Rathaliya," Mechanics of Solids"AtulPrakashan, 2018.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
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Sri Manakula Vinayagar Engg. College
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Department of Civil Engineering

Web References	
1.	https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l15.pdf
2.	https://www.youtube.com/watch?v=uMuFpT1gFVI
3.	https://youtu.be/6CLEWA2WNqM
4.	https://nptel.ac.in/content/storage2/courses/105101085/downloads/lec-24.pdf
5.	https://nptel.ac.in/content/storage2/courses/105105109/pdf/m2l12.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
2	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
3	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
4	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
5	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PC			End Semester Exam Type: TE			
Course Code	U23CET406	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Soil Mechanics	3	0	0	3	25	75	100
Prerequisite	Nil							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Classify the soil and assess the Engineering Properties, based on index properties	K3
CO2	Assess the soil hydraulics and geostatic stress	K3
CO3	Understand the compressibility of soil under consolidation and compaction	K3
CO4	Understand the concept shear strength of cohesive and cohensionless soil.	K3
CO5	Analyze the stability of slopes using different methods	K3

UNIT – I	IDENTIFICATION AND CLASSIFICATION OF SOILS	Periods:09	
Formation of soil - Basic definition and phase relationship - Index properties (Determination of moisture content, specific gravity and voids ratio , grain size analysis , Atterberg limits) - classification of soil- Bureau of Indian Standards classification system – Unified classification system - soil deposits in India.			CO1
UNIT – II	**PERMEABILITY AND SEEPAGE IN SOILS**	**Periods:09**	
Soil hydraulics : Soil water – capillary - Permeability - field and laboratory test - one dimensional flow, Seepage through soils – two - dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force; Principle of geostatic stress - neutral and effective stress and quicksand condition.			CO2
UNIT – III	**CONSOLIDATION AND COMPACTION**	**Periods:09**	
Compressibility : Terzaghi's one dimensional consolidation theory - consolidation process – Computation of rate of settlement. - √t and log t methods– e-log p relationship – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction. Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point load, Line load and UDL) Use of New marks influence chart.			CO3
UNIT – IV	**SHEAR STRENGTH**	**Periods:09**	
Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Cyclic mobility – Liquefaction.			CO4
UNIT – V	**SLOPE STABILITY**	**Periods:09**	
Introduction- slopes failure - stability of infinite slope – landslides-Finite slope analysis - Bishop's method - Swedish circle method – stability number-Slope stability – improving slope stability by reinforcement and confinement			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, (2017).
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
4. Purushothama Raj. P.,"Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013.
5. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005

Reference Books

1. Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
3. Modi P N, "Soil Mechanics and Foundation Engineering", Standard Book House, New Delhi, 2010.
4. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
5. B. J. Kasmalkar" Foundation Engineering", Pune VidyarthiGrihaPrakashan, McGraw- Hill Book Company.

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1. https://nptel.ac.in/courses/105101201/
2. https://nptel.ac.in/courses/105103097/
3. http://ascelibrary.org/page/books/s-gsp.
4. http://nptel.ac.in/courses/105101084/
5. http://nptel.ac.in/courses/105106142/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
5	2	2	1	-	-	-	1	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: PC			End Semester Exam Type: TE			
Course Code	U23CET508	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Foundation Engineering	3	0	0	3	25	75	100
Prerequisite	Geotechnical Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Analyze the method of soil exploration and sampling.	K3
CO2	Get knowledge on bearing capacity and testing methods.	K3
CO3	Select the type of foundation required for the soil at a place and able to design different types of foundation.	K3
CO4	Determine the load carrying capacity of pile foundation.	K3
CO5	Gain knowledge about retaining structures and Stability analysis.	K3

UNIT – I	SOIL EXPLORATION	Periods:12
Site investigation – Soil exploration methods- Hand augers and power drills- Wash boring - samplers-sampling method - Spacing and depth of bore holes - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test- Subsurface soundings - Geo physical method - Preparation of soil investigation Report.		CO1
UNIT – II	**SHALLOW FOUNDATION**	**Periods:12**
Classification of foundation- Types and selection criteria-- Methods to determine bearing capacity- Methods to increase BC-Terzaghi Analysis-Codal provision-Factors affecting bearing capacity -Settlement of foundations on granular and clay deposits- Seismic considerations in bearing capacity evaluation.		CO2
UNIT – III	**FOOTINGS AND RAFTS**	**Periods:12**
Types of Isolated footing-Combined footing- Mat foundation-Codal provision– Contact pressure and settlement distribution -Proportioning of foundation–design of foundation.		CO3
UNIT – IV	**DEEP FOUNDATION**	**Periods:12**
Pile foundations Introduction- classification-selection criteria- Individual and grouppile carrying capacity- static and dynamic approach-pile load tests- under reamed piles-IS Codal provisions. Methods to increase pile carrying capacity – Deep compaction methods – Grouting.		CO4
UNIT – V	**RETAINING WALLS**	**Periods:12**
Active and passive states –Definitions, Rankine's theory – Cohesion less and cohesive soil – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Stability analysis of retaining walls – Codal provisions.		CO5

Lecture Periods: 45	Tutorial Periods: 15	Practical Periods: -	Total Periods: 60

Text Books

1. Punmia B.C,"Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2017.
2. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005
3. Purushothama Raj. P."Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013

Reference Books

1. Venkatramaiah.C.,"Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Modi P N, "Soil Mechanics and Foundation Engineering", second Edition Standard Book House, New Delhi, 2017.
3. Coduto,D.P."Geotechnical Engineering Principles and Practices",Prentice Hall of India Private Limited, New Delhi,2002.
4. Michael A. Joyce "Site Investigation Practice", E. & F.N. Spon, 1982
5. Murthy,V.N.S."Textbook of Soil Mechanics and Foundation engineering",CBS Publishers Distribution Ltd., New Delhi. 2014.

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1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105105176/
3. https://nptel.ac.in/courses/105/105/105105039/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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ANNEXURE II

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

CIVIL ENGINEERING

ACADEMIC REGULATIONS 2023
(R - 2023)

CURRICULUM

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

MI: Quality Education

To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship

To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

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DEPARTMENT VISION AND MISSION

Vision

We envision a world where the civil engineering department will be a home to an intellectual community with good quality education embedded with practical knowledge by inculcating research, strong social commitment and ethical values from its students, staffs and alumni.

Mission

M1: Quality Education

To fulfill the requirements of construction industry, Civil Engineering profession and rural community through dissemination of technical services.

M2: Practical Knowledge

To impart quality and real-time education to the students with the knowledge & skills needed for Civil Engineering practice

M3: Work Efficiency

To encourage research, development and consultancy through sustained interaction with industry & research organization.

M4: Societal issues

To develop graduates to compete at the global level to deal with modern issues.

M5: Moral & Ethical

To insist ethical values and professionalism among the students.

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PROGRAMME OUTCOMES (POs)

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, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

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

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Fundamental Knowledge

To gain a thorough fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities for a civil engineering career.

PEO2: Knowledge and Skills

To establish the knowledge and skills necessary for identifying and assessing design alternatives and the related social, economic, environmental, and public safety impacts.

PEO 3: Societal Implications

To develop the ability to deal effectively with ethical and professional issues, taking into account the broader societal implications of civil engineering

PEO 4: Competent Professionals

To create competent professionals who are trained in the design and development of Civil Engineering systems to engulf research and development activities

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Practical Knowledge

Inculcating practical knowledge in planning, analysis, design and construction management without much exploiting natural resources.

PSO 2: Critical Thinking

Imparting effective communicational skills, leadership attributes towards the team work and developing critical thinking abilities to find solutions for civil engineering problems of multi-disciplinary nature.

PSO 3: Challenging Employment

Ability to take up any challenging employment, entrepreneurship, research and development for sustainable civil society as a civil engineering graduate.

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STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	15
2	Basic Science Courses (BS)	20
3	Engineering Science including workshop, drawing, basics of electrical / mechanical / computer etc. (ES)	28
4	Professional Core Courses (PC)	66
5	Professional Electives Courses (PE)	18
6	Open Electives Courses (OE)	9
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	0
9	Mandatory Courses (MC*)	0
Total		**169**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science (HS)	3	5	1	1	2	-	-	3	15
2	Basic Sciences(BS)	7	4	5	4	-	-	-	-	20
3	Engineering Sciences (ES)	11	5	4	4	4	-	-	-	28
4	Professional Core (PC)	1	7	13	10	8	15	12	-	66
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	-	3	3	3	-	9
7	Project Work (PA)	-	-	-	-	1	1	2	8	12
8	Internship (PA)	-	-	-	-	-	-	1	-	1
9	Ability Enhancement Courses (AEC*)	-	-	-	-	-	-	-	-	0
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	0
Total		22	21	23	22	21	22	21	17	169

**** AEC and MC are not included for CGPA calculation***

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SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics - I	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23ESTC01	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
4	U23ESTC02	Engineering Mechanics	ES	2	1	0	3	25	75	100
5	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ENBC01	Communicative English I	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
9	U23CEP101	Civil Engineering Practice Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC1XX	Certification Course – I**	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CEM101	Induction Programme	MC	2 Weeks			-	-	-	-
							22	425	575	1000

***** Certification courses are to be selected from the list given in Annexure III***

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SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics - II	BS	3	1	0	4	25	75	100
2	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
3	U23CET201	Mechanics of Solids - I	PC	2	1	0	3	25	75	100
4	U23CET202	Building Materials and Construction	PC	2	1	0	3	25	75	100
5	U23HSTC01	Universal Human Value II	HS	2	0	0	2	25	75	100
Theory cum Practical										
6	U23ENBC02	Communicative English II	HS	2	0	2	3	50	50	100
Practical										
7	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
9	U23CEP202	Strength of Materials Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC2XX	Certification Course – II	AEC	0	0	4	0	100	-	100
Mandatory Course										
11	U23CEM202	Sports Yoga and NSS	MC	0	0	2	0	100	-	100
							21	525	575	1100

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SEMESTER – III											
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory											
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
3	U23CET303	Fluid Mechanics and Machinery	PC	3	0	0	3	25	75	100
4	U23CET304	Construction Technique, Equipment and Practices	PC	3	0	0	3	25	75	100
5	U23CET305	Mechanics of Solids - II	PC	3	0	0	3	25	75	100
Theory cum Practical											
6	U23CEB301	Surveying and Geomatics	PC	2	0	2	3	50	50	100
Practical											
7	U23ENPC01	General Proficiency I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
10	U23CEP303	Fluid Mechanics and Machines Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course											
11	U23CEC3XX	Certification Course – III	AEC	0	0	4	0	100	-	100
12	U23CES301	Skill Enhancement Course - I*	SEC	0	0	2	0	100	-	100
Mandatory Course											
13	U23CEM303	Climate Change	MC	2	0	0	0	100	-	100
Total							23	675	625	1300

**** Skill Enhancement Courses are to be selected from the list given in Annexure IV***

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SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC04	Numerical Methods and Optimization	BS	3	1	0	4	25	75	100
2	U23CSTC03	Data Structures	ES	3	0	0	3	25	75	100
3	U23CET406	Soil Mechanics	PC	3	0	0	3	25	75	100
4	U23CET407	Design of RC Elements	PC	3	0	0	3	25	75	100
5	U23CEE4XX	Professional Elective - I#	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23CEB402	Concrete Technology	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency II	HS	0	0	2	1	50	50	100
8	U23CSPC02	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U23CEP404	Geotechnical Engineering Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC4XX	Certification Course – IV**	AEC	0	0	4	0	100	-	100
12	U23CES402	Skill Enhancement Course - II*	SEC	0	0	2	0	100	-	100
Mandatory Course										
13	U23CEM404	Right to Information and Good Governance	MC	2	0	0	0	100	-	100
Total							22	625	575	1200

 # Professional Electives are to be selected from the list given in Annexure I

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SEMESTER – V										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
3	U23CET508	Foundation Engineering	PC	3	0	0	3	25	75	100
4	U23CET509	Water supply and Wastewater Engineering	PC	3	0	0	3	25	75	100
5	U23CEE5XX	Professional Elective - II#	PE	3	0	0	3	25	75	100
6	U23XXO5XX	Open Elective – I$	OE	3	0	0	3	25	75	100
Practical										
7	U23ITPC02	Programming In Java Laboratory	ES	0	0	2	1	50	50	100
8	U23CEP505	Water and Wastewater Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U23CEP506	REVIT Architecture Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC5XX	Certification Course – V	AEC	0	0	4	0	100	-	100
Project Work										
11	U23CEW501	Micro Project	PA	0	0	2	1	100	-	100
Mandatory Course										
12	U23CEM505	Essence of Indian Traditional Knowledge	MC	2	0	0	0	100	-	100
Total							21	600	600	1200

$Open electives are to be selected from the list given in Annexure II

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SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CET610	Design of Steel Structures	PC	3	0	0	3	25	75	100
2	U23CET611	Structural Analysis	PC	3	0	0	3	25	75	100
3	U23CET612	Transportation Engineering	PC	3	0	0	3	25	75	100
4	U23CEE6XX	Professional Elective - III#	PE	3	0	0	3	25	75	100
5	U23XXO6XX	Open Elective – II$	OE	3	0	0	3	25	75	100
Theory cum Practical										
7	U23CEB603	Instrumentation and sensor Technologies for Civil Engineering Application	PC	2	0	2	3	50	50	100
Practical										
8	U23CEP607	STAAD PRO V8i Laboratory	PC	0	0	2	1	50	50	100
9	U23CEP608	Transportation Engineering Laboratory	PC	0	0	2	1	50	50	100
10	U23CEP609	Survey Camp	PC	0	0	0	1	50	50	100
Project Work										
11	U23CEW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
12	U23CEC6XX	Certification Course – VI**	AEC	0	0	4	0	100	-	100
Mandatory Course										
13	U23CEM606	Gender Equality	MC	2	0	0	0	100	-	100
						Total	22	625	575	1200

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SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CET713	Construction Technology and Management	PC	3	0	0	3	25	75	100
2	U23CET714	Hydrology and Water Resource Engineering	PC	3	0	0	3	25	75	100
3	U23CET715	Prefabricated Structures	PC	3	0	0	3	25	75	100
4	U23CEE7XX	Professional Elective – IV#	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective – III$	OE	3	0	0	3	25	75	100
Practical										
6	U23CEP710	Simulation Software Laboratory	PC	0	0	2	1	50	50	100
7	U23CEP711	Estimation Costing and Valuation Engineering	PC	0	0	2	1	50	50	100
8	U23CEP712	Modelling and Analysis Laboratory	PC	0	0	2	1	50	50	100
Project Work										
9	U23CEW703	Project Phase – I	PA	0	0	4	2	50	50	100
10	U23CEW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
Total							21	425	575	1000

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23CEE8XX	Professional Elective – V#	PE	3	0	0	3	25	75	100
3	U23CEE8XX	Professional Elective – VI#	PE	3	0	0	3	25	75	100
Project Work										
4	U23CEW805	Project Phase – II	PA	0	0	16	8	50	100	150
Total							17	125	325	450

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Annexure – I

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE401	Composite Structures
2	U23CEE402	Environmental Law and Policy
3	U23CEE403	Building Services
4	U23CEE404	Remote Sensing and GIS
5	U23CEE405	Alternative Building Materials and Technologies
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE506	Advanced Design of RCC Structures
2	U23CEE507	Air and Noise Pollution
3	U23CEE508	Sustainable and Lean Construction
4	U23CEE509	Airport and Harbor Engineering
5	U23CEE510	Green Building Technology
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE611	Advanced Structural Analysis
2	U23CEE612	Pollution Control and Monitoring
3	U23CEE613	Buildings Codes and Requirement
4	U23CEE614	Traffic engineering and Management
5	U23CEE615	Urban Planning and Development

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Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE716	Structural Health Monitoring
2	U23CEE717	Municipal Solid Waste Management
3	U23CEE718	Quality Control and assurance in Construction
4	U23CEE719	Tunneling Engineering
5	U23CEE720	Architecture and Town Planning

Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE821	Precast Structures
2	U23CEE822	Industrial Waste Disposal and Treatment
3	U23CEE823	Construction Safety
4	U23CEE824	Intelligent Transport System
5	U23CEE825	Interior Design

Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE826	Pre- Stressed Concrete Structures
2	U23CEE827	Environmental Impact Assessment
3	U23CEE828	Natural Disaster and Mitigation
4	U23CEE829	Bridge Engineering
5	U23CEE830	Smart City

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Annexure – II

OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING

S. No	Course Code	Course Title
Open Elective – I		
1	U23CEOC01	Energy and Environment
2	U23CEOC02	Energy Efficient Buildings
Open Elective – II		
1	U23CEOC03	Disaster Management
2	U23CEOC04	Air Pollution and Solid Waste Management

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Annexure -III

ABILITY ENHANCEMENT COURSES – CERTIFICATION COURSES

Semester	Course Code	R-2023 Course Title
I	U23CEC107	Autodesk AutoCAD - ACU
II	U23CEC248	Sketch Up
III	U23CEC360	Total Station
IV	U23CEC430	Fundamentals of Internet of Things
V	U23CEC511	Autodesk 3ds Max -ACU
VI	U23CEC656	MX Road

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Annexure - IV

Skill Enhancement Courses

Sl. No	Course Code	Course Title
1	U23CES301	**Skill Enhancement Course - I**
		1) Basic Vasthu
		2) Plane Table Surveying
		3) Auto level surveying
2	U23CES402	**Skill Enhancement Course - II**
		1) MS Office – Word, Excel, Power Point
		2) Measurements and Conversion
		3) Traditional construction in modern age

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NPTEL COURSE LIST

Sl.No.	List of Subjects
1	Geosynthetics and Reinforced Soil Structures
2	Principles of Construction Management
3	Introductory Field Structural Geology
4	Geotechnical Earthquake Engineering
5	Finite Element Method and Computational Structural Dynamics
6	Underground Space Technology
7	Environmental Chemistry
8	Sustainable Transportation Systems
9	Environmental Modeling and Simulation
10	Pavement Materials (Under Pavement Engineering)
11	Advanced Geomatics Engineering
12	Geometric Design of Highways
13	Plate Tectonics
14	Introduction to Engineering Seismology
15	Remote Sensing: Principles and Applications
16	Geotechnical Engineering - II
17	Environmental Geomechanics
18	Advanced Concrete Technology
19	Geotechnical Engineering Laboratory
20	Dynamics of Structures
21	Mechanics of Solids
22	Structural Geology
23	Reliability-Based Structural Design
24	River Engineering
25	Optimization Methods for Civil Engineering
26	Subsurface Exploration: Importance And Techniques Involved
27	Remote Sensing and GIS
28	Municipal Solid Waste Management
29	Fluid Mechanics
30	Bridge Engineering
31	Introduction to Multimodal Urban Transportation Systems (MUTS)
32	Rock Mechanics and Tunneling
33	Ground Improvement
34	Wastewater Treatment and Recycling
35	Sustainable Engineering Concepts and Life Cycle Analysis
36	Global Navigation Satellite Systems and Applications
37	Soil Mechanics/Geotechnical Engineering I
38	Railway Engineering
39	Geo Engineering
40	Earth Sciences for Civil Engineering Part - I & II
41	Foundation Engineering
42	Design Of Steel Structures

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MOOC COURSE LIST

Sl.No.	List of Subjects
1	Construction Project Management
2	Python fundamentals for beginners
3	Risk and safety in civil engineering
4	Energy literacy training
5	Architecture urban design
6	Autodesk certified professional: AutoCAD for Design and Drafting exam prep
7	Transportation, Sustainable Buiidings, Green Construction
8	AI for everyone: Master the basics
9	Python Basics for Data Science
10	Introduction to Engineering Mechanics
11	Construction Project Management
12	Python fundamentals for beginners
13	Risk and safety in civil engineering
14	Energy literacy training
15	Architecture urban design
16	Autodesk certified professional: AutoCAD for Design and Drafting exam prep
17	Transportation, Sustainable Buildings, Green Construction
18	AI for everyone: Master the basics
19	Python Basics for Data Science
20	Introduction to Engineering Mechanics

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The following courses are provided by Trainlab Academy for Regulation 2023:

ABILITY ENHANCEMENT COURSES–(A) CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23XXCX01	Adobe Photoshop	Adobe
2	U23XXCX02	Adobe Animate	Adobe
3	U23XXCX03	Adobe Dreamweaver	Adobe
4	U23XXCX04	Adobe After Effects	Adobe
5	U23XXCX05	Adobe Illustrator	Adobe
6	U23XXCX06	Adobe InDesign	Adobe
7	U23XXCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23XXCX08	Autodesk Inventor - ACU	Autodesk
9	U23XXCX09	Autodesk Revit - ACU	Autodesk
10	U23XXCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23XXCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23XXCX12	Autodesk Maya - ACU	Autodesk
13	U23XXCX13	Cloud Security Foundations	AWS
14	U23XXCX14	Cloud Computing Architecture	AWS
15	U23XXCX15	Cloud Foundation	AWS
16	U23XXCX16	Cloud Practitioner	AWS
17	U23XXCX17	Cloud Solution Architect	AWS
18	U23XXCX18	Data Engineering	AWS
19	U23XXCX19	Machine Learning Foundation	AWS
20	U23XXCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23XXCX21	Advance Programming Using C	CISCO
22	U23XXCX22	Advance Programming Using C ++	CISCO
23	U23XXCX23	C Programming	CISCO
24	U23XXCX24	C++ Programming	CISCO
25	U23XXCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23XXCX26	CCNP Enterprise: Core Networking	CISCO
27	U23XXCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23XXCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23XXCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23XXCX30	Fundamentals Of Internet of Things	CISCO
31	U23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23XXCX32	Java Script Programming	CISCO
33	U23XXCX33	NGD Linux Essentials	CISCO
34	U23XXCX34	NGD Linux I	CISCO
35	U23XXCX35	NGD Linux II	CISCO
36	U23XXCX36	Advance Java Programming	Ethnotech
37	U23XXCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23XXCX38	Angular JS	Ethnotech

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39	U23XXCX39	Catia	Ethnotech
40	U23XXCX40	Communication Skills for Business	Ethnotech
41	U23XXCX41	Coral Draw	Ethnotech
42	U23XXCX42	Data Science Using R	Ethnotech
43	U23XXCX43	Digital Marketing	Ethnotech
44	U23XXCX44	Embedded System Using C	Ethnotech
45	U23XXCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23XXCX46	English For IT	Ethnotech
47	U23XXCX47	Plaxis	Ethnotech
48	U23XXCX48	Sketch Up	Ethnotech
49	U23XXCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23XXCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23XXCX52	IOT Using Python	Ethnotech
53	U23XXCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23XXCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23XXCX55	Software Testing	Ethnotech
56	U23XXCX56	MX-Road	Ethnotech
57	U23XXCX57	CLO 3D	Ethnotech
58	U23XXCX58	Solid works	Ethnotech
59	U23XXCX59	Staad Pro	Ethnotech
60	U23XXCX60	Total Station	Ethnotech
61	U23XXCX61	Hydraulic Automation	Festo
62	U23XXCX62	Industrial Automation	Festo
63	U23XXCX63	Pneumatics Automation	Festo
64	U23XXCX64	Agile Methodologies	IBM
65	U23XXCX65	Block Chain	IBM
66	U23XXCX66	Devops	IBM
67	U23XXCX67	Artificial Intelligence	ITS
68	U23XXCX68	Cloud Computing	ITS
69	U23XXCX69	Computational Thinking	ITS
70	U23XXCX70	Cyber Security	ITS
71	U23XXCX71	Data Analytics	ITS
72	U23XXCX72	Databases	ITS
73	U23XXCX73	Java Programming	ITS
74	U23XXCX74	Networking	ITS
75	U23XXCX75	Python Programming	ITS
76	U23XXCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23XXCX77	Network Security	ITS & Palo alto
78	U23XXCX78	MATLAB	MathWorks
79	U23XXCX79	Azure Fundamentals	Microsoft
80	U23XXCX80	Azure AI (AI-900)	Microsoft
81	U23XXCX81	Azure Data (DP -900)	Microsoft
82	U23XXCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23XXCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23XXCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23XXCX86	Microsoft Excel	Microsoft
87	U23XXCX87	Microsoft Excel Expert	Microsoft
88	U23XXCX88	Securities Market Foundation	NISM

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89	U23XXCX89	Derivatives Equinity	NISM
90	U23XXCX90	Research Analyst	NISM
91	U23XXCX91	Portfolio Management Services	NISM
92	U23XXCX92	Cyber Security	Palo alto
93	U23XXCX93	Cloud Security	Palo alto
94	U23XXCX94	PMI – Ready	PMI
95	U23XXCX95	Tally – GST & TDS	Tally
96	U23XXCX96	Advance Tally	Tally
97	U23XXCX97	Associate Artist	Unity
98	U23XXCX98	Certified Unity Programming	Unity
99	U23XXCX99	VR Development	Unity

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ANNEXURE III

Department	Civil Engineering	Programme: B.Tech						
Semester	V	Course Category Code: HS			*End Semester Exam Type: TE			
Course Code	U23HSTC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Research Methodology	2	0	0	2	25	75	100

Common to ALL Branches

Prerequisite	Nil	
Course Outcomes	*On completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Interpret the different types of research and explain how research methods can be used to address engineering problems.	K2
	CO2 Discuss the research problems, conduct comprehensive literature reviews, and utilize tools and services for effective information retrieval.	K2
	CO3 Apply appropriate methods to design experiments, analyze data, and interpret results using both numerical and graphical techniques.	K3
	CO4 Analyze and apply ethical guidelines to structure and write research papers and dissertations, ensuring academic integrity and avoiding plagiarism.	K4
	CO5 Examine the fundamentals of intellectual property rights to protect and enforce them, with emphasis on their role in fostering innovation and entrepreneurship in engineering.	K3

UNIT-I	Introduction to Research	Periods: 6
Meaning and Importance of Research, Types of Research: Overview of Basic, Applied, and Developmental Research, Overview of the Research Process, Defining a Research Problem: Key Considerations, Setting Research Objectives and Research Questions, Introduction to Research Design: Basic Concepts, Approaches to Research: Quantitative vs. Qualitative.		CO1
UNIT-II	**Problem Formulation and Literature Review**	**Periods: 6**
Identifying and Formulating Research Problems, conducting a Literature Review: Essential Steps, Referencing and Citation Methods: Basic Techniques. Sources of Information: Overview of Libraries and Online Databases.		CO2
UNIT-III	**Research Methods and Data Analysis**	**Periods: 6**
Introduction to Experimental Research, Developing Hypotheses: Basic Approach. Data Collection Methods: Sampling and Surveys, Basics of Data Analysis: Numerical and Graphical Analysis, Introduction to Inferential Statistics.		CO3
UNIT-IV	**Writing and Presenting Research**	**Periods: 6**
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview.		CO4
UNIT-V	**Ethics and Intellectual Property in Research**	**Periods: 6**
Ethical Considerations in Research: Introduction to Scientific Misconduct. Basics of Intellectual Property Rights - Introduction to Patents, Copyrights, and Trademarks – Case studies on ethical dilemmas in research.		CO5

Lecture Periods: 30	Tutorial Periods: -	Practical Periods: -	Total Periods: 30

Text Books

1. Kumar, R. Research Methodology: A Step-by-Step Guide for Beginners, 5th Edition, SAGE Publications, 2019.
2. Ram Ahuja, *Research methods*, Rawat Publications, 2nd edition, 2022
3. Creswell, J. W., and Creswell, J. D. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, SAGE Publications, 2018.

Reference Books

1. Thiel DV. Research methods for engineers. Cambridge: Cambridge University Press; 2014.
2. Ganesan R. Research methodology for engineers. Chennai: MJP Publishers; 2024.
3. Agarwal C, Sharma V. Research methodology in sociology. New Delhi: Commonwealth Publishers; 2012.
4. Thody A. Writing and presenting research. 2nd edition, London: SAGE Publications; 2006.
5. Kothari CR. Research methodology – methods and techniques. 5th edition, New Delhi: New Age International Publishers; 2023.

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1. https://conjointly.com/kb/
2. https://owl.purdue.edu/owl/research_and_citation/conducting_research/writing_a_literature_review.html
3. https://files.eric.ed.gov/fulltext/ED536788.pdf
4. https://researcheracademy.elsevier.com/
5. https://www.wipo.int/
6. https://www.scholastic.com /7-steps-to-successful-research-report.html
7. https://www.futurelearn.com/info/courses/business-research-methods- investigation.
8. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India

COs/POs/PSOs Mapping

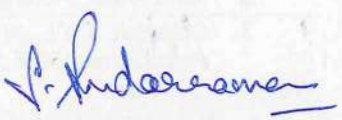
Course Outcomes (COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	2	-	-	2	2	3	3	2	1
CO2	3	1	1	3	1	-	2	-	-	1	2	-	3	2	1
CO3	1	3	3	1	3	-	2	-	-	2	2	-	3	2	1
CO4	-	-	1	2	-	-	2	3	2	2	-	2	3	2	1
CO5	2	2	2	2	2	2	3	3	2	2	3	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



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Text Books

1. Allen B. Downey and Chris Mayeld, "Think Java - How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2020
2. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
3. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017
4. Cay S. Horstmann, Gary Cornell, "Core Java Volume - I Fundamentals", 9th Edition, Prentice Hall, 2013.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Poaul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
3. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
4. Steven Holzner, "Java 2 Black book", Dreamtech Press, 2011.

Web References

1. https://www.javatpoint.com/java-tutorial
2. https://docs.oracle.com/en/java/
3. https://www.studytonight.com/java/
4. https://onlinecourses.nptel.ac.in/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	-	2	3	2	1
2	3	3	3	-	3	-	-	-	-	-	-	2	3	2	1
3	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
4	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
5	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **ES**			*End Semester Exam Type: **TE**			
Course Code	**U23ITTC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Java**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to All Branches)								

Prerequisite	Basic knowledge of Object-Oriented Programming Principles		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Articulate the concept of Java fundamentals, OOPs and Strings	**K2**
	CO2	Demonstrate the principles of inheritance, packages and interfaces with real time applications	**K2**
	CO3	Create real time applications using exception handling and thread programming.	**K3**
	CO4	Build distributed applications using Collections and IO streams	**K3**
	CO5	Design and build simple GUI programs using AWT, Swings and build database applications	**K3**

Unit- I	**Introduction**	**Periods: 09**
Introduction: Java: History – Features – JVM - JRE – JDK – Java Compilation and Execution – Data Types - Variables, Types, Expressions, Assignment Statements, Input/Output Statements: Scanner/System class, Type Casting (Primitives to Primitives), Conditional and Iterative Control Structures – Arrays. **OOPs with Java:** Introduction to OOPs Concepts - Class – Objects – Methods - Access Modifiers – Creating Class and Objects, Object Life-Cycle - Garbage Collection-Constructors - this – static – Array of Objects – Nested Classes. **String**: String Class– Built-in Methods – StringBuilder – String Buffer		**CO1**
Unit- II	**Inheritance, Interfaces and Packages**	**Periods: 09**
Inheritance: Types of Inheritance – is-a Relationship, has-a Relationship – super keyword – final keyword – Polymorphism - Method overloading and Method overriding – Abstract Class **Interfaces:** Define – Extend – Implement – Access - Interfaces vs Abstract classes, Type Conversions (Primitives to Objects vice-versa): Autoboxing and Auto unboxing **Packages:** Define – Create – Access – Import		**CO2**
Unit- III	**Exception Handling and Multithreading**	**Periods: 09**
Exception Handling: Exception Hierarchy – Checked and Unchecked Exceptions – try, catch, throws, throw and finally – User Defined Exceptions. **Multithreading:** Thread – Life cycle – Defining and Running – Implementation Types – Thread Priorities – Thread Synchronization - Inter-Thread Communication		**CO3**
Unit- IV	**Collections and I/O Streams**	**Periods: 09**
Collections: List: Array List and LinkedList. Set: HashSet and Tree Set. Map: HashMap – Stack – Queue. Lambda Expressions. **I/O Streams:** Streams – Byte Streams and Character Streams – File Input Stream and File Output Stream – File Reader and FileWriter. Object Serialization: Object Input Stream and Object Output Stream.		**CO4**
Unit- V	**GUI and JDBC**	**Periods: 09**
AWT: Components – Controls – Event Handling. **SWING**: Swing Components – Layout Management. **JDBC:** JDBC Architecture – JDBC Driver Types – Implementation of JDBC.		**CO5**

Lecture Periods: 45	**Tutorial Periods: –**	**Practical Periods: –**	**Total Periods: 45**

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Department	Civil Engineering			Programme: B.Tech.			
Semester	V			Course Category Code: PC		End Semester Exam Type: TE	
Course Code	U23CET508	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Foundation Engineering	3	0	0	3	25	75	100
Prerequisite	Geotechnical Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Analyze the method of soil exploration and sampling.	K3
CO2	Get knowledge on bearing capacity and testing methods.	K3
CO3	Select the type of foundation required for the soil at a place and able to design different types of foundation.	K3
CO4	Determine the load carrying capacity of pile foundation.	K3
CO5	Gain knowledge about retaining structures and Stability analysis.	K3

UNIT – I	SOIL EXPLORATION	Periods:09
Site investigation – Soil exploration methods- Hand augers and power drills- Wash boring - samplers-sampling method - Spacing and depth of bore holes - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test- Subsurface soundings - Geo physical method - Preparation of soil investigation Report.		CO1
UNIT – II	**SHALLOW FOUNDATION**	**Periods:09**
Classification of foundation- Types and selection criteria-- Methods to determine bearing capacity- Methods to increase BC-Terzaghi Analysis-Codal provision-Factors affecting bearing capacity -Settlement of foundations on granular and clay deposits- Seismic considerations in bearing capacity evaluation.		CO2
UNIT – III	**FOOTINGS AND RAFTS**	**Periods:09**
Types of Isolated footing-Combined footing- Mat foundation-Codal provision– Contact pressure and settlement distribution -Proportioning of foundation–design of foundation.		CO3
UNIT – IV	**DEEP FOUNDATION**	**Periods:09**
Pile foundations Introduction- classification-selection criteria- Individual and grouppile carrying capacity- static and dynamic approach-pile load tests- under reamed piles-IS Codal provisions. Methods to increase pile carrying capacity – Deep compaction methods – Grouting.		CO4
UNIT – V	**RETAINING WALLS**	**Periods:09**
Active and passive states –Definitions, Rankine's theory – Cohesion less and cohesive soil – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Stability analysis of retaining walls – Codal provisions.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Punmia B.C."Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2017.
2. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005
3. Purushothama Raj. P."Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013

Reference Books

1. Venkatramaiah.C.,"Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Modi P N, "Soil Mechanics and Foundation Engineering", second Edition Standard Book House, New Delhi, 2017.
3. Coduto,D.P."Geotechnical Engineering Principles and Practices",Prentice Hall of India Private Limited, New Delhi,2002.
4. Michael A. Joyce "Site Investigation Practice", E. & F.N. Spon, 1982
5. Murthy,V.N.S."Textbook of Soil Mechanics and Foundation engineering",CBS Publishers Distribution Ltd., New Delhi. 2014.

Web References

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105105176/
3. https://nptel.ac.in/courses/105/105/105105039/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: PC			*End Semester Exam Type: TE			
Course Code	U23CET509	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Water Supply and Wastewater Engineering	3	0	0	3	25	75	100
Prerequisite	Basic Civil Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the sources and characteristics of water	K2
CO2	Design various treatment methods in water supply.	K2
CO3	Design the various distribution network and water storage methods	K2
CO4	Understands the characteristics of sewage and method of various sewerage systems.	K2
CO5	Gain knowledge in water management and Wastewater recycle process.	K2

UNIT – I	SOURCES AND WATER SUPPLY	Periods:9
Sources of water - surface and ground water source- Objectives of water supply systems - water supply scheme- quantity of water - Design period – per capita consumption - fluctuations in demand pattern -population forecast – Arithmetic, Incremental, Geometric methods - Physical, Chemical and Biological aspects - Water Act 1974 -Water standards and quality- Role of regulatory bodies and Local bodies - Water Management system.		CO1
UNIT – II	**WATER TREATMENT METHODS**	**Periods:9**
Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects		CO2
UNIT – III	**WATER STORAGE AND DISTRIBUTION**	**Periods:9**
Intake structures - pipe materials - laying, jointing, testing of pipes - methods of distributing water - storage and distribution reservoirs – plumbing system- pumping stations and their operations- House service connections.		CO3
UNIT – IV	**PLANNING AND DESIGN OF SEWERAGE SYSTEM**	**Periods:9**
Sewage Characteristics – sewer and sewerage -methods of collection - conservancy system, water carriage system - classification of sewerage systems- quantity of sanitary sewage - fluctuation in sewage flow - design of flow of sewage for separate, storm and combined sewers - sewer appurtenances - traps - plumbing system of drainage – one pipe system and two pipe system of plumbing - sanitary fittings- Principles, functions - activated sludge unit and trickling filter - septic tank - sludge digestion tank - oxidation pond- oxygen sag curve-aerobic reactor- anaerobic reactor.		CO4
UNIT – V	**SEWAGE TREATMENT AND DISPOSAL**	**Periods:9**
Sewage farming - deep well injection - Principles, Functions, - Activated Sludge Process - Trickling filters - UASB - Waste Stabilization Ponds - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. - Discharge standards-sludge treatment- Objectives of sludge treatment -Disposal of sludge - thickening - dewatering - conditioning - drying beds.		CO5

Lecture Periods:45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. S.K., - "Environmental Engineering I", Khanna Publishers, New Delhi, 2016
2. Modi, P.N., - "Environmental Engineering I ", Standard Book House, Delhi, 2016
3. Garg, S.K., - "Environmental Engineering II", Khanna Publishers, New Delhi, 2016.
4. Modi, P.N., - "Environmental Engineering II", Standard Book House, Delhi, 2018

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
3. Metcalf and Eddy, M.C., "Wastewater Engineering - Treatment and Reuse II" , 4Th Edition, McGraw Hill India, 2016.
4. Birdie, G.S. and Birdie,"Water Supply and Sanitary Engineering", Dhanpat Raiand Sons, 2016.

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Web References
1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
4. https://swayam.gov.in/nd1_noc20_ce23/preview
5. nptel.ac.in/courses/105/104/105104102/

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3
CO2	3	2	2	2	3	2	2	2	2	2	2	2	3	2	2
CO3	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech						
Semester	V	Course Category Code: ES			*End Semester Exam Type: LE			
Course Code	U23ITPC02	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Programming in Java Laboratory	0	0	2	1	50	50	100
(Common to All Branches)								
Prerequisite	Basic concepts of Object-Oriented Programming Principles							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Apply and practice logical formulations to solve simple problems leading to specific applications.	K3
CO2	Demonstrate the use of inheritance, interface and package in relevant applications	K3
CO3	Implement robust application programs in Java using exception handling and multithreading	K3
CO4	Build java distributed applications using Collections and IO streams.	K3
CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java.	K3

List of Exercises

1. Develop simple programs using java
2. Develop a java program that implements class and object.
3. Write a java program to find the frequency of a given character in a string
4. Write a java program to demonstrate inheritance and interfaces.
5. Develop a java program that implements the Packages.
6. Create java applications using Exception Handling for error handling.
7. Develop a simple real life application program to illustrate the use of Multi-Threads.
8. Implement simple applications using Collections.
9. Develop application using the concept of I/O Streams
10. Write a Java Program to demonstrate AWT and Swing Components
11. Develop a simple application and use JDBC to connect to a back-end database.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

Reference Books

1. Allen B. Downey and Chris Mayeld, "Think Java - How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2020
2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, 7th Edition, 2010

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog.
5. https://www.geeksforgeeks.org.

* TE – Theory Exam, LE – Lab Exam

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COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	Civil Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	U23CEP505	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Water and Wastewater Engineering Laboratory	0	0	2	1	50	50	100

Prerequisite	Nil	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Discuss about importance of water and its quality analysis.	K2
	CO2 Analyze various physico-chemical and biological parameters of water and wastewater in case of quality requirements.	K3
	CO3 Assess complete water quality assessment for EIA and domestic supplies.	K2
	CO4 Suggest various types of treatment methods required to purify raw water with different contaminants.	K3
	CO5 Apply the laboratorial results to problem identification, quantification, and basic environmental design.	K3

List of Experiments:

(i)ANALYSIS OF WATER AND WASTEWATER

PHYSICAL ANALYSIS

1. Measurement of pH
2. Measurement of Conductivity
3. Determination of Turbidity by using Nephlometer.
4. Measurement of Total Solids.
5. Estimation of Total Dissolved and Total Suspended solids

CHEMICAL ANALYSIS

6. Estimation of Alkalinity.
7. Estimation of Hardness.
8. Estimation of Chlorides.
9. Estimation of Sulphate
10. Estimation of Residual Chlorine
11. Estimation of Dissolved Oxygen.
12. Estimation of Manganese.

(ii)ANALYSIS OF WASTEWATER

PHYSICAL ANALYSIS

13. Estimation of Settable solids

CHEMICAL ANALYSIS

14. Determination of optimum coagulant Dosage.
15. Estimation of COD

BIOLOGICAL ANALYSIS

16. Estimation of BOD

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 3 0	Total Periods :30

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi,1987.
3. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013.
4. Metcalf and Eddy, M.C., Wastewater Engineering - Treatment and Reuse II , 4Th Edition, McGraw Hill India, 2016.
5. IS10500 Indian Standards for Drinking Water.
6. IS 2490 Indian Standards for Industrial and sewage effluent discharge

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Web References
1. https://swayam.gov.in/nd1_noc20_ce23/preview
2. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements?force=tru

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	Civil Engineering	Programme : B.Tech.						
Semester	V	Course Category Code: PC			End Semester Exam Type: LE			
Course Code	U23CEP506	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	REVIT Architecture Laboratory	0	0	2	1	50	50	100

Prerequisite	Nil	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Describe building information modeling methodology and its benefits.	K3
CO2	Use different parts of the Revit Architecture user interface and work with different types of architectural elements and families.	K3
CO3	Use the different views listed in the Project Browser, control the visibility and graphical	K3
CO4	Representation of objects in architecture model, and work with elevation, section, and 3D views.	K4
CO5	Set up a project and transfer standards between projects, add and modify levels in project model, createand modify grids.	K4

List of Experiments

1. Introduction
2. Basic drawing and Editing Tools
3. Setting up levels and Grids
4. Modelling walls
5. Working with Doors and Windows
6. Working with Curtain Walls
7. Working with Views
8. Adding Components
9. Modelling Floors
10. Modelling Ceilings and Roofs
11. Modelling Stairs and Railing
12. 3D modeling of Residential building

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

Reference Books

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to BuildEnvironment", Tata McGraw Hill Publishers Limited, 2019.
2. Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing- "Building planning and Drawing",2017
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers,2018.

Web References

1. https://www.google.com/search?q=revit+architecture+tutorialandrlz=1C1CHBD_enIN877IN877andoq=REVIT+ARCHITECTURE+tandaqs=chrome.1.69i57j0l7.13121j0j8andsourceid=chromeandie=UTF-8
2. https://www.youtube.com/watch?v=cJz20pnOGrw
3. https://www.pdfdrive.com/revit-architecture-d18827665.html.

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	Civil Engineering	Programme: B. Tech.						
Semester	V	Course Category Code: PA				*End Semester Exam Type: -		
Course Code	U23CEW501	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Micro Project	0	0	2	1	100	-	100
	Civil							
Prerequisite	Civil Engineering							

Course Outcomes	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Identify the problem statement for the micro project work through the literature survey	K2
	CO2	Choose the proper components as per the requirements of the design/ system.	K2
	CO3	Apply the acquainted skills to develop final model/system	K3

There shall be a Micro Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the micro project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and, in the hardware / software he/she using in the Project. The Micro-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Micro Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Micro Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	3	2	2	1	-	2	-	-	3	3	3	1	3	3	3

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	Review 1			Review 2				Total Marks
	Novelty	Presentation	Viva	Presentation	Demonstration	Viva	Report	
Marks	10	20	10	20	20	10	10	100

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Department	Civil Engineering	Programme: B. Tech.						
Semester	V	Course Category: AEC			End Semester Exam Type: -			
Course Code	U23CEC5XX	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	CERTIFICATION COURSE - V	0	0	4	-	100	-	100
Prerequisite	-							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as "pass" on satisfactory completion. A letter grade "P" is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

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Department	Civil Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: MC			*End Semester Exam Type: -			
Course Code	U23CEM505	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Essence of Indian Traditional Knowledge	2	0	0	-	100	-	100
Common to ALL Branches								
Prerequisite	Nil							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Familiarize with the philosophy of Indian culture	K2
CO2	Distinguish the Indian languages and literature	K2
CO3	Describe the philosophy of ancient, medieval and modern India	K2
CO4	Illustrate the information about the fine arts in India	K2
CO5	Describe the contribution of scientists of different eras	K2

UNIT- I	Introduction To Culture	Periods:06
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.		CO1

UNIT- II	Indian Languages, Culture and Literature	Periods:06
Indian Languages and Literature - I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature- II: Northern Indian languages & literature		CO2

UNIT- III	Religion and Philosophy	Periods:06
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)		CO3

UNIT- IV	Fine Arts in India (Art, Technology and Engineering)	Periods:06
Indian Painting, Indian handicrafts, Music, divisions of Indian classical music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India		CO4

UNIT-V	Education System in India	Periods:06
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India		CO5

Lecture Periods:30	Tutorial Periods: -	Practical Periods: -	Total Periods:30

Reference Books

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200
4. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993
5. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978 - 8120810990, 2014

Web References

1. https://nptel.ac.in/courses/109/104/109104102/
2. https://nptel.ac.in/courses/101/104/101104065/
3. https://nptel.ac.in/courses/109/108/109108158/
4. https://nptel.ac.in/courses/109/106/109106059/
5. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

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Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CET610**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Design of Steel Structures**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Nil									
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Understand the design philosophy in simple practical design and behavior of steel structural Joints using bolts.							**K3**	
	CO2	Understand the design philosophy in simple practical design and behavior of steel structural Joints using welds.							**K3**	
	CO3	Understand the behavior of tensile member and able to design of compound sections.							**K3**	
	CO4	Understand the behavior of compression member and able to design with laced and battened columns.							**K3**	
	CO5	Know the knowledge of beams and purlins and able to design flexural member.							**K3**	
UNIT – I	**STEEL STRUCTURAL JOINTS- BOLTED CONNECTIONS**						**Periods:09**			
Introduction to Design philosophies by limit state and working stress method. Properties of steel - Structural steel sections - Types of connections, terminologies, failures in bolted joints, Design of Joints – lap joint, single cover butt joint and double cover butt joint using bolts under axial loading - Efficiency of joints.										**CO1**
UNIT – II	**STEEL STRUCTURAL JOINTS- WELDED CONNECTIONS**						**Periods:09**			
Introduction – Advantages and Disadvantages - Types of welds: Fillet welds, groove welds, plug and slot welds - Welding symbols as per IS 813 - Welding Processes and Joint Configurations - Strength of welds - Throat thickness - effective length, - Design of fillet welds and butt welds as per IS 800 – Modes of Failures.										**CO2**
UNIT – III	**DESIGN OF TENSION MEMBERS**						**Periods:09**			
Types of sections - Design of tension members – single and compound sections – concept of shear lag - tension splices – design of lug angles.										**CO3**
UNIT – IV	**DESIGN OF COMPRESSION MEMBERS**						**Periods:09**			
Theory of columns – Modes of failures, Design of axially and eccentrically loaded members, Built-up columns, Design of Lacings and Battens, Design of Column Base.										**CO4**
UNIT – V	**DESIGN OF BEAMS AND PURLINS**						**Periods:09**			
Modes of failures- Design of Laterally supported and unsupported beams -Design of built up beam- Design of purlins - Types of roof trusses for different spans- Estimation of dead, live and wind loads.										**CO5**
Lecture Periods: 45		**Tutorial Periods: -**		**Practical Periods: -**			**Total Periods: 45**			

Text Books

1. Subramanian, P., “Design of steel structures”, Oxford Publishers, New Delhi, 2007
2. Shiyekar, M.R., “Limit State Design in Structural Steel”, Second Edition, PHI Learning Private Ltd., Delhi, 2013. .
3. Bhavikatti, S.S., “Design of Steel Structures”, IK International Publishing House Pvt Ltd, New Delhi, 2014.

Reference Books

1. Shah, V.L., and Veena Gore, “Limit state design of Steel Structures”, Structures Publications, Pune, 2012.
2. Sai Ram K.S., “Design of Steel Structures”, Pearson Education Ltd., 2013.
3. VirendraGehlot, Ram Chandra, “Design of steel structures”, Vol.I& II, Standard Publishers, 2012.
4. IS: 800- 2007, “General Construction in Steel-Code of Practice”, Bureau of Indian Standards, New Delhi

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1.https://nptel.ac.in/courses/105105162/
2.https://nptel.ac.in/courses/105106113/
3.https://nptel.ac.in/courses/105106112

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	3	1	3	3	3	3
2	3	3	3	2	1	-	-	-	3	1	3	3	3	3
3	3	3	3	2	1	-	-	-	3	-	-	3	3	3
4	3	3	3	2	1	-	-	-	3	-	-	3	3	3
5	3	3	3	2	1	-	-	-	3	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CET611**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Structural Analysis**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Mechanics of Solids**	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the principles and assumptions of the slope deflection method	**K3**
	CO2 Analyze statically indeterminate beams by using moment distribution method	**K3**
	CO3 Understand the fundamentals of matrix methods for structural analysis	**K3**
	CO4 Apply the stiffness matrix method for structural analysis	**K3**
	CO5 Apply influence lines to determine maximum moments, shears and reactions due to moving loads.	**K3**

UNIT-I	**Slope Deflection Method**	**Periods: 12**
Concepts - Deflection equation – Joint equilibrium – Limitation - Analysis of continuous beams and portal frames without sway - Non-sway analysis		**CO1**
UNIT-II	**Moment Distribution Method**	**Periods: 12**
Definition – Stiffness – Carry over moment and carry over factor – Distribution factor at a pinned end and at a fixed end - Analysis of continuous beams and portal frames without sway - Non-sway analysis		**CO2**
UNIT-III	**Flexibility Matrix Method**	**Periods: 12**
Introduction to matrix methods of analysis - Static indeterminacy - Concept of flexibility - Analysis of indeterminate beams with maximum three degrees using flexibility method		**CO3**
UNIT-IV	**Stiffness Matrix Method**	**Periods: 12**
Matrix stiffness method – Transformation of displacements – Elements stiffness to system - stiffness – Application to continuous beams supports with maximum three degrees – Effects of support settlements		**CO4**
UNIT-V	**Moving Load and Influence Lines**	**Periods: 12**
Determinate Beams: Single concentrated load moving on the span – UDL longer than the span – UDL shorter than the span– Two concentrated loads – Series of concentrated loads – Equivalent UDL Influence lines for reactions, shear force, bending moment – Load Position – Absolute maximum Bending Moment and Shear Force - UDL smaller than the span – Concentrated loads – Absolute maximum Bending Moment and Shear Force **Indeterminate beams:** Muller Breslau's principle and its applications to determine the influence lines for continuous beams.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Reference Books

1. Dr.R.P. Rethaliya, Structural Analysis-I, Atul Prakashan Publisher, 2020
2. Dr. Suresh R. Parekar, H.M. Somayya, Structural Analysis- I, Nirali Prakashan Publisher, 2014
3. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
4. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
5. Thandavamoorthy, "Analysis of Structures", Oxford and IBH Publishers, New Delhi.2008.

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1. https://nptel.ac.in/courses/105105166/
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. https://nptel.ac.in/courses/105101085/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	-	-	-	3	3	3
2	3	3	3	2	1	-	-	-	-	-	-	3	3	3
3	3	3	3	2	1	-	-	-	-	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CET612**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Transportation Engineering**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Basic of Civil and Mechanical Engineering									
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Understand & Analyze the geometric design of highways							**K2**	
	CO2	Understand the various test procedures for highway materials and design theories							**K2**	
	CO3	Design the pavement							**K2**	
	CO4	Understand the railway elements							**K2**	
	CO5	Prepare airport layout and understand the various concepts and components of harbor							**K2**	

UNIT – I	**HIGHWAY GEOMETRY**	**Periods:10**	
Significance of highway planning –Factors influencing highway alignment -Classification of highways –Typical cross sections - Cross sectional elements - Sight Distances, Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]- Gradients and its types, Design of Horizontal Alignments - Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments - Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curve			**CO1**
UNIT – II	**PAVEMENT COMPONENTS AND ANALYSIS**	**Periods:08**	
Pavement components - Types of pavements - Highway materials — Tests on aggregates and Tests on bitumen - Calculation of stresses – Single layer, Two layer theory, Westergaard's theory, Bradbury theory (Problems in stress calculation)			**CO2**
UNIT – III	**PAVEMENT DESIGN AND MAINTENANCE**	**Periods:09**	
Pavement Design Factors in the design of flexible and rigid pavements- CBR methods - IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58) (Problems in design of flexible pavement) - Highway drainage and its types - Pavement failures - Pavement evaluation –Benkelman beam deflection method			**CO3**
UNIT – IV	**RAILWAY ENGINEERING**	**Periods:09**	
Permanent way and its elements – Functions, requirements and types of Rails, Sleepers and Ballast - Rail fixtures and fastenings - Gauge and its types -Coning of wheels - Defects in rails - Super elevation – Cant deficiency, negative cant (Problems) - Widening of gauge on curves (Problems) - Transition Curves and Shift (Problems) - Points and crossings – Turn outs - Design of turnouts (Problems) – Stations and Yards - classification of stations and yards			**CO4**
UNIT – V	**AIRPORT AND HARBOUR ENGINEERING**	**Periods:09**	
Components of Airport - Airport organization – Types of airport - Runway orientation - Wind rose diagram (Problems), Basic runway length and corrections, Geometric design of Runway (Problems on Runway length) Runway Marking – Runway Lighting - Design of exit taxiway (Problems), Definition of Terms - Harbors, Ports, Docks, Littoral Drift, Satellite Ports - Requirements and Classification of Harbors - Dry and Wet Docks - Light Houses, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. S C Saxena and S P Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publication, 2010.
3. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010

Reference Books

1. Kadiyali L R, "Principles and Practice of Highway Engineering", Khanna Technical Publications, Delhi, 2019.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2018.
3. S P Bindra, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2018.

4. Indian Road Congress (IRC), “Guidelines for the Design of Flexible Pavements”, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC),”Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, (Third Revision), IRC: 58-2017

Web References

1. http://www.yorku.ca/yaoguo/tranportation1025/
2. http://www. tranportation.cum.edu/~wn0g/2ch6a.pdf
3. https://youtu.be/0xwPILJUqsI
4. https://youtu.be/0g_KRhJ4WCI
5. https://youtu.be/ba7ue8H14Iw

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

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Department	**Civil Engineering**	Programme : **B.Tech**						
Semester	**VI**	Course Category Code: PC			*End Semester Exam Type: TE & LE			
Course Code	**U23CEB603**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Instrumentation and Sensor Technologies for Civil Engineering Applications**	**2**	**0**	**2**	**3**	**50**	**50**	**100**

Prerequisite	**Nil**		
Course Outcomes	***On completion of the course, the students will be able to***		**BT Mapping (Highest Level)**
	CO1	Identify the type of transducer	**K2**
	CO2	Create mathematical model of transducer	**K4**
	CO3	Identify the various types of sensor	**K2**
	CO4	Identify and understand the errors in sensor and Transducers	**K4**
	CO5	Identify and understand Characterization and Measurement Techniques	**K4**

UNIT-I	**Introduction**	**Periods: 10**
Definition of sensor/transducer-Block Diagram-elements of measurement system-sensors for sensing infrastructure, classification of sensors/transducers-static characteristics-accuracy, precision, resolution, linearity, sensitivity, range, loading effect, threshold, dead time, dead zone, span.Errors in measurement: True value, static error, static correction, scale range and scale span, error calibration curve, readability, repeatability & reproducibility, drift and noise		**CO1**
UNIT-II	**Integrated Sensing for Smart Infrastructure**	**Periods: 10**
Piezoelectric sensors: Principle of piezoelectricity, piezoelectric materials, fabrication of piezoelectric transducers, piezoelectric transducers for SHM, Bonding effects, limitations, Applications. Fiber optic sensors: properties of optical fibres, common optical fiber sensors		**CO2**
UNIT-III	**Acoustomagnetic Diagnostics for Structural Integrity**	**Periods: 10**
Acoustic Emission Sensors: Fundamentals of AE technique, Interpretation of AE signals, AE localization methods, AE equipment technology, Field applications, SHM using AE. Electromagnetic Sensors: magnetics and magnetic materials, magnetoelasticity, magnetic sensor technology, the role of microstructure in magnetization and magnetoelasticity, temperature effects, Eddy current, portable elastomagnetic stress sensor.		**CO3**
UNIT-IV	**Calibration and Characterization of Sensors and Transducers**	**Periods: 15**
1. Calibration of ammeter and voltmeter 2. calibration of RTD, thermistor and thermocouple 3. Characteristics of potentiometer. 4. Characteristics of LVDT 5. Angular displacement measurement using a capacitive transducer		**CO4**
UNIT-V	**Characterization and Measurement Techniques Using Advanced Transducers**	**Periods: 15**
1. Characteristics of load cell. 2. Characteristics of optical transducers. 3. Pressure measurement using piezoelectric transducers. 4. Measurement of current, voltage and power using hall effect transducer. 5. Characteristics of Strain gauge.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Text Books
1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis.
Reference Books
1. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer
2. Patranabis, Sensors and Transducers, Second Edition, PHI Publisher
3. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

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1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/preview

COs/POs/PSOs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	-	-	-	-	-	2	3	2	1
CO2	2	3	2	2	3	-	-	-	-	-	2	3	3	2
CO3	3	3	3	1	2	-	-	-	-	-	3	3	2	1
CO4	1	2	1	3	3	-	-	-	-	-	2	2	2	1
CO5	2	1	2	3	2	-	-	-	-	-	3	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Theory						
Assessment	**Continuous Assessment Marks (CAM)**				**End Semester Examination (ESE) Marks**	**Total Marks**
	CAT 1	**CAT 2**	**Model Exam**	**Attendance**		
Marks	5	5	5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

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Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CEP607**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**STAAD PRO V8i LABORATORY**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches)								
Prerequisite	Nil							

Course Outcomes	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Students understand and design the basic one-dimensional elements.	**K3**
	CO2	To provide hands on exercise and make the students learn the concept of designing 2D elements.	**K3**
	CO3	To provide hands on training on various 3D elements and learn their challenges practically.	**K4**
	CO4	Students completing this course would have acquired practical knowledge on designing an entire G+2 (floor) buildings.	**K3**
	CO5	Students completing this course would have acquired practical knowledge on applying wind and seismic loading in building design.	**K3**

LIST OF EXPERIMENTS

1. Analysis & Experimental Validation of 2D Truss and Frame under Combined Loads
2. Behavior of 3D Structural Elements: Beams, Columns, and Frames
3. Foundation Systems: Isolated Footings and Retaining Walls
4. Slab Systems: One-Way and Two-Way Slabs
5. Integrated Building Design and Analysis: G+2 Framed Structure
6 Earthquake Engineering: Lateral Force Analysis and Seismic Design

Lecture Periods: —	**Tutorial Periods:** —	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Staad Pro V8i for Beginners: With Indian Examples by T. S. Sharma, Notion Press Media Pvt Ltd.

Web References

1. STAAD Pro V8i Technical Reference Manual – Bentley Communities.
2. https://bentleysystems.service-now.com/community?id=community_forum&sys_id=f420bf06475e31109091861f536d43f6
3. https://www.youtube.com/results?search_query=staad+pro+tutorials
4. https://learnstaad.com/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
1	3	1	-	-	3	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**			Programme : **B.Tech.**				
Semester	**VI**			Course Category Code: **PS**		End Semester Exam Type: **LE**		
Course Code	**U23CEP608**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Transportation Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Prerequisite	Basic of Civil and Mechanical Engineering							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Carry out the test on aggregate	**K3**
	CO2 Conduct the test on bitumen	**K3**
	CO3 Design the pavement	**K4**
	CO4 Investigate the test on bituminous mix	**K3**
	CO5 Carry out the test on subgrade soil	**K3**

List of Experiments

I. Tests on Aggregate:

1. Shape Tests (Elongation index, Flakiness index, Angularity number)
2. Impact test
3. Crushing value
4. Los Angles Abrasion test
5. Specific gravity
6. Water absorption

II. Tests on Bitumen:

1. Penetration Value
2. Ductility
3. Softening point
4. Flash & fire point
5. Specific gravity
6. Viscosity of cutback Bitumen

III. Tests on Bituminous Mix

1. Marshall's test on bituminous mixes
2. Bitumen Extraction test by Centrifuge Extractor

IV. Test on Sub-grade soil

1. C.B.R. Test - (on sub grade soil)

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Kadiyali L R, "Highway Engineering", Khanna Book Publishing Co Pvt Ltd, 2019.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
3. Bureau of Indian Standards (BIS) Publications on Highway Materials
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Standard (IS), Methods of test for soil, Part 16 (Second Revision), IS: 2720 (Part 16) – 1987.

Web References

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/transporation_lab/labs/index.php.
2. http://www.nptelvideos.in/2012/12/ transporation_lab.html
3. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-21.pdf
4. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf
5. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdfhttps://dwgmodels.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**			Programme : **B.Tech.**			
Semester	**VI**			Course Category Code: **PC**		End Semester Exam Type: **LE**	
Course Code	**U23CEP609**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Survey Camp**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Surveying and Geomatics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Mastery of modern surveying techniques using Theodolite, Total Station, and GPS for accurate measurements and traverses.	**K3**
	CO2 Proficiency in contour mapping through radial tachometric and block leveling methods for terrain analysis.	**K3**
	CO3 Practical skills in road and canal alignment surveying with longitudinal and cross-sectional surveys.	**K3**
	CO4 Competence in building offset and plot location for precise construction planning.	**K3**
	CO5 Application of astronomical and GPS techniques to determine azimuths and geospatial coordinates.	**K3**

List of Experiments

1. Traverse – using Theodolite / Total station
2. Contouring
   i. Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
   ii. Block Level/ By squares of size at least 100 Meter x 100 Meter atleast 20 Meter interval
   iii. L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30m and C.S at every 90m
4. Offset of Buildings and Plotting the Location
5. Sun observation to determine azimuth (guidelines to be given to the students)
6. Use of GPS to determine latitude and longitude and locate the survey camp location
7. Traversing using GPS
8. Curve setting by deflection angle

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I and II, Lakshmi Publications Pvt Ltd, New Delhi, 2016
2. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 and 2, Pune Vidyarthi Griha Prakashan, Pune, 2014
3. S. K. Duggal, "Surveying, Vol. I and II ", 5th Edition, McGraw Hill, 2019.
4. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
5. Subramanian, “Surveying and Levelling”, Oxford University Press, 2012

Web References

1. https://landsurveyorsunited.com/forum/topics/best-software-to-used-in-surveying
2. https://www.capterra.com/survey-software/
3. https://nptel.ac.in/courses/105/107/105107157/
4. https://nptel.ac.in/courses/105/107/105107122/
5. https://www.youtube.com/watch?v=d_DoEB4zWEQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	-	3	3	2	2	3	3	2	2	3	3	3
2	3	3	-	3	3	2	2	3	3	2	2	3	3	3
3	3	3	2	3	3	3	2	3	3	2	2	3	3	3
4	3	3	2	-	3	2	2	3	3	2	2	3	3	3
5	3	3	2	-	3	2	2	3	3	2	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23CEW602**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mini Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**

CIVIL

Prerequisite	**Civil Engineering, C Programming**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the problem statement for the mini project work through the literature survey	**K2**
	CO2 Choose the proper components as per the requirements of the design/ system**.**	**K2**
	CO3 Apply the acquainted skills to develop final model/system	**K3**

There shall be a Mini Project, which the student shall pursue as a team consists of maximum 4 students during the third year, Sixth semester. The aim of the mini project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Mini-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Mini Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Mini Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	2	-	-	-	3	3	-	1	1	1	1
2	3	3	3	2	2	3	2	3	3	3	1	2	2	2
3	3	2	2	1	-	2	-	3	3	3	1	2	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	**Review 1**			**Review 2**				**Total Marks**
	Novelty	**Presentation**	**Viva**	**Presentation**	**Demonstration**	**Viva**	**Report**	
Marks	10	20	10	20	20	10	10	100

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Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC6XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course - VI**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
CIVIL								
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

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Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **MC**			End Semester Exam Type :**TE**			
Course Code	**U23CEM606**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Gender Equality**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

Prerequisite	**-**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the general identity, social construction of gender roles.	**K2**
	CO2 Illustrate the causes and issues of gender discrimination in Indian society.	**K2**
	CO3 Describe the workplace discrimination, media influences on gender and culture.	**K2**
	CO4 Familiarize with international and Indian frameworks on gender equality.	**K2**
	CO5 Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.	**K2**

UNIT – I	**Introduction to Gender Equality**	**Periods:06**
Gender equality – exploring gender identity and expression, Understanding the social construction of general roles and norms, historical perspectives on gender roles, Analyzing key milestones in the fight for gender equality.		**CO1**
UNIT – II	**Gender Inequality and Its Manifestations**	**Periods:06**
Gender discrimination in Indian society – causes of gender inequality – Illiteracy, patriarchal set up, lack of awareness, social beliefs, practice and custom – Issues of gender discrimination – Child marriage, child domestic work, poor education and health, violence and exploitation in workplace.		**CO2**
UNIT – III	**Gender and Culture**	**Periods:06**
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.		**CO3**
UNIT – IV	**Promoting Gender Equality**	**Periods:06**
Gender Equality and Human Rights – International frameworks and Conventions on Gender Equality – Equality under the Indian Constitution – Policies and initiatives for gender mainstreaming – Strategies for promoting Gender Equality in various contexts.		**CO4**
UNIT – V	**Contemporary Challenges and Future Directions**	**Periods:06**
Current challenges and emerging issues in gender equality – Glass ceiling – role of technology in continuing or challenging gender inequality – Exploring possibilities for transformative change and envisioning a gender-equal future.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Books

1. "Gender and Society" by Raewyn Connell – This book provides a comprehensive overview of gender roles, power dynamics, and the social construction of gender.
2. "The Second Sex" by Simone de Beauvoir – A historical and philosophical examination of women's oppression and gender inequality.
3. "Women and Gender in the Indian Society" by Neera Desai and Usha Thakkar – Focuses on the context of gender roles, inequality, and feminist movements in India.

Reference Books

1. Woman in early Indian societies, New Delhi: Manohar Publications. Sita A. Raman (2009).
2. A social and Cultural history, Volume1. Connecticut: Oxford: Praeger. Sita Raman (2009).
3. A social and Cultural history, Volume2. Connecticut: Oxford: Praeger.
4. Iftikhar R. (2016). Indian Feminism: Class, Gender and Identity in Medieval Ages. Chennai: Notion Press. Iftikhar, R. (2012).

Web References

1. https://www.unwomen.org
2. https://ncw.nic.in
3. https://en.unesco.org/themes/gender-equality
4. https://www.weforum.org/reports
5. https://wcd.nic.in

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	1	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

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Professional Elective Courses – II (Offered in Semester V)

Course Code	Course Title
U23CEE506	Advanced Design of RCC Structures
U23CEE507	Air and Noise Pollution
U23CEE508	Sustainable and Lean Construction
U23CEE509	Airport and Harbor Engineering
U23CEE510	Green Building Technology

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Department	Civil Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CEE506	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Advanced Design of RCC Structures	3	0	0	3	25	75	100

Prerequisite	DESIGN OF RC ELEMENTS	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the behavior of Concrete Material subjected to various conditions	K3
	CO2 Understand the limit state design of columns and beams	K3
	CO3 Understand the serviceability limit state in short and long term conditions	K3
	CO4 Understand the special RC structural elements	K3
	CO5 Understand the Limiting analysis of beams and slabs	K3

UNIT – I	BASICS OF STRUCTURAL DESIGN	Periods:09
Behaviour of concrete under uni-axial compression, Tension, and combined stresses- Modulus of Elasticity and Poisson's Ratio-Creep, shrinkage and temperature effects on concrete- Bearing strength of Concrete- Moment curvature relationship and ductility of R.C. members under monotonic and cyclic loading-Confined Concrete-Reinforcing steel.		CO1
UNIT – II	**DESIGN PHILOSOPHY**	**Periods:09**
Behavior of short and long columns – Limit State Design of Short and Long Columns with Biaxial bending - Interaction curves- Design of beam column joints (problem for type1 only).		CO2
UNIT – III	**SERVICEABILITY LIMIT STATES**	**Periods:09**
Estimation of deflections and crack widths in RC members.		CO3
UNIT – IV	**SPECIAL RC MEMBERS**	**Periods:09**
Behaviour and design of special RC member - deep beams, design of shear walls, corbels and pile caps.		CO4
UNIT – V	**ANALYSIS OF RC MEMBERS**	**Periods:09**
Limit analysis of RC members: moment redistribution in continuous beams, Yield Line theory of slabs, Introduction to Strip theory for the analysis of slabs.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Punmia, B.C and Jain, A.K, Limit state design of Reinforced Concrete, Lakshmi Publications (P) Ltd., New Delhi, First Edition, 2007
2. Varghese P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2011.
3. Subramanian.N., Design of Reinforced Concrete Structures, Oxford University, New Delhi,2013.

Reference Books

1. Sinha, S.N, Reinforced Concrete Design, 2nd Edition, Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, 2002.
2. UnnikrishnaPillai and DevdasMenon, Reinforced Concrete Design, Tata McGraw Hill Publishing Company Ltd., New Delhi, Third edition, 2011
3. Shah V.L. and Karve, S.R, Advanced Reinforced Concrete Design, Structures Publications, Pune, 2002.
4. IS 456-2000 Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi
5. IS 875- 1987 (Part 1), Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures, Bureau of Indian Standards, New Delhi.

Web References

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/105/105105104/
3. https://nptel.ac.in/courses/105/106/105106176/

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	-	3	-	1	1	-	-	-	-	-	3	-	-
2	1	2	-	3	-	1	1	-	-	-	-	-	3	-	-
3	1	2	-	3	-	1	1	-	-	-	-	-	3	-	-
4	1	2	-	3	-	1	1	-	-	-	-	-	3	-	-
5	1	2	-	3	-	-	1	-	-	-	-	-	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

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Department	Civil Engineering	Programme: B.Tech.					
Semester	V	Course Category Code: PE			*End Semester Exam Type: TE		
Course Code	U23CEE507	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Air And Noise Pollution	3	0	0	3	25	75	100

Prerequisite	-	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Identify the types and sources of air pollutants	K2
CO2	Predict the effects of air pollutants on human health and the environment	K2
CO3	Choose appropriate technologies for removal of particulates and gaseous pollutants	K2
CO4	Measure the pollutant concentration in indoor environment	K2
CO5	Suggest the control techniques for Noise pollution.	K2

UNIT – I	INTRODUCTION	Periods:9
Air pollutants – Sources – Classification of air pollutants – Particulates and gaseous pollutants – Effects of air pollutants on human health, vegetation and property – Global issues and air pollution – Global warming – Ozone layer depletion – Ambient air quality and emission standards – Air pollution indices – Air act		CO1

UNIT – II	METEOROLOGY AND AIR POLLUTION	Periods:9
Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height –Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling		CO2

UNIT – III	CONTROL OF PARTICULATE POLLUTANTS	Periods:9
Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers		CO3

UNIT – IV	GASEOUS POLLUTION CONTROL	Periods:9
Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description		CO4

UNIT – V	NOISE POLLUTION CONTROL	Periods:9
Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods: -	Total Periods:45

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2018.
2. Rao.C.S., Environmental Pollution Control Engineering , New Age International Publishers, 2017

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2016.
2. Stern, A.C., Air Pollution, Vol.I, II and III, Academic Press, 2015.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2017.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**V**			Course Category Code: **PE**			*End Semester Exam Type: **TE**	
Course Code	**U23CEE508**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Sustainable and Lean Construction**			**3**	**0**	**0**	**3**	**25 / 75 / 100**
Prerequisite								
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Describe the various sustainable materials used in construction.						**K3**
	CO2	Explain the method of estimating the amount of energy required for building.						**K3**
	CO3	Describe the features of LEED, TERI and GRIHA ratings of buildings.						**K3**
	CO4	Explain the core concepts of lean construction tools and techniques and their importance inachieving better productivity.						**K3**
	CO5	Apply lean tools & techniques to achieve sustainability in construction projects.						**K3**

Unit – I	**Introduction & materials used in sustainable construction**	**Periods:09**
Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.		**CO1**
Unit – II	**Energy calculations**	**Periods:09**
Components of embodied energy-calculation of embodied energy for construction materials - Energy concept and primary energy-Embodied energy via-a-vis operational energy in conditioned building-Life Cycle energy use.		**CO2**
Unit – III	**Green buildings**	**Periods:09**
Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboringtropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'		**CO3**
Unit – IV	**Core concepts in lean**	**Periods:09**
Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).		**CO4**
Unit – V	**Lean construction tools and techniques**	**Periods:09**
Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S, Collaborative Planning System (CPS)/ Last Planner System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.		**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment,Butterworth Heinemann Publishers, 2011.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment ofLean Construction Techniques, Lean Construction Journal, 2005.

Reference Books

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, WileyPublishers 2016.
2. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques,2002.

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1. https://onlinecourses.nptel.ac.in/noc22_ce49
2. https://archive.nptel.ac.in/courses/105/106/105106213
3. https://archive.nptel.ac.in/courses/105/102/105102195
4. https://onlinecourses.nptel.ac.in/noc21_mg85

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	1	1	-	2	3	1	1	-	2	1	3	2	3
2	3	1	3	2	1	2	2	-	1	1	1	2	3	2	3
3	2	2	3	1	1	1	1	-	-	-	3	1	3	3	3
4	3	1	3	2	2	1	3	1	1	1	3	2	3	3	3
5	3	1	2	2	2	2	3	1	-	1	3	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.					
Semester	V	Course Category Code: PE			End Semester Exam Type: TE		
Course Code	U23CEE509	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Airport and Harbor Engineering	3	0	0	3	25	75	100
Prerequisite	Transportation Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Gain an insight on the planning and site selection of Airport Planning and design	K2
CO2	Knowledge on Design of various Airport components	K2
CO3	Analyze and design the elements for orientation of runways and passenger facility systems	K3
CO4	Understand the various features in Harbours and Ports, their construction, coastal protection works	K2
CO5	Knowledge on various Environmental Regulations and Acts	K2

UNIT – I	**AIRPORT PLANNING**	**Periods:09**	
Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area			CO1
UNIT – II	**AIRPORT COMPONENTS**	**Periods:09**	
Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hangar- Passenger Terminals- Geometric design of runway and taxiways-Runway pavement Design- Difference between Highway and airport pavements- Introduction to various design methods- Airport drainage.			CO2
UNIT – III	**AIRPORT DESIGN**	**Periods:09**	
Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Runway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings- Air Traffic Control Tower- Instrumental Landing.			CO3
UNIT – IV	**SEAPORTS COMPONENTS AND CONSTRUCTION**	**Periods:09**	
Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.			CO4
UNIT – V	**SEAPORT REGULATIONS AND EIA**	**Periods:09**	
Wave action on Coastal Structures and Shore Protection and Reclamation – Coastal Regulation Zone, 2011-EIA – methods of impact analysis and its process			CO5

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee,1994
2. Robert Honjeff and Francis X.Mckelvey, "Planning and Design of Airports", McGraw Hill, New York,1996 2. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York,2003
3. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering,Scitech Publications (India), Chennai, 2010

Reference Books

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 2018.
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017 .

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1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105105176/
3. https://nptel.ac.in/courses/105/105/105105039/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

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Department	Civil Engineering	Programme :B.Tech.						
Semester	V	Course Category Code: PE			*End Semester Exam Type: TE			
Course Code	U23CEE510	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Green Building Technology	3	0	0	3	25	75	100
Prerequisite	-							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand green building principles, history, impacts, and Indian rating systems.	K2
CO2	Identify energy sources, their carbon footprints, and building performance testing methods.	K2
CO3	Recognize energy-efficient materials and technologies, and compare sustainable materials.	K2
CO4	Apply green building design guidelines and conduct cost and life-cycle analysis.	K3
CO5	Familiarize with building codes, legislation, and the IGBC certification process.	K2

Unit – I	Concept of Green buildings	Periods:09	
Definition of Green Buildings - Typical features of green buildings - Necessity, initiatives of green buildings in India - Green building Assessment - Green Building Rating Systems - Energy efficient criteria - Environmental benefits, economic benefits, health and social benefits - Major energy efficiency areas for building - Contribution of buildings towards Global Warming - Life cycle cost of buildings - Codes and Certification Programs			CO1

Unit – II	Sources of energy	Periods:09	
Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution - Global scenario with reference to demand and supply in India - Global efforts to reduce carbon emissions. Carbon emission: Forecasting - Control of carbon emission - Air quality and its monitoring carbon foot print - Environmental issues - Minimizing carbon emission - Energy retrofits and Green Remodels.			CO2

Unit – III	Green building materials, planning and specification	Periods:09	
Green Building Materials: Sustainably managed Materials - Depleting natural resources of building materials - Renewable and Recyclable resources - Energy efficient materials - Green cement - Biodegradable materials - Smart materials - Manufactured Materials - Volatile Organic Compounds (VOC's) - Natural Non-Petroleum Based Materials - Recycled materials - Renewable and Indigenous Building Materials - Engineering evaluation of these materials. Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies - Integrated Life cycle design of Materials and Structures - Energy Conservation Measures in Buildings.			CO3

Unit – IV	Design of Green buildings	Periods:09	
Sustainable sites - Impact of building on environment - Life cycle assessment - Principles of sustainable development in building design - Design on Bioclimatic and solar passive architecture - Considerations of energy consumption, water use and system reliability - Indoor air quality, noise level, comfort and cost efficiency in building design - Advanced Green building technologies and innovations.			CO4

Unit – V	Construction of Green buildings	Periods:09	
Energy efficient construction - Practices for thermal efficiency and natural lighting - Eco- friendly water proofing - ECB codes building rating - Maintenance of green buildings - Cost and Performance Comparisons and Benchmarking - Green Project Management methods and Best Practices - Cost/benefit analysis of green buildings - Life-cycle analysis of greenbuildings - Case studies of rated buildings (new and existing).			CO5

Lecture Periods:45	Tutorial Periods:-	Practical Periods:-	Total Periods:45

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Text Books
1. Kibert, C.J, "Sustainable Construction: Green Building Design and Delivery". John Willey and Sons, 2016.
2. Edward G Pita, An Energy Approach – Air -conditioning Principles and Systems", Pearson Education, 2018.
3. K.S Jagadish, B. U. Venkataramareddy and K.S. Nanjundarao, "Alternative Building Materials and Technoogies K, New Age International, 2018.
Reference Books
1. Osman Attmann, "Green Architecture Advanced Technologies and Materials". McGraw Hill, 2018.
2. Jerry Yudelson "Green building Through Integrated Design" McGraw Hill, 2018.
3. Lever More G J,"Building Energy Management System", E and FN Spon , London, 2013.
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1. https://nptel.ac.in/courses/105102195/
2. https://www.archdaily.com/tag/case-study-houses
3. https://www.archdaily.com/category/office-buildings

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
5	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Professional Elective Courses – III (Offered in Semester VI)

Course Code	Course Title
U23CEE611	Advanced Structural Analysis
U23CEE612	Pollution control and Monitoring
U23CEE613	Building Codes and Requirement
U23CEE614	Traffic engineering and Management
U23CEE615	Urban Planning and Development

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PE			*End Semester Exam Type: TE			
Course Code	U23CEE611	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Advanced Structural Analysis	3	0	0	3	25	75	100
Prerequisite	Structural Analysis							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the principles of cable structures and the mechanics of suspension bridges.	K3
CO2	Understand the behavior of arches under different loading conditions.	K3
CO3	Understand the behavior of building frames under various loading conditions	K3
CO4	Analyze indeterminate structures using plastic analysis techniques to determine collapse loads and plastic hinges	K3
CO5	Understand fundamentals theory of the Finite Element Method	K3

UNIT-I	Cables and Suspension Bridges	Periods: 09
Components and their Functions - Analysis of cable under concentrated loads and UDL – Shape of cable under self-weight – Anchorage of suspension cables – Bending Moment and Shear Force in three hinged stiffened girders – Max Bending Moment due to single concentrated load and UDL - Influence lines for Bending Moment and Shear Force – Two hinged stiffened girders		CO1

UNIT-II	Arches	Periods: 09
Arches as structural forms –Types of arches – Two hinged and Three hinged parabolic arches with supports at the same and different levels – Determination of normal thrust, radial shear and bending moment.		CO2

UNIT-III	Analysis of Trusses	Periods: 09
Analysis of trusses with internal and external redundancy with maximum one redundant of simply supported and cantilever truss by force method		CO3

UNIT-IV	Plastic Analysis of Structures	Periods: 09
Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems		CO4

UNIT-V	Finite Element Method	Periods: 09
Introduction – Discretization of structure – Step in Finite Element Analysis – Shape function – Classification of Functional Approximation methods – Analysis of one dimensional and two dimensional elements		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Junuthula Narasimha Reddy, An introduction to the finite element method, McGraw Hill, 1993.

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Reference Books

1. Dr.R.P. Rethaliya, Structural Analysis-I, Atul Prakashan Publisher, 2020
2. Dr. Suresh R. Parekar, H.M. Somayya, Structural Analysis- I, Nirali Prakashan Publisher, 2014
3. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
4. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
5. P.Seshu, "Finite Element Analysis", PHI Learning Private Limited, New Delhi 2012

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1. https://nptel.ac.in/courses/105105166/
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. https://nptel.ac.in/courses/105101085/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	1	-	-	-	-	-	-	-	1	3	3
2	3	3	3	2	1	-	-	-	-	-	-	-	1	3	3
3	3	3	3	2	1	-	-	-	-	-	-	-	1	3	3
4	3	3	3	2	1	-	-	-	-	-	-	-	1	3	3
5	3	3	3	2	1	-	-	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

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Department	Civil Engineering			Programme: B.Tech.				
Semester	VI			Course Category Code: PE			*End Semester Exam Type: TE	
Course Code	U23CEE612	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Pollution Control and Monitoring	3	0	0	3	25	75	100

Prerequisite	Air and Noise Pollution	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water.	K2
	CO2 Analyze the sources, effect of air pollution, air quality monitoring and control system.	K3
	CO3 Use advanced methods for monitoring and modeling for noise pollution and preventive temporal patterns for noise pollution.	K3
	CO4 Understand the generation and preventive measures of solid waste.	K2
	CO5 Analyze the method of sanitation for various field	K3

UNIT – I	WATER POLLUTION & CONTROL	Periods: 09
Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.		CO1
UNIT – II	AIR POLLUTION AND CONTROL	Periods: 09
Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation		CO2
UNIT – III	NOISE POLLUTION AND CONTROL	Periods: 09
Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.		CO3
UNIT – IV	SOLID WASTE MANAGEMENT	Periods: 09
Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.		CO4
UNIT – V	ENVIRONMENTAL SANITATION	Periods: 09
Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurization of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods: -	Total Periods:45

Text Books

1. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
2. S. M. Khopkar "Environmental Pollution Monitoring and Control",New age international(P)Limited 2004
3. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.

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1. Vesilind (1997), Introducing to Environmental Engineering, PWS Publishing Company.
2. Gerard Kiley (1997), Environmental Engineering, Irwin McGraw-Hill.
3. Rao C.S. (1996), Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi.
4. Ahmed El-Nemr, 2010, Impact, Monitoring and Management of Environmental Pollution.
5. Marquita K. Hill,2010 Understanding Environmental Pollution

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2. http://www.ilocis.org/documents/chpt55e.htm
3. https://nptel.ac.in/courses/105/102/105102089

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	1	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	2	3
CO4	2	3	3	3	-	-	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CEE613	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Building Codes and Requirement	3	0	0	3	25	75	100

Prerequisite	Building Materials, Basic of Civil Engineering	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand importance of National Building Code	K2
CO2	Learn various building requirement for building codes	K2
CO3	Identify various fire and safety related codal requirements	K3
CO4	Become aware of different codes related to various building services	K2
CO5	Familiarize the various building bylaws used in building drawings	K2

UNIT – I	INTRODUCTION TO NATIONAL BUILDING CODE	Periods:09	
Scope and Terminologies, Administration. Historical background and need for codes and bye laws for buildings and land use development in urban context. Building Permit and Inspection			CO1
UNIT – II	**GENERAL BUILDING REQUIREMENTS**	**Periods:09**	
Land Use classification, Classification of Buildings, Area and Height Limitations, Requirements of various parts of Building.			CO2
UNIT – III	**FIRE AND SAFETY**	**Periods:09**	
Fire prevention, life safety, Design and Construction-: construction practices and safety, Earth quake resistant of masonry wall, Wind load design.			CO3
UNIT – IV	**BUILDING SERVICES**	**Periods:09**	
Plumbing, Lighting and ventilation, Acoustics, Sound Insulation and Heat Insulation in buildings. National Building Code and provisions related to general building requirements, fire and life safety, lighting and ventilation, MEP, acoustics, vertical circulation, sustainability etc.; Energy Conservation Building Code.			CO4
UNIT – V	**BUILDING BYLAWS**	**Periods:09**	
Overview of various development regulations, building bye laws, architectural controls; Study of Building Bye laws/regulations of selected cities with emphasis on zoning, architectural controls, frame controls etc. Requirements of statutory drawings- submission drawings, as built drawings, completion drawings			CO5

Lecture Periods: 45	Tutorial Periods: 0	Practical Periods: -	Total Periods: 45

Text Books

1. "Building Construction Handbook" by Roy Chudley and Roger Greeno. Publisher: Routledge
2. "Handbook on Building Bye-Laws" by National Building Organisation. Publisher: Ministry of Housing & Urban Poverty Alleviation, Government of India.

Reference Books

1. National Building Code of India 2005
2. SP 64 (2001), SP 7 (2005), Bureau of Indian Standards
3. National Building Code 2005
4. Energy Conservation Building Code (ECBC) 2007
5. Building Byelaws of different cities of India

Web References

1. https://www.irc.nic.in/
2. https://www.bis.gov.in/standards/technical-department/national-building-code/

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CEE614	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Traffic Engineering and Management	3	0	0	3	25	75	100
Prerequisite	Transportation Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Analyze vehicle and driver characteristics, road conditions, and control mechanisms to design effective and safe transportation systems.	K3
CO2	Apply principles of road cross-section design, curvature, and traffic flow analysis to optimize highway and road infrastructure.	K2
CO3	Design and optimize traffic signal systems, including intersections, interchanges, and roundabouts, to improve traffic management and safety.	K3
CO4	Implement traffic regulation strategies, parking management, and control measures to enhance road safety and efficiency.	K3
CO5	Develop and evaluate traffic safety measures, legislation, and infrastructure improvements to reduce accidents and improve overall traffic management.	K2

UNIT – I	ELEMENTS OF TRANSPORTATION ENGINEERING	Periods:09
Vehicle characteristics like weight , size, turning radius, concept of design vehicle. Human and Driver characteristics – PIEVE theory, comfort, concept of design driver. Road characteristics – surface conditions, slopes and curves. Control mechanisms. Terminal facilities.		CO1
UNIT – II	**HIGHWAY GEOMETRIC DESIGN**	**Periods:09**
Introduction, road cross section parameters. Horizontal curves, vertical curves, channelization design. Fundamentals of traffic flow, uninterrupted traffic flow, Interrupted traffic flow, speed studies and analysis, Highway capacity studies and analysis,		CO2
UNIT – III	**TRAFFIC SIGNAL**	**Periods:09**
Fixed and vehicle actuated signals - Optimum cycle length - Warrants for signals - Saturation flow - Signal co-ordination - Area traffic control - Design of signalized and un-signalized intersections. Design of interchanges, Design of roundabouts. Road signs- test of the sign. Lettering and placement of signals.		CO3
UNIT – IV	**TRAFFIC REGULATION AND SAFETY**	**Periods:09**
Regulation of speed - Vehicle and road users – Parking regulations - Parking and Traffic Control : Parking studies - Design of parking lots – Traffic signs - Road markings at different locations - Speed breaker Accident investigation - Accident data analysis.		CO4
UNIT – V	**TRAFFIC MANAGEMENT**	**Periods:09**
Legislation enforcement and education for traffic safety, Cost of road accidents, Measures for accident reduction Segregation of traffic, Tidal flow operation, Exclusive bus lane, oneway streets, Street lighting, Noise barrier.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. S C Saxena and S P Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publication, 2010.

Reference Books

1. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2018.
3. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
4. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017

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Web References
1. http://www.yorku.ca/yaoguo/tranportation1025/
2. http://www. tranportation.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/105101087/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PE				End Semester Exam Type: TE		
Course Code	U23CEE615	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Urban Planning and Development	3	0	0	3	25	75	100

Prerequisite	Transportation Engineering	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Describe basic issues in urban planning	K2
	CO2 Get knowledge on bearing capacity and testing methods.	K2
	CO3 Formulate plans for urban and rural development	K3
	CO4 Determine the load carrying capacity of pile foundation.	K3
	CO5 Plan and analyse socio economic aspects of urban and rural planning.	K3

UNIT – I	BASIC ISSUES	Periods:08
Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri-urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.		CO1
UNIT – II	**PLANNING PROCESS**	**Periods:08**
Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.		CO2
UNIT – III	**DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION**	**Periods:10**
Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies		CO3
UNIT – IV	**PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS**	**Periods:09**
Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.		CO4
UNIT – V	**LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM**	**Periods:10**
Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi,2002
2. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001
3. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

Reference Books

1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu,Chennai.
2. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi,2002.
3. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A
4. Publications, Chennai, 2005

Web References

1. https://archive.nptel.ac.in/courses/124/107/124107158/
2. https:// nptel.ac.in/courses/124105016
3. https://archive.nptel.ac.in/courses/124/105/124105163/

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	2	1	2	-	-	-	-	-	-	3	3	2
2	2	1	2	2	1	2	1	-	-	-	-	-	3	2	3
3	2	3	3	2	2	3	1	-	-	-	-	-	3	2	3
4	2	3	3	2	2	3	1	-	-	-	-	-	2	2	2
5	2	3	3	2	2	3	1	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

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ANNEXURE IV

Honours/Minors Degree Programme

Green Technologies and Sustainable Engineering

Green Technologies and Sustainable Engineering										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
1	**U23CEX401**	Energy, Environment and Renewable Energy Technologies	PC	3	1	0	4	25	75	100
2	**U23CEX502**	Green Technologies & Renewable Energy Systems	PC	3	1	0	4	25	75	100
3	**U23CEX603**	Sustainable Energy Systems	PC	3	1	0	4	25	75	100
4	**U23CEX704**	Sustainability in the Built Environment	PC	3	1	0	4	25	75	100
5	**U23CEX805**	Green management	PC	3	1	0	4	25	75	100

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Department	Civil Engineering	Programme : Honours/Minors						
Semester	IV	Course Category Code: PC				End Semester Exam Type: TE		
Course Code	U23CEX401	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Energy Environment and Renewable Energy Technologies	3	1	0	4	25	75	100

Prerequisite	Environmental Science	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the nexus between energy, environment and sustainable development	K4
CO2	Appreciate energy ecosystems and its impact on environment	K4
CO3	Learn basics of various types of renewable and clean energy technologies.	K4
CO4	Serve as bridge to advanced courses in renewable energy	K4
CO5	Understand about energy and economics.	K4

UNIT- I	ENERGY	Periods: 12
Introduction to the nexus between energy, environment and sustainable development, Energy sources over view and classification, sun as the source of energy, fossil fuel reserves and resources - overview of global/ India's energy scenario. Energy consumption models – Specific Energy Consumption.		CO1

UNIT- II	ECOLOGY AND ENVIRONMENT	Periods: 12
Concept and theories of ecosystems, - energy flow in major man-made ecosystems- agricultural, industrial and urban ecosystems - sources of pollution from energy technologies and its impact on atmosphere - air, water, soil, and the environment - environmental laws on pollution control, The environmental protection act: Effluent standards and ambient air quality, innovation and sustainability, eco-restoration: phyto-remediation.		CO2

UNIT - III	RENEWABLE SOURCES OF ENERGY	Periods: 12
Solar Energy: Solar radiation: measurements and prediction. Indian's solar energy potential and challenges, solar energy conversion principles and technologies: Photosynthesis, Photovoltaic conversion and Photo thermal energy conversion. Wind Energy: Atmospheric circulations, atmospheric boundary layers, classification, factors influencing wind, wind shear, turbulence, wind energy basics and power Content, wind speed monitoring, Betz limit, wind energy conversion system: classification, characteristics and applications. Ocean Energy: Ocean energy resources-ocean energy conversion principles and technologies: ocean thermal, ocean wave & ocean tide. Bioenergy: resources and types.		CO3

UNIT - IV	OTHER ENERGY SOURCES AND SYSTEMS	Periods: 12
Hydropower, Nuclear fission and fusion-Geothermal energy: Origin, types of geothermal energy sites, site selection, geothermal power plants; hydrogen energy, Magneto-hydro-dynamic (MHD) energy conversion – Radioisotope Thermoelectric Generator (RTG), Bio-solar cells, battery & super capacitor, energy transmission and conversions		CO4

UNIT - V	ENERGY AND ECONOMY	Periods: 12
Energy and Economics: gross domestic product (GDP) and energy – energy market and society – energy efficiency – energy – energy and economics – energy: security – equity – environmental sustainability index and global measure		CO5

Lecture Periods: 45	Tutorial Periods: 15	Practical Periods: -	Total Periods: 60

Text Books

1. Loulou, Richard; Waaub, Jean- Philippe,"Energy and Environment Set: Mathematics of Decision Making", Zaccour, Georges (Eds.), 2005.

2. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A "Energy and the Environment", 2nd Edition, John Wiley, 2006.

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Reference Books
1. Energy and the Challenge of Sustainability, World Energy assessment, UNDP, N York, 2000.
2. Solar Energy: principles of Thermal Collection and Storage, S.P. Sukhatme, Tata McGraw-Hill (1984).
3. D. Y. Goswami, F. Kreith and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000.
4. Wind Energy Conversion Systems, L.L. Freris, Prentice Hal 1990.
5. Geothermal Energy: From Theoretical Models to Exploration and Development by Ingrid Sober and Kurt Bucher, Springer, 2013.
6. Ocean Energy: Tide and Tidal Power by R. H. Charlier and Charles W. Finkl, Springer 2010

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering			Programme : Honours/Minors.				
Semester	V			Course Category Code: PC		End Semester Exam Type: TE		
Course Code	U23CEX502	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Green Technologies & Renewable Energy Systems	3	1	0	4	25	75	100
Prerequisite	Environmental Science							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the significance of green technologies.	K4
CO2	Analyze cleaner development mechanism (CDM).	K4
CO3	Understand green production techniques and eco-friendly processes.	K4
CO4	Understand various aspects of green buildings	K4
CO5	Analyze renewable energy systems as a part of green technology.	K4

UNIT- I	FUNDAMENTALS OF GREEN TECHNOLOGY	Periods: 12
Twelve principles of green chemistry, definition & significance of Green technology, factors affecting green technology. Role of green technologies in sustainable development, industrial ecology, role of industrial ecology in green technology.		CO1
UNIT- II	**CLEANER DEVELOPMENT MECHANISM**	**Periods:12**
Cleaner development mechanisms, role of industry; reuse, reduce and recycle, raw material substitution; wealth from waste; carbon credits, carbon trading, carbon sequestration, eco labeling; Oxidation technology for waste water treatment- Cavitation, Fenton chemistry, photocatalysis and hybrid processes.		CO2
UNIT - III	**ECO FRIENDLY PROCESSES**	**Periods: 12**
Energy efficient design of processes- photo, electro and sono chemical methods, microwave assisted synthesis, Eco-friendly and costeffective materials, recyclable and environment friendly materials, green production systems.		CO3
UNIT - IV	**GREEN BUILDINGS & SUSTAINABLE URBANIZATION**	**Periods: 12**
Basic Features, advantages & limitations, Energy efficient buildings- methods for increasing energy efficiency of buildings, building components, ventilation system, Energy need and supply, use of solar photovoltaic system and sun-tracking system, Sustainable cities, Sustainable transportation.		CO4
UNIT - V	**RENEWABLE ENERGY**	**Periods:12**
Various renewable energy sources, Solar Energy Systems: Solar radiations data; Solar energy collection, Storage and applications, Hydro Energy Systems: Resource assessment of micro and small hydro power: WindEnergy Systems, bio-fuels, fuel cells.		CO5

Lecture Periods: 45	Tutorial Periods: 15	Practical Periods: -	Total Periods: 60

Text Books

1. M. Lancaster, "Green Chemistry – An introductory text", RSC.
2. Rashmi Sanghi and M.M. Srivastava, "Green Chemistry-Environment Friendly Alternatives", NarosaPublishing House, New Delhi 2009.

Reference Books

1. Paul L. Bishop, Pollution prevention –Fundamentals and Practices, McGraw-Hill- international 2000
2. Mili Majumdar, "Energy Efficient Buildings in India"' Tata Energy Research Institute.
3. Volker Quaschning, "Understanding Renewable Energy Systems".
4. Abbasi & Abbasi, "Renewable Energy Sources and Their Environmental Impacts", Prentice Hall of India.
5. B.H Khan, "Non conventional energy resources", Tata McGraw-Hill, New Delhi 2006.

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

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Department	Civil Engineering			Programme : Honours/Minors.				
Semester	VI			Course Category Code: PC		End Semester Exam Type: TE		
Course Code	U23CEX603	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Sustainable Energy Systems	3	1	0	4	25	75	100
Prerequisite	Environmental Science							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Analyze the energy landscape and sustainability to provide solutions to energy problems using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	K4
	CO2 Analyze solar and wind energy systems to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.	K4
	CO3 Analyze biomass, geothermal, tidal and wave energy systems to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.	K4
	CO4 Analyze electric storage technology systems to solve the complex energy problems using appropriate tools and techniques following relevant standards and latest developments considering society, health, environment, sustainability and economics besides communicating effectively in graphical form	K4
	CO5 Analyze grid integration of renewable energy to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.	K4

UNIT- I	THE ENERGY LANDSCAPE AND SUSTAINABILITY	Periods: 12
Current global energy use, National and international energy consumption and relatedgreenhouse gas emissions, Lifetime of fossil fuels, Sustainability and energy use, Energyconversion technologies, Energy forms and conversion, First and second laws ofthermodynamics and efficiencies; Devices - Heat engines, Refrigerators, Heat pumps;Instantaneous and average power		CO1

UNIT- II	SOLAR AND WIND ENERGY	Periods:12
Principles of solar radiation, Resource foundations, Technology challenges, Sustainability,Solar energy industry and economics, Net Metering; Origin of the wind, Power in thewind, Wind resource basics, Wind energytechnologies, Challenges, Sustainability, Windenergy Industry.		CO2

UNIT - III	BIOMASS, GEOTHERMAL, TIDAL AND WAVE ENERGIES	Periods: 12
Sources of feedstocks; Biofuels - Bioethanol, Biodiesel, Algal, Jatropha and Biogas;Conversion technology, Diesel and ethanol, Biogas, Electricity production,Transportation, Challenges, Sustainability, Economics; Geothermal energy - Principles,Geothermal potential and technology, Electricity production, Conversiontechnology,Challenges, Economics; Tidal and wave energies, Conversion technologies,Sustainability.		CO3

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UNIT - IV	ELECTRICITY STORAGE TECHNOLOGIES	Periods: 12
Introduction, Battery energy storage technologies - Lithium-ion batteries, Full cells,Nickel-based batteries, Lead-acid batteries, Sodium-sulfur batteries; Hydro energystorage - Applications of pump hydro energy storage plant,Site selection for pump hydroenergy storage plant; Thermal energy storage, Capacitors and applications, Latestdevelopments		CO4

UNIT - V	GRID INTEGRATION OF RENEWABLE ENERGY	Periods:12
Variability, Intermittency and dispatchability, Electric grid infrastructure, Integratingrenewable energy into the grid, Growing a more efficient grid, The smart grid, Securecommunication in the smart grid; Cogeneration plant and power distribution in industry,Micro grids.		CO5

Lecture Periods: 45	Tutorial Periods: 15	Practical Periods: -	Total Periods: 60

Text Books

1. Boyle, Godfrey, "*Renewable Energy: Power for a Sustainable Future*", Oxford University Press, 3rd Edition, 2012.
2. efferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, WilliamA. Peters, "*Sustainable Energy (ChoosingAmong Options)*", MIT Press, 2nd Edition,2012.

Reference Books

1. Gilbert M. Masters, "*Renewable and Efficient Electric Power Systems*", John Wiley &Sons, Inc., Hoboken, New Jersey, 2nd Edition, 2013
2. Vanek, F.M., Albright, L.D., "*Energy Systems Engineering - Evaluation and Implementation*", McGraw-Hill, 2nd Edition, 2008.
3. David MacKay, "*Sustainable Energy: Without the Hot Ai"r*, UIT Cambridge Ltd., Cambridge, England, 2009.
4. Frank Kreith, "*Principles of Sustainable Energy Systems*," , CRC Press, Taylor and Francis group, 2nd Edition, 2014.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme : Honours/Minors						
Semester	VII	Course Category Code: PC			End Semester Exam Type: TE			
Course Code	U23CEX704	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SUSTAINABILITY IN THE BUILT ENVIRONMENT	3	1	0	4	25	75	100

Prerequisite	Environmental science		
Course Outcomes	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Analyze sustainable urban development to solve problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form	K4
	CO2	Analyze sustainable site planning to solve complex problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	K4
	CO3	Analyze sustainable buildings to solve complex problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	K4
	CO4	Analyze building envelope and services to solve complex problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	K4
	CO5	Analyze management of sustainable built environment to solve complex problems using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	K4

UNIT- I	SUSTAINABLE URBAN DEVELOPMENT	Periods: 12	
Urban development - Human activities and their effects; Carbon cycle; Role ofconstruction material such as concrete and steel; CO2 contribution from cement andother construction materials; GHG emissions - Global climate change; Efforts insustainable development and construction - Universal efforts, Internationalorganizations involved.			CO1

UNIT- II	SUSTAINABLE SITE PLANNING AND ANALYSIS	Periods:12	
Sustainable site planning, Principles of site analysis, Improving sustainability of a site –Stormwater, Reducing site disturbance, Vegetation; Site analysis - Examples of siteanalysis; Introduction to alternative energy - Solar, Wind, Hydro, Biofuel etc.			CO2

UNIT - III	SUSTAINABLE BUILDINGS	Periods: 12	
Introduction to sustainable buildings and standards, Green buildings, Energy efficiency and sustainability; Passive House; Net Zero Energy Buildings (NZEB), Examples of different types of NZEB.			CO3

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UNIT - IV	BUILDING ENVELOPE AND SERVICES	Periods: 12	
Building envelope effect and energy efficiency measures, Renewable energy integration,Sustainable building services, Sustainable construction and materials, Integrated design,Energy use and CO2, Built environment - Aging and susceptibility to natural disasters.			CO4
UNIT - V	**MANAGEMENT OF SUSTAINABLE BUILT ENVIRONMENT**	**Periods:12**	
Life cycle planning, Measuring sustainability; Facilities management – Waste management, Improved amenities, Improved transport infrastructure, Social mix, Accessibility issues, Cultural and historical issues.			CO5
Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Alison Cotgrave and Mike Riley, "*Total Sustainability in the Built Environment*",Macmillan Education, 1st Edition, 2012.
2. Kevin Lynch and Gary Hack, "*Site Planning*", MIT Press, 3rd Edition, 1984.

Reference Books

1. William McLean and Pete Silver, "*Environmental Design Source Book: Innovative Ideas for a Sustainable Built Environment*", RIBA Publishing, 1st Edition, 2021.
2. Tim Dixon, John Connaughton, Stuart Green, "*Sustainable Futures in the Built Environment to 2050: A Foresight Approach to Construction and Development*", John
3. Rob Fleming, Saglinda H Roberts, "*Sustainable Design for the Built Environment*",Routledge Press, London, 1st Edition, 2019
4. Charles J. Kibert, "*Sustainable Construction: Green Building Design andDelivery*",Wiley,4th Edition, 2021.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
5	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering			Programme : Honours/Minors.			
Semester	VIII			Course Category Code: PC		End Semester Exam Type: TE	
Course Code	U23CEX805	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	GREEN MANAGEMENT	3	1	0	4	25	75	100

Prerequisite	Environmental Science	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Demonstrate an understanding of the concept, evolution, nature, scope, and types of Green Management	**K4**
	CO2 Analyze the Indian corporate structure and the environmental challenges it faces and Develop strategies for organizations to implement Green Management practices and address sustainability issues in high-tech production.	**K4**
	CO3 Assess indicators of sustainability and the role of ecosystem services in promoting biodiversity and examine alternate theories in ecological economics from an Indian perspective	**K4**
	CO4 Evaluate the impact of climate change on business practices and understand the relevance of ISO 14064 in environmental management and explore financial initiatives for green projects, including green financing and energy management strategies.	**K4**
	CO5 Apply knowledge of green tax incentives, project management, and business redesign in real-world scenarios and Develop eco-commerce models that promote sustainability and corporate environmental responsibility	**K4**

UNIT- I	**INTRODUCTION TO GREEN MANAGEMENT**	**Periods: 12**
The Concept of Green Management; Evolution; nature, scope, importance and types; Developing a theory; Green Management in India; Relevance in twenty first century		**CO1**

UNIT- II	**ORGANIZATIONAL ENVIRONMENT**	**Periods:12**
Indian Corporate Structure and Environment; How to go green; spreading the concept in organization; Environmental and sustainability issues for the production of high-tech components and materials, Life Cycle Analysis of materials, sustainable production and its role in corporate environmental responsibility (CER).		**CO2**

UNIT - III	**APPROACHES FROM ECOLOGICAL ECONOMICS**	**Periods: 12**
Indicators of sustainability; Eco- system services and their sustainable use; Bio-diversity; Indian perspective; Alternate theories		**CO3**

UNIT - IV	**ENVIRONMENTAL REPORTING AND ISO 14001**	**Periods: 12**
Climate change business and ISO 14064; Green financing; Financial initiative by UNEP; Green energy management; Green product management		**CO4**

UNIT - V	**GREEN TECHNIQUES AND METHODS**	**Periods:12**
Green tax incentives and rebates (to green projects and companies); Green project management in action; Business redesign; Eco-commerce models.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

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Text Books
1. Jazmin Seijas Nogarida, "Green Management and Green Technologies: Exploring the Causal Relationship", ZEW Publications.
2. Leo A. Meyer,"The Green Energy Management Book", LAMA books
Reference Books
1. John F. Whaik, Green Marketing and Management: A global Perspective,Qbase Technologies.
2. Richard Maltzman And David Shiden, "Green Project Management", CRC Press Books.
3. Andrew S. Winston, "Green and World", Yale Press B

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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ANNEXURE V

Professional Elective – II (Offered in Semester V)

U20CEE506 **GROUND IMPROVEMENT TECHNIQUES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Study the geotechnical problems in various types of soils and suggestions
- Learn the suitable dewatering techniques
- Learn the appropriate grouting materials and techniques to strengthen the soil.
- Study the stabilization techniques.
- Understand the various geo synthetic materials for soil.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Assess the geo-technical problems in various types of soils and suggest suitable ground improvement techniques. **(K4)**

CO2 - Choose suitable dewatering techniques for construction sites where the ground water table is at a higher level. **(K4)**

CO3 - Select the appropriate grouting materials and techniques to strengthen the soil. **(K2)**

CO4 - Apply the stabilization techniques for soil. **(K3)**

CO5 – Understand the design and application of geo synthetics materials.

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION (9 Hrs)

Introduction: Need – methods – suitability – Mechanical modification: principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation.

UNIT II DRAINAGE AND DEWATERING (9 Hrs)

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis. Preloading, sand drains, wick drains- Thermal methods case studies.

UNIT III GROUT TECHNIQUES (9 Hrs)

Grouting: Classification – Methods – Types – grouts – equipments, grouting design and layout, grout monitoring – applications – Case studies.

UNIT IV STABILIZATION (9 Hrs)

Stabilization: cement stabilization, Lime stabilization – chemical stabilization - methods, principles, applications and field control. Stabilization using reinforcement – rock anchor- soil tie backs.

UNIT V GEO SYNTHETICS (9 Hrs)

Geo synthetics: Geotextiles, Geogrids, Geomembranes, Geonets, Geomats, Geomeshes, principles Design and applications – Case studies.

Text Books

1. Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications, 2020.
2. NiharRanjanPatra, Ground Improvement Techniques, S.Chand Publishers 2012
3. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, 2013.

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Reference Books

1. Das, B.M. – "Principles of Foundation Engineering" 7th edition, Cengage learning, 2016
2. Robert M. Koerner , "Designing with Geosynthetics Vol. 1and2", Xlibris; 6 edition, 2012
3. Jie Han, Principles and Practice of Ground Improvement, John Wiley and Sons, 2015

Web References

1. https://nptel.ac.in/courses/105/108/105108075/
2. https://nptel.ac.in/courses/105/103/105103097/
3. https://nptel.ac.in/courses/105/101/105101201/

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	2	-	1	-	-	-	-	-	1	2	2	2
CO 2	2	3	3	3	1	2	2	-	-	-	-	1	2	2	2
CO 3	3	3	2	2	2	1	-	-	-	-	2	1	2	2	2
CO 4	2	1	-	-	-	-	-	-	-	-	2	1	2	2	2
CO 5	3	3	3	3	2	-	-	-	-	-	2	1	2	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

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Professional Elective – IV (Offered in Semester VII)

U20CEE716 SITE INVESTIGATION METHODS AND PRACTICES	L	T	P	C	Hrs
	3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the site investigation, its types and applications
- Gain the knowledge about the geological methods and its characterization
- Familiar with the logging methods, classification and its factors
- Understand the site exploration methods and its factors
- Understand the technical report preparation on site works

Course Outcomes

After completion of the course, the students will be able to

CO1 – Understand the methods of site investigation through various maps & records. **(K2)**
CO2 – Characterize the rocks & its test procedures. **(K2)**
CO3 – Classify the bore hole & prepare a log report for bore hole. **(K2)**
CO4 – Familiarize with the different insitu tests & sampling procedures. **(K2)**
CO5 – Write technical report for various site works. **(K2)**

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION (9 Hrs)

Objective(s) of site investigation - various stages in site investigation process - Planning and Desk Study - topographic maps, aerial photographs - interpretation of aerial photographs, applications in site investigation , Geological maps, minerals and mining records, soil planning maps, site reconnaissance and local enquiries.

UNIT II GEOLOGICAL METHODS (9 Hrs)

Geological methods - different stages, Geological exploration methods –Areal mapping, site mapping and construction mapping-Rock mass characterization- Discontinuities in rocks ,Rock core descriptors , Rock mass classification, RQD, Rock mass rating, Rock structure rating , Q-system- General principle distribution of physical field in subsurface – Electrical resistivity, Seismic refraction methods, their principle, methods of survey, correction to field data, Interpretation and limitations. Index and Mechanical properties of rocks, Laboratory and insitu tests.

UNIT III GEOPHYSICAL EXPLORATION (9 Hrs)

Trial pits, shafts, tunnels, auguring, and different types of drilling methods, their merits and demerits, Bore hole logging techniques (subsurface geophysical exploration) - Need for logging techniques, classification and different types logging methods.

UNIT IV SAMPLING METHODS (9 Hrs)

Soil Exploration methods, samples, sampling procedure, sample disturbances, samplers, Factors controlling spacing and depth of bore hole, Insitu tests, SPT, SCPT, Pressure meter tests, interpretation and application, Index properties , Laboratory testing.

UNIT V REPORT PREPARATION (9 Hrs)

Technical Report writing, report format, recommendations for earth work structures, highway excavations and drainage works, dams, check report site preparation, investigation during construction and operation.

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Text Books

1. Francis Longstreth Thompson "Site planning in Practice: an Investigation of the Principles of Housing Estate Development" Palala Press, 2016.
2. Craig. C "Advances in site investigation practice" Thomas Telford Ltd, 1996
3. Joyce, M.D. 'Site Investigation Practice; ESFN. SPON Publishers, 1982.

Reference Books

1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2006.
2. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
3. Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988.
4. Legget and Karrow, Hand book of Geology in Civil Engineering, McGraw Hill Publishers, 1983.
5. Hunt, R.E., Geotechnical Engineering Analysis and Evaluation, McGraw Hill Book Company, 1986.

Web References

1. https://nptel.ac.in/courses/105103182/
2. https://nptel.ac.in/courses/105104167/
3. http://www.digimat.in/nptel/courses/video/105103182/L15.html
4. https://nptel.ac.in/courses/105/108/105108075/
5. https://nptel.ac.in/courses/105/105/105105185/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	3	3	2	2
CO2	2	-	-	-	1	-	-	-	-	-	-	3	3	2	2
CO3	2	1	-	-	1	-	-	-	-	-	-	2	3	2	2
CO4	1	1	-	2	1	-	-	-	-	-	-	2	3	2	2
CO5	-	-	2	-	-	2	-	-	-	-	-	3	3	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

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Open Elective – III (Offered in Semester -V)

		L	T	P	C	Hrs
U20HSO504	PROJECT MANAGEMENT FOR ENGINEERS	3	0	0	3	45

Course Objectives

- To understand the various concepts and steps in project management.
- To familiarize the students with the project feasibility studies and project life cycle
- To enable the students to prepare a project schedule
- To understand the risk management and project Control process.
- To learn about the closure of a project and strategies to be an effective project manager.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Interpret the different concepts and the various steps in defining a project. **(K2)**
CO2 - Examining the feasibility of a project. **(K3)**
CO3 - Build a schedule for a Project. **(K6)**
CO4 - Predict the risk associated with a project and demonstrate the project audit. **(K2)**
CO5 - Analyse the project team and outline the Project closure. **(K4)**

UNIT I PROJECT MANAGEMENT CONCEPTS (9 Hrs)

Project: Meaning, Attributes of a project, Project Life cycle, Project Stakeholders, Classification, Importance of project management, Project Portfolio Management System, Different Project Management Structure, Steps in Defining the Project, Project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints

UNIT II PROJECT FEASIBILITY ANALYSIS (9 Hrs)

Opportunity Studies, Pre-Feasibility studies, and Feasibility Study: Market Feasibility, Technical Feasibility, Financial Feasibility and Economic Feasibility. Financial and Economic Appraisal of a project, Social Cost Benefit Analysis in India and Project Life Cycle.

UNIT III PROJECT SCHEDULING & NETWORK TECHNIQUES (9 Hrs)

Scheduling Resources and reducing Project duration: Types of project constraints, classification of scheduling problem, Resources allocation methods, Splitting, Multitasking, Benefits of scheduling resources, Rationale for reducing project duration, Options for accelerating Project completion
Developing and Constructing the Project Network (Problems), PERT, CPM; Crashing of Project Network,

UNIT IV PROJECT RISK MANAGEMENT AND PROJECT CONTROL (9 Hrs)

Project Risk management; Risk concept, Risk identification, Risk assessment, Risk response development, Contingency planning, Contingency funding and time buffers, Risk response control, and Change control management
Budgeting and Project Control Process, Control issues, Tendering and Contract Administration. Steps in Project Appraisal Process and Project Audits

UNIT V PROJECT CLOSURE AND MANAGING PROJECT (9 Hrs)

Project Closure: Team, Team Member and Project Manager Evaluations. Managing versus Leading a Project: Qualities of an Effective Project Manager, Managing Project Stakeholders, Managing Project Teams: Five Stage Team Development Model, Situational factors affecting team development and project team pitfalls.

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Text Books

1. Erik Larson and Clifford Gray. "Project Management: The Managerial Process". 6th Edn. McGraw Hill Education; 2017.
2. Harold Kerzner. "Project Management: A systems approach to Planning, Scheduling and Controlling. 12th Edn. John Wiley & Sons; 2017

Reference Books

1. Meredith, J.R. & Mantel, S. J. "Project Management- A Managerial Approach". John Wiley.:2017
2. Prasanna Chandra. "Projects: Planning, Analysis, Selection, Financing, Implementation, and Review". 9th Edn. McGraw Hill Education; 2019.
3. B C Punmia by K K Khandelwal. "Project Planning and Control with PERT and CPM". 4th Edn. Laxmi Publications Private Limited; 2016.
4. Hira N Ahuja, S.P.Dozzi, S.M.Abourizk. "Project Management". 2nd Edn. Wiley India Pvt Ltd; 2013.
5. "A guide to Project Management Body of Knowledge". 6th Edn. Project Management Institute; 2017

Web Resources

1. www.pmi.org
2. www.projectmanagement.com
3. https://www.sciencedirect.com/journal/international-journal-of-project-management
4. https://nptel.ac.in/courses/110/107/110107081/
5. https://nptel.ac.in/courses/110/104/110104073/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	2	-	1	-	-	-	-	-	2	-	2	2	-	-	-
2	-	2	1	-	-	1	-	-	1	1	1	1	-	-	-
3	-	1	3	-	-	-	-	-	-	-	1	-	-	-	-
4	3	1	1	-	-	1	1	-	-	1	1	3	-	-	-
5	3	-	3	-	-	-	-	3	3	2	3	2	-	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

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Open Elective – IV (Offered in Semester -VII)

U20ECO705	IOT AND ITS APPLICATIONS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

Course Outcomes

After completion of the course, students will be able to

CO1-Understand internet of Things and its hardware and software components.(K2)
CO2-Demonstrate the Interfacing of I/O devices, sensors & communication modules.(K3)
CO3-Understand the concepts of remotely monitor data and control devices.(K2)
CO4-Build and deploy an various architecture with their elements.(K3)
CO5-Can develop real time IoT based projects.(K3)

UNIT – I INTRODUCTION TO INTERNET OF THINGS (9 Hrs)

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

UNIT -II ARCHITECTURE OF IoT (9 Hrs)

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT - III ELEMENTS OF IoT (9 Hrs)

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.
Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT - IV IoT APPLICATION DEVELOPMENT (9 Hrs)

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

UNIT -V IoT APPLICATIONS (9 Hrs)

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

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Text Books

1. Vijay Madisetti, Arshdeep Bahga, "Ïnternet of Things, A Hands on Approach", University Press ,3rd/e ,Aug 2018.
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill ISBN: 9789352605224, 9789352605224,2nd edition, May 2017
3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs 2014

Reference Books

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2012
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2007
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
6.

Web Resources

1. https://www.i-scoop.eu/internet-of-things-guide/
2. https://www.theinternetofthings.eu/
3. https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/
4. https://www.coursera.org/learn/iot
5. https://onlinecourses.nptel.ac.in/noc21_ee85/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	2	2	3	2	-	-	-	-	-	-	-	-	-	-	-
2	3	-	3	2	-	-	-	-	-	-	-	-	-	-	-
3	2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
4	2	2	2	-	-	-	-	-	-	-	3	-	-	-	-
5	2	3	2	-	3	-	-	-	-	-	3	-	-	-	-

Correlation Level: 1-Low, 2-Medium, 3-High

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Annexure VI

CHOSEN SKILL ENHANCEMENT COURSES – I (REGULATION 2023)

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**Third**	Course Category Code: SEC			*End Semester Exam Type: -			
Course Code	**U23CES301**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**BASIC VASTHU**	**0**	**0**	**2**	**-**	**100**	**-**	**100**

UNIT-I	**Introduction to Vasthu Shastra**	**Periods: 06**

Overview of Vasthu Shastra- Ancient texts and scriptures (e.g., Manasara, Vishwakarma Prakash)-Role in building design and planning-

Cultural significance- Relationship with astrology and geography-Introduction to common Vasthu terms (e.g., Vasthu Dosh, Shubh Muhurat).

UNIT-II	**Fundamental Principles of Vasthu**	**Periods: 06**

Five Elements (Panchabhutas)- Earth, Water, Fire, Air, and Space-

Directions and their Significance-Importance of cardinal directions (North, South, East, West)-Auspicious and inauspicious directions-

Vasthu Purusha Mandala-Spatial Geometry and Design Shapes and forms (square, rectangular, circular) and their significance

UNIT-III	**Vasthu for Residential Buildings**	**Periods: 06**

Site Selection and Layout: Criteria for choosing a plot (topography, environment), Orientation and zoning

Room Placement and Design: Ideal placements for various rooms (bedrooms, kitchens, bathrooms),

Ventilation and Lighting: Importance of natural light and airflow, design tips for maximizing natural resources.

UNIT-IV	**Vasthu for Commercial Buildings**	**Periods: 06**

Office Layout and Design: Principles for efficient workspace, Placement of desks and meeting rooms,

Retail Spaces: Designing for customer flow and engagement.

UNIT-V	**Impact of Vasthu on Business Success**	**Periods: 06**

Case studies of successful Vasthu-compliant businesses Understanding the psychological impact of Vasthu on employees and customers,

Hospitality Sector: Vasthu considerations for hotels and restaurants.

Lecture Periods: 30	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	Internal Assessment Marks (CAM)			Total Marks
	Attendance	Report	Presentation/Demo/Skil Test	
Marks	10	40	50	100

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CHOSEN SKILL DEVELOPMENT COURSES 4 AND 5 (REGULATION 2020)

		L	T	P	C	Hrs
U20CES504	SKILL DEVELOPMENT COURSE 4 (Foreign Language / IELTS - I)	0	0	2	-	30

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are to be approved by Academic Council on the recommendation of HOD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting, Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.

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	SKILL DEVELOPMENT COURSE 5	L	T	P	C	Hrs
U20CES505	(Presentation Skills using ICT)	0	0	2	0	30

The methodology used is "learning by doing", a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

CT skills

- Understand ICT workflow in cloud computing.
- Manage multitasking.
- Deal with main issues using technology in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study and have to prepare a report, running to 15 or 20 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee for a total of 100 marks. The marks attained for this course is not considered for CGPA calculation.

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CHOSEN MANDATORY COURSES – REGULATION 2023

Department	Civil Engineering	Programme: B.Tech.						
Semester	Third	Course Category Code: MC			*End Semester Exam Type: -			
Course Code	U23CEM303	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Climate Change	2	0	0	-	100	-	100

Prerequisite	-	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Inspect the characteristics and temperature profile of the atmosphere	K2
CO2	Analyze past climate, human influence on global warming, and predict future climates	K3
CO3	Analyze the impact of climate change and the risk of Irreversible changes	K3
CO4	Outline the carbon credits and evidences of changes in Environment	K2
CO5	Acquire knowledge on clean development mechanism and mitigation technologies	K2

UNIT-I	ATMOSPHERE AND ITS COMPONENTS	Periods: 06
Importance of Atmosphere - Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere - Composition of the atmosphere-Atmospheric stability -Temperature profile of the atmosphere - Lapse rates - Temperature inversion-effects of inversion on pollution dispersion.		CO1
UNIT-II	**GLOBAL CLIMATE**	**Periods: 06**
Account of past climate - Environmental indicators and instrumental records - Human Footprints on global warming- Predicting future climates- Temperature regime - Extreme climate events		CO2
UNIT-III	**IMPACTS OF CLIMATE CHANGE**	**Periods: 06**
Causes of Climate change: Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors - Agriculture, Forestry and Ecosystem - Water Resources - Human Health - Industry, Settlement and Society - Methods and Scenarios - Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change - Risk of Irreversible Changes		CO3
UNIT-IV	**OBSERVED CHANGES AND ITS CAUSES**	**Periods: 06**
Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks -The Montreal Protocol - UNFCCC - IPCC -Evidences of Changes in Climate and Environment - on a Global Scale and in India.		CO4
UNIT-V	**CLIMATE CHANGE AND MITIGATION MEASURES**	**Periods: 06**
Clean Development Mechanism -Carbon Trading- examples of future Clean Technology - Biodiesel -Natural Compost - Eco- Friendly Plastic - Alternate Energy - Hydrogen - Bio-fuels —Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices-Carbon sequestration - Carbon capture and storage (CCS) - International and Regional cooperation- Remedial measures.		CO5

Lecture Periods: 30	Tutorial Periods:	Practical Periods: -	Total Periods: 30

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.
2. Andrew Dessler and Edward A. Parson "The Science and Politics of Global Climate Change" 2009
3. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
4. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
5. S. Dash Sushil Kumar, "Climate Change - An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

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Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. Jason Smerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. Van Dam,(2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University press

Web References

1. lutos://nntelac.in/courses/105102089/
2. httos://wonv.warmheartworldwide
3. huns://noteLac.inkontent/storage

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

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CHOSEN MANDATORY COURSES – REGULATION 2020

		L	T	P	C	Hrs
U20CEM505	INDIAN CONSTITUTION	2	0	0	-	30

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India –The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

U20CEM707	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

This course should enable the students to

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes

After completion of the course, the students will be able to

CO - Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

UNIT I HUMAN VALUES **(6 Hrs)**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Livingpeacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS **(6 Hrs)**

Senses of „Engineering Ethics" — Variety of moral issues — Types of inquiry — Moral dilemmas — Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **(6 Hrs)**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **(6 Hrs)**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES **(6 Hrs)**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Codeof Conduct — Corporate Social Responsibility

Reference Books

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases", Cengage Learning, 2009
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
6. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
7. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi2013.
8. World Community Service Centre, " Value Education", Vethathiri publications, Erode,2011

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

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CHOSEN CERTIFICATE COURSES

Sl. No.	Regulation	Chosen Course
1	2023	Total Station
2	2020	STAAD Pro – V8i

CERTIFICATION COURSE

L	T	P	C	Hrs
0	0	4	-	50

Students shall choose an International / Reputed organization certification course of 40 - 50 hours duration specified in the curriculum (mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses shall have no credit and will not be considered for CGPA calculation.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

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CHOSEN ONLINE NPTEL CERTIFICATION COURSES

Batch	List of Courses	No. of Students Registered
2023-2027	Earth Science for Civil Engineering Part I & II	26
2022-2026	Cyber Security	04
	Sustainable Engineering Concepts and Life Cycle Analysis	03
2021-2025	Geotechnical Engineering Laboratory	05

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ANNEXURE VII

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF CIVIL ENGINEERING
Revised list of question paper setters and Evaluators

Specialization		Structural Engineering		
S.No	**Name of the Examiner**	**Designation & Institution Name**	**Mobile No**	**Mail ID**
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17.	Dr. L.K.Rex	Professor, Department of Civil Engineering Meenakshi College of Engineering, West K.K. Nagar, Chennai - 600078	9381026207	rex_lk@rediffmail.com lkrex2009@gmail.com
18.	Dr.S.Kotteeswaran	Associate Professor, Department of Civil Engineering Jaya Engineering College Tiruninarvur, Avadi	9751103627	skotteeswaranme1992@gmail.com
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Specialization	Geotechnical Engineering			
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Specialization	Water and Wastewater Management			
S.No	Name of the Examiner	Designation & Institution Name	Mobile No	Mail ID
1.	Dr. P. Sivarajan	Associate Professor, Department of Civil Engineering, Annamalai University, Annamalainagar - 608002 Tamil Nadu	9443669336	sivarajan.au@gmail.com

Specialization	Fluid Mechanics and Machinery			
S.No	Name of the Examiner	Designation & Institution Name	Mobile No	Mail ID
1.	Dr. Arivumangai	Assistant Professor, Department of Civil Engineering, Dr. MGR Educational & Research Institute, Chennai- 600095	9443486831	arivu_civil@yahoo.co.in

Specialization	Water Resources Engineering			
S.No	Name of the Examiner	Designation & Institution Name	Mobile No	Mail ID
1.	Dr. Jailakshmi Menon	Associate Professor, Department of Civil Engineering, Saveetha Engineering College, Chennai- 602105	9940066459	jailakshmiunni@gmail.com
2.	Dr.N.Senthil Kumar	Assistant Professor, Department of Civil Engineering, Vellore Institute of Technology, Vellore- 632014	9003378135	n.senthilkumar@vit.ac.in

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Civil

COMMON COURSE

COMMON COURSES OFFERED BY CIVIL ENGINEERING

Sl.No.	Course Code	Course Title
1	U23ESTC01	Basics of Civil and Mechanical Engineering

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE401	Composite Structures
2	U23CEE402	Environmental Law and Policy
3	U23CEE403	Building Services
4	U23CEE404	Remote Sensing and GIS
5	U23CEE405	Alternative Building Materials and Technologies
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE506	Advanced Design of RCC Structures
2	U23CEE507	Air and Noise Pollution
3	U23CEE508	Sustainable and Lean Construction
4	U23CEE509	Airport and Harbor Engineering
5	U23CEE510	Green Building Technology
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE611	Advanced Structural Analysis
2	U23CEE612	Pollution Control and Monitoring
3	U23CEE613	Buildings Codes and Requirement
4	U23CEE614	Traffic engineering and Management
5	U23CEE615	Urban Planning and Development

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Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE716	Structural Health Monitoring
2	U23CEE717	Municipal Solid Waste Management
3	U23CEE718	Quality Control and assurance in Construction
4	U23CEE719	Tunneling Engineering
5	U23CEE720	Architecture and Town Planning

Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE821	Precast Structures
2	U23CEE822	Industrial Waste Disposal and Treatment
3	U23CEE823	Construction Safety
4	U23CEE824	Intelligent Transport System
5	U23CEE825	Interior Design

Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CEE826	Pre- Stressed Concrete Structures
2	U23CEE827	Environmental Impact Assessment
3	U23CEE828	Natural Disaster and Mitigation
4	U23CEE829	Bridge Engineering
5	U23CEE830	Smart City

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OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING

S. No	Course Code	Course Title
Open Elective – I		
1	U23CEOC01	Energy and Environment
2	U23CEOC02	Energy Efficient Buildings
Open Elective – II		
1	U23CEOC03	Disaster Management
2	U23CEOC04	Air Pollution and Solid Waste Management

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Department	Civil / Mechanical	Programme : B.Tech.						
Semester	I	Course Category Code: ES			End Semester Exam Type: TE			
Course Code	U23ESTC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Basics of Civil and Mechanical Engineering	3	-	-	3	25	75	100

(Common to EEE, ECE, ICE, MECH, Civil, Mechatronics Branches)

Prerequisite: Basic Science

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the types of buildings and materials.	K2
CO2	Summarize on the various components of buildings and surveying concepts	K2
CO3	Identify the various infrastructure facilities	K2
CO4	To familiarize the working principles of IC engines and automobile systems	K2
CO5	To understand about the power generation systems and its components	K1
CO6	To acquire knowledge about the various machining process.	K2

SECTION A - CIVIL ENGINEERING

UNIT - I	Buildings and Buildings Materials	Periods: 08
Buildings – Definition – Classification according to NBC-plinth area, Floor area, carpet area, floor space index - Development of Smart cities - Green building, Benefits from green building. Building Materials - stone, brick, cement, cement mortar, concrete, steel, Timber - their properties and uses.		CO1

UNIT - II	Buildings Components and Surveying	Periods: 08
Various Buildings Components and their functions. Foundation: function and types - Brick masonry, Stone Masonry and its types – Floors, Roofs and its types. Surveying: Objects – Classification – Principles – Measurements of Distances and areas – Leveling.		CO2

UNIT - III	Basic Infrastructure	Periods: 07
Roads and Bridges – types, components advantage and disadvantages. Railways - Permanent way and its elements. Sources of Water - Quality of Water- Domestic sewage Treatment – Rain Water harvesting – Dams - site selection for dam construction, types of dams.		CO3

SECTION B – MECHANICAL ENGINEERING

UNIT- IV	Internal and External Combustion Systems	Periods: 08
IC engines – Classification – Working principles – Diesel and Petrol Engines: Two stroke and four stroke engines – merits and demerits. Steam generators (Boilers) – Classification – Constructional features (of only low-pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.		CO4

UNIT- V	Power Generation Systems, Refrigeration and Air Conditioning System	Periods: 07
Power plants: Thermal – Nuclear, Hydraulic, Solar, Wind, Geothermal, Wave, Tidal and Ocean Thermal Energy Conversion systems - Functions, Applications - Schemes and layouts (Description only) Refrigeration and Air Conditioning System: Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.		CO5

UNIT- VI	Manufacturing Process	Periods: 07
Lathe - types, Specifications, Operations of a centre lathe. Casting - Pattern making, Allowances, Green sand and dry sand moulding, casting defects. Welding - Arc and Gas welding process, brazing and soldering (process description only).		CO6

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Dr. S. Jayakumar, "Basic Civil Engineering", Aagash Nekaa Publications, 2011
2. G Shanmugam, MS Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education, 1st Edition, 2018.
3. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.

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Reference Books	
1.	M.P. Poonia, S.C. Sharma and T.R. Banga, Basic Mechanical Engineering, Khanna Publishing House 2018.
2.	S.S.Bhavikatti, Basic Civil engineering, New Age International Ltd 2018.
3.	V. Rameshbabu, Basic Civil & Mechanical Engineering, VRB Publishers Private Limited, January 2017.
4.	Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, 7th Edition, Pearson Publication, 2014.
5.	Gopi Satheesh, Basic Civil engineering, Pearson Publications, 3rd Edition, 2015.
Web References	
1.	https://nptel.ac.in/courses/112107291/
2.	https://nptel.ac.in/courses/112/103/112103262/
3.	https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/ lecture-notes/
4.	https://nptel.ac.in/courses/105102088/
5.	https://nptel.ac.in/courses/105104101/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
2	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
3	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
5	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING

S. No	Course Code	Course Title
Open Elective – I		
1	U23CEOC01	Energy and Environment
2	U23CEOC02	Energy Efficient Buildings
Open Elective – II		
1	U23CEOC03	Disaster Management
2	U23CEOC04	Air Pollution and Solid Waste Management

S. Sudararam

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: OE				*End Semester Exam Type: TE		
Course Code	U23CEOC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ENERGY AND ENVIRONMENT	3	0	0	3	25	75	100

(Common to ECE, ECE, MECH, BME, IT, Mechatronics)

Course Outcome	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Apply the knowledge of science & engineering to the contemporary issues of Energy for better humankind & environment	K3
	CO2	Identify, review & analyze the complex problems of Energy crises in environment	K4
	CO3	Designing solutions for the energy crises in the form of renewable energy systems to meet the needs by understanding the limitations	K4
	CO4	Understanding the impact of energy on environment and providing solutions for sustainable development.	K5
	CO5	Apply biomass energy under relevant technologies	K3

UNIT-I	ENERGY	Periods: 09
Introduction, Importance of energy, role of energy consumption in economic and social transformation, Energy needs and crisis. Energy production and utilization. Types and classification of energy sources, Conventional & unconventional energy, Renewable sources & Nonrenewable sources of energy advantages, limitations, comparisons		CO1

UNIT-II	ENVIRONMENT	Periods: 09
Impact of energy on economy &environment. Regional impacts of temperature change - Global warming, Greenhouse effect, Acid rain, Ozone layer depletion. Indian environment degradation, Environmental laws - Water Act-1974 (Prevention & control of pollution), The environment protection act 1986, Air act.		CO2

UNIT-III	HYDROPOWER & GEOTHERMAL ENERGY	Periods: 09
Hydropower Energy – Introduction, Site selection, layout of hydro power plant, components & working, classifications, power station, structure and control. Geothermal Energy - Introduction, Site selection, layout of power plant, components & working, Advantages and disadvantages.		CO3

UNIT-IV	SOLAR & WIND ENERGY	Periods: 09
Sun as source of energy - Introduction, Site selection, layout of power plant components & working, classifications, Types of collectors, collection systems efficiency, Solar cells. Wind Energy - Introduction, advantages/limitations, Site selection, layout of power plant, components &working, classification.		CO4

UNIT-V	ENERGY AUDIT AND MANAGEMENT	Periods: 09
Introduction, advantages/limitations, Photosynthesis, biomass fuel, biomass gasification, biogas from waste biomass, factors affecting biogas generation, types of biogas plant, Biomass programme in India,		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. Trivedi R.R. and Jalka K.R, "Energy Management", Commonwealth Publication, 20177.
2. Diamant R.M.E., "Total Energy", Pergamon, OxfordPublishers, 2017.
3. N.G. AJJANNA " Energy auditing & demand side management" first edition, Gouthami Publications, Shimoga
4. Chakrabarti, M.L.Soni, P.V. Gupta,U.S. Bhatnagar " Power system Engineering" 2001, DhanpatRai&Co, New Delhi.
5. D.P.Kothari, K.C Singal, Rajesh Ranjan, "Renewable Energy sources and Emerging Technologies" second edition , PHI , India

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Reference Books

1. Boyle G, Everett B and Ramett J, "Energy systems and sustainability", Oxford University Press, 2018
2. "Pollution Control Acts, Rules and Notifications", CPCB, Pollution Control series, PC/2/2014, Vol.I,2014
3. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
4. S.Rao, Dr. BB Parulekar "Energy Technologies" Khanna Publications , New Delhi
5. David M Buchla, Thomas E Kissel, Thomas L Floyd "Renewable Energy systems" Pearson, India
6. Godfrey Boyle "Renewable Energy power for sustainable future" oxford Publications , New Delhi

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. www.iucn.org
4. www.cites.org
5. www.thesummitbali.com/
6. http://engineering geology.gov.in/

COs/POs/PSOs Mapping .

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	2	1	-	-	-	-	3	3	3	3
CO2	1	1	1	-	-	2	1	-	-	-	-	3	1	1	1
CO3	2	2	2	2	2	3	3	-	1	1	2	3	3	3	3
CO4	2	2	2	2	3	3	3	-	1	1	2	3	3	3	3
CO5	2	2	2	2	3	3	3	-	1	1	2	3	3	3	3

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23CEOC02	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ENERGY EFFICIENT BUILDINGS	3	0	0	3	25	75	100
	(Common to EEE, ECE, MECH)							

Course Outcome	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Understand the concept and effects of global warming	K2
	CO2	Understand Climate system, earth's atmosphere and its components.	K2
	CO3	Analyze the Impacts of Climate Change on various sectors	K4
	CO4	Assess the concept about carbon credit and clean development mechanism	K3
	CO5	Understand climate changes, its impact and mitigation activities.	K2

UNIT-I	INTRODUCTION	Periods: 09	
Energy consumption of building, Energy efficiency potential in buildings, Energy efficient building design (procedure), Energy efficient building technologies, energy efficient materials, certification of energy efficient building, cooling comfort in hot climates			CO1

UNIT-II	ENERGY EFFICIENCY IMPLEMENTION	Periods: 09	
Energy efficiency policies, Target setting and stakeholder engagement, Various building codes and standards, Energy efficient building operation, Passive solar, Natural ventilation, Day lighting of building			CO2

UNIT-III	ENERGY EFFICIENCY MEASUREMENT	Periods: 09	
Data and energy efficiency indicators, Evaluation of energy efficiency, The multiple benefits of energy efficiency. Electrical Energy Measurements, Thermal Energy Measurements, Mechanical & Utility System Measurements, Measurement & Verification. Case studies.			CO3

UNIT-IV	ENERGY EFFICIENCY INVESTMENT	Periods: 09	
Energy efficiency investment – through policy, through project standardization, through procurement, through funding, finance and fiscal instruments, through energy markets. Case studies with cutting edge of sustainable construction.			CO4

UNIT-V	ENERGY AUDIT AND MANAGEMENT	Periods: 09	
Definition, energy audit, need, types of energy audit. energy management (audit) approach - understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering, precautions, smart metering.			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. Ana-Maria Dabija, "Energy Efficient Building Design", Springer Nature, 2020
2. Dean Hawkes and Wayne Forster, "Energy Efficient Buildings", W.W. Norton & Company, 2002
3. Amritanshu Shukla, Atul Sharma, "Sustainability Through Energy-Efficient Buildings", CRC Press, 2018.
4. Ursula Eicker, "Energy Efficient Buildings with Solar and Geothermal Resources", John Wiley & Sons, 2014.
5. Jacob J. Lamb and Bruno Georges Pollet, "Energy-Smart Buildings: Design, Construction and Monitoring of Buildings for Improved Energy Efficiency", Institute of Physics Publishing, 2020

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Reference Books

1. Umberto Desideri, Francesco Asdrubali, "Handbook of Energy Efficiency in Buildings: A Life Cycle Approach", Butterworth-Heinemann, 2019.
2. Susan Roaf and Mary Hancock, "Energy Efficient Building: A Design Guide", Wiley, 1992
3. Xiaoqiang Zhai and Ruzhu Wang, "Handbook of Energy Systems in Green Buildings", Springer Berlin Heidelberg, 2018
4. Roberto Gonzalo, "Energy-efficient architecture", Walter de Gruyter, 2012
5. José Manuel Andújar and Sergio Gómez Melgar, "Energy Efficiency in Buildings: Both New and Rehabilitated", MDPI, 2020

Web References

1. https://nptel.ac.in/courses/105/102/105102175/
2. https://nptel.ac.in/courses/105/102/105102195/
3. https://alison.com/course/sustainable-architecture-energy-efficiency-and-quality

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO2	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO3	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO4	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO5	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering	Programme: B.Tech.						
Semester	VII	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23CEOC03	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	DISASTER MANAGEMENT	3	0	0	3	25	75	100

(Common to EEE, ECE, CSE, IT, ICE, MECH, BME,CCE,AI&DS)

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Infer Disasters, man-made Hazards and Vulnerabilities	K2
	CO2 Summarize the flood management studies	K2
	CO3 Identify disaster mitigation and management mechanism	K1
	CO4 Estimate the disaster safety precaution	K2
	CO5 Determine the disaster plan and act	K3

UNIT-I	DEFINITION AND TYPES	Periods: 09
Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires		CO1

UNIT-II	STUDY OF IMPORTANT DISASTERS	Periods: 09
Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g.) Earthquakes, Landside). Social Economics and Environmental impact of disasters.		CO2

UNIT-III	MITIGATION AND MANAGEMENT	Periods: 09
Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief.		CO3

UNIT-IV	SAFETY PROCESS	Periods: 09
Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management		CO4

UNIT-V	PLANNING AND ACT	Periods: 09
Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd.
3. Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
4. J. P. Singhal, Disaster Management, Laxmi Publications
5. C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication

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Reference Books

1. Disaster Management by Mrinalini Pandey Wiley 2014.
2. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015
3. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
4. National Disaster Management Plan, Ministry of Home affairs, Government of India
5. Manual on Disaster Management, National Disaster Management, Agency Govt of India.

Web References

1. http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf
2. http://nidm.gov.in/pdf/guidelines/new/sdmp.pdf
3. http://sdmassam.nic.in/pdf/publication/undp/disaster_management_in_india.pdf

COs/POs/PSOs Mapping

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO2	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO3	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO4	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO5	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Civil Engineering			Programme: B.Tech.				
Semester	VII			Course Category Code: OE			*End Semester Exam Type: TE	
Course Code	U23CEOC04			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	AIR POLLUTION AND SOLID WASTE MANAGEMENT			3	0	0	3	25	75	100
(Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS)										
Course Outcome	On completion of the course, the students will be able to									BT Mapping (Highest Level)
	CO1	Understand the type, sources & effect of air pollutants								K2
	CO2	Know the parameters affecting air pollution and various methods of measurement and estimation of pollutants								K3
	CO3	Gain knowledge of basics of noise pollution								K2
	CO4	Understand various air pollution control equipment's & pollution caused due to automobile exhaust								K4
	CO5	Understand the concepts of solid waste management								K2
UNIT-I	DEFINITION AND TYPES						Periods: 09			
Introduction to air pollution: Air pollution episodes, Atmosphere and its zones, classification and sources of air pollutants, effects of air pollutants on man, plants animal & materials										CO1
UNIT-II	STUDY OF IMPORTANT DISASTERS						Periods: 09			
Meteorological Aspects: Atmospheric stability, plume behavior, Ambient air sampling and stack sampling, collection of particulates and gaseous pollutants, methods of estimation.										CO2
UNIT-III	MITIGATION AND MANAGEMENT						Periods: 09			
Air pollution control methods and equipment: Principle of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters cyclones, wet scrubbers, automobile exhaust: Pollution due to diesel and petrol engines, exhaust treatment and abatement, noise Pollution: Sources, ill effects, control measures.										CO3
UNIT-IV	SAFETY PROCESS						Periods: 09			
Introduction to solid waste management, sources, quantification and characterisation, classification and components, sampling and analysis, Method of collection.										CO4
UNIT-V	PLANNING AND ACT						Periods: 09			
Equipment used for collection and transportation, transfer stations, solid waste processing and management. Treatment and disposal methods: composting, sanitary landfills, Incineration – concept, components and applications, leachate management.										CO5
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -			Total Periods:45			

Text Books

1. M.N. Rao & H.V.N. Rao, 1988, Air Pollution, Tata McGraw Hill Publishing Co. Ltd.
2. C.S. RAO, 2007, Environmental Pollution Control Engineering, New Age International, Wiley Estern Ltd. New Delhi.
3. Stern A. C., 1973, Air pollution, Academic Press.
4. A.D. Bhide & Sunderesan B.B., 1983, Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tohobanoglous, 1993, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd.

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Reference Books

1. P. Aarne Vesilind, William Worrell & Debra Reinhart, 2002, Solid Waste Engineering, Cengage Learning India pvt. Ltd.
2. Dr. Y Anjaneyulu, 2002, Air Pollution and Control Technologies, Allied Publisher pvt. Ltd.
3. Waste Management: A Reference Handbook. Contributors: Jacqueline Vaughn - Author. Publisher: ABC-Clio
4. K. V. S. G. Murlikrishna, 1995, Air Pollution, Kaushal& Company.

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1. https://nptel.ac.in/courses/120108005/
2. http://cpheeo.gov.in/upload/uploadfiles/files/Part1
3. https://nptel.ac.in/content/storage2/courses/104103022

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	2	3	3	3	3	3	2	3	3	2	3
CO2	3	3	2	3	3	3	3	2	3	2	2	3	3	3	3
CO3	3	3	3	2	2	2	3	3	3	3	2	3	3	3	2
CO4	2	3	2	3	2	3	2	3	3	2	2	3	3	3	3
CO5	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MBA	Programme: B. Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC05	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	MARKETING MANAGEMENT	3	0	0	3	25	75	100
Common to ALL Branches								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Explain the importance of marketing and differentiate between marketing and selling.	K2
CO2	Apply the consumer decision-making process and differentiate between industrial and consumer buying behavior.	K3
CO3	Examine product life cycle management strategies and demonstrate the steps involved in new product development.	K3
CO4	Illustrate the role of distribution channels and design an effective channel distribution strategy for both consumer and industrial goods.	K3
CO5	Analyze emerging trends in marketing, including Customer Relationship Management and experiential marketing strategies.	K4

UNIT-I	Introduction to Marketing	Periods: 9
Marketing - Importance of Marketing - Difference between Marketing and Selling - Marketing Environment: The Macro and Micro Environment factors, Importance of environment analysis – Strategic Marketing planning: Introduction, Need, Framework of Strategic planning process and Steps in strategic planning - Ethical and Social Responsibility of Marketing - 4 Ps of Marketing		CO1

UNIT-II	Consumer Behaviour and Marketing Strategy	Periods: 9
Role of buyer - Types of Buying behavior - Factors influencing buying decisions - Consumer decision making process: Meaning and Steps in Consumer decision making Process – Organizational buying behaviour: Classification of organizational markets, Characteristics, Difference between Industrial and Consumer buying - Market Segmentation - Needs, Classification and Significance – Targeting, Positioning and Competitive Strategies.		CO2

UNIT-III	Product and Pricing Mix	Periods: 9
Product classifications - Product Life cycle - Strategies for managing Product Life cycle – Categories of New product, Importance and Steps in New Product Development – Packaging: Need for packaging, Essential qualities of packaging, kinds of packaging and advantages of packaging – Labelling: Functions, Types of labelling, advantages and disadvantages of labelling – Pricing objectives – Pricing strategies		CO3

UNIT-IV	Place and Promotion Mix	Periods: 9
Distribution Channel and Physical distribution: Meaning and Importance of distribution channel - Channel design decisions – Channels of distribution for consumer and industrial goods – Physical Distribution: Meaning, Objectives and components of physical distribution - Promotion: Objectives, Types of sales promotion: Consumer, Salesperson and Dealer sales promotion – Introduction to Integrated Marketing Communication		CO4

UNIT-V	Trends in Marketing	Periods: 9
Emerging trends in Marketing - Customer Relationship Management: Definition, features, Types and importance - Experiential Marketing: Meaning, strategies and benefits - Mobile Marketing: Definition and types of mobile marketing - Digital Marketing: Meaning, types of digital marketing – Inbound marketing: Meaning, fundamentals and difference between inbound and outbound marketing - Marketing Analytics: Meaning, importance, metrices of marketing analytics – An overview of Sustainable Marketing		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods:	Total Periods: 45

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Text Books
1. Keller, Philip and Kevin Lane Kotler "Marketing Management" 16th Edition, Pearson Education Limited, 2022.
2. V.S.Ramaswamy, S.Namakumari, 6th Edition, Sage Publications India Pvt Ltd, 2018
Reference Books
1. Prachi Gupta, Ashita Aggarwal, et al. "Marketing Management: Indian Cases" Pearson Education Limited, 2024
2. Arunkumar, Meenakshi.N, "Marketing Management" 3rd Edition, Vikas Publishing House, 2016
3. Rajan Saxena, "Marketing Management" 5th Edition, MacGraw Hill Publications, 2017
Web References
1. https://www.ama.org/
2. https://www.marketingprofs.com/
3. https://indianjournalofmarketing.com/
4. http://www.publishingindia.com/ijamm/
5. https://onlinecourses.swayam2.ac.in/imb20_mg36/preview

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO 1	1	2	-	-	-	2	1	1	-	2	1	1	3	2	1
CO 2	1	2	1	-	1	2	1	2	-	2	1	1	3	2	1
CO 3	1	2	3	-	1	2	1	2	-	2	1	1	3	2	1
CO 4	1	1	3	-	2	1	2	1	1	2	2	1	3	2	1
CO 5	1	3	2	2	2	3	2	2	1	2	2	3	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus`

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Department	MBA	Programme: B. Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	NEW PRODUCT DEVELOPMENT	3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite	-	
Course Outcomes	***On completion of the course, the students will be able to***	**BT Mapping (Highest Level)**
	CO1 Explain the stages and importance of new product development (NPD) in modern business contexts.	**K2**
	CO2 Apply market research to identify customer needs and translate them into product specifications.	**K3**
	CO3 Illustrate the product concepts using screening and scoring techniques to select the most viable option.	**K3**
	CO4 Examine product prototype that incorporates principles of product architecture and design for manufacturing.	**K3**
	CO5 Analyze a business plan and market strategy for the successful launch of a new product.	**K4**

UNIT-I	**Introduction to New Product Development**	**Periods: 9**
Introduction to New Product Development (NPD) - Product Development vs New Product Development - Stages of NPD - Role of Innovation and Creativity in NPD - Reverse Engineering and its Application in NPD - Business Models for New Products - Risk Management in New Product Development - Sustainability and Ethical Considerations in NPD		**CO1**
UNIT-II	**Market Research and Customer Needs**	**Periods: 9**
Identifying Market Opportunities for New Products - Conducting Market Research for NPD - Translating Customer Needs into Product Specifications - Establishing and Refining Product Specifications - Competitive Analysis and Benchmarking in NPD - Tools for Understanding Consumer Behaviour: Surveys, Focus Groups, and Ethnography		**CO2**
UNIT-III	**Concept Generation and Evaluation**	**Periods: 9**
Concept Generation Process: Continuous and External Idea Sources - Clarifying the Problem and Brainstorming Solutions - Design Thinking for New Products - Techniques for Concept Generation - Systematic Exploration of Concepts - Screening and Scoring Product Concepts - Concept Evaluation and Selection Methods - Prototyping Techniques		**CO3**
UNIT-IV	**Product Design and Development**	**Periods: 9**
Product Architecture and its role in NPD - Modular vs. Integral Product Architecture - Design for Sustainability - Environmental Considerations - Organizing Product Development Teams - Stages of team Development - Collaboration and Cross - Functional Teams in Product Development - Tools for Effective Product Design - Agile Product Development Methodologies		**CO4**
UNIT-V	**Launch, Strategy and Commercialization**	**Periods: 9**
Developing a New Product Strategy - Building Market Demand and Entry Strategies for New Products - Developing a New Product Business Plan - Preparing for Market Launch - Post - Launch Evaluation - Product Life Cycle - Continuous Improvement and Future Product Enhancements		**CO5**
Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:** **Total Periods: 45**

Text Books

1. Ulrich KT, Eppinger SD. Product design and development. 7th edition. McGraw-Hill Education; 2020.
2. Crawford CM, Di Benedetto A. New products management. 11th edition. McGraw-Hill Education; 2014.
3. Cooper RG. Winning at new products: Creating value through innovation. 5th edition. Basic Books; 2017.

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Reference Books
1. Trott, P. Innovation management and new product development 6th edition. Pearson Education. 2017
2. Thomke, S. Experimentation works: The surprising power of business experiments. Harvard Business Review Press. 2020
3. Blank, S. G., & Dorf, B. The startup owner's manual: The step-by-step guide for building a great company. Wiley. 2020
4. Brown, T. Change by design: How design thinking transforms organizations and inspires innovation. Harper Business. 2009
5. Kelley, T., & Littman, J. The ten faces of innovation: IDEO's strategies for beating the devil's advocate and driving creativity throughout your organization. Currency/Doubleday. 2006.
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1. https://conjointly.com/kb/
2. https://www.entrepreneur.com/article/281999
3. https://www.mindtools.com/pages/article/newSTR_66.htm
4. https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy
5. https://www.productplan.com/glossary/product-architecture/
6. https://hbr.org/2019/09/why-design-thinking-works
7. https://www.smartsheet.com/new-product-development.
8. https://www.ptc.com/en/blogs/cad/best-practices-for-developing-new-products

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

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Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	3	-	3	-	3	1	1	-	-	1	-	2	3	2	1
CO2	1	-	2	1	3	-	-	1	-	1	-	3	3	2	1
CO3	1	1	3	-	2	-	1	-	2	-	1	2	3	2	1
CO4	3	-	1	1	3	1	-	1	2	-	1	1	3	2	1
CO5	1	-	3	-	3	-	-	-	2	-	1	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MBA	Programme: B. Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC04	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ECONOMICS FOR ENGINEERS	3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite	Basics of Economics		BT Mapping (Highest Level)
Course Outcomes	*On completion of the course, the students will be able to*		
	CO1	Interpret principles of managerial economics to real-world scenarios, utilizing demand analysis and forecasting techniques.	K2
	CO2	Discuss production functions and cost structures to evaluate their impact on managerial decision-making and market strategies.	K2
	CO3	Examine various market structures and pricing strategies, synthesizing their effects on market behavior and competitive dynamics.	K3
	CO4	Apply macroeconomic policies and their implications on business cycles, investment decisions, and economic stability.	K3
	CO5	Analyze recent economic trends, such as technological advancements and income inequality.	K4

UNIT-I	Introduction to Managerial Economics	Periods: 9
Managerial Economics: Meaning, Scope, and Importance - Functions of a Managerial Economist - Demand Analysis: Law of Demand, Elasticity of Demand, Law of Supply, Elasticity of supply and Market Equilibrium - Comparative statistics: Shift of a curve and movement along with the curve - Demand Forecasting: Criteria for Effective Forecasting - Qualitative Methods - Quantitative Methods.		CO1

UNIT-II	Production Function and Cost Concepts	Periods: 9
Production Function: Meaning, Types, Applications in Managerial Decision Making - Law of variable proportion and law of returns to scale - ISO Quants - Producer Surplus: Price ceiling and price floor - Cost concept: Types of Costs - Total, average and marginal cost - Revenue Concepts: Total Revenue (TR) - Marginal Revenue (MR) and Average Revenue (AR).		CO2

UNIT-III	Market Structure	Periods: 9
Market structure: Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly and Duopoly - Pricing policies: Cost-Based Pricing, Demand - Based Pricing, Competition - Based Pricing, Psychological Pricing, Geographical Pricing, Dynamic Pricing, Bundle Pricing, Price Discrimination, Premium Pricing and practices.		CO3

UNIT-IV	Macroeconomics	Periods: 9
Globalization and Economic Policies - National Income Concepts: Methods of measuring national income - circular flow of income - Monetary policy and Fiscal Policy - Business Cycles concepts - Inflation, deflation and its types - Foreign Direct Investment (FDI) - Foreign Institutional Investment (FII).		CO4

UNIT-V	Recent Trends in Economics	Periods: 9
Digital Economy : E-commerce, Fintech, and Online Services - Role of Technology : Big Data, Artificial Intelligence and Automation in Economic Decision-Making - Gig Economy : Growth of Freelance and Contract Work - Impact on Global Economies - Income In - equality : Causes, Effects, and Socio - political Impact		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods:	Total Periods: 45

Text Books

1. Samuelson, William F., and Marks, Stephen G. Managerial Economics: Theory, Applications, and Cases, 10th edition, Wiley, 2020.
2. Ahuja, H. L. Principles of Managerial Economics, 7th edition, Tata McGraw-Hill, 2017
3. Mithani, D. M. Managerial Economics, 3rd edition., Himalaya Publishing House,2021.

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Reference Books	
1.	Varian, Hal R. Intermediate Microeconomics: A Modern Approach, 9th edition., W.W. Norton & Company, 2014.
2.	Brickley, James A., Smith Jr., Clifford W., and Zimmerman, Jerold L. Managerial Economics and Organizational Architecture, 7th edition., McGraw-Hill Education, 2016.
3.	Samuelson, Paul, and Nordhaus, William. Economics, 20th edition., McGraw-Hill Education, 2019.
4.	Schiff, Peter, and Schotter, Andrew J. Introduction to Microeconomics, 3rd edition., Cengage Learning, 2012.
5.	Moore, James C. Economic Theory and Operations Analysis, 2nd edition., Academic Press, 1970.
Web References	
1.	https://www.jaroeducation.com/blog/nature-and-types-of-managerial-economics/
2.	https://psu.pb.unizin.org/introductiontomicroeconomics/chapter/chapter-6-costs-and-production/
3.	https://corporatefinanceinstitute.com/resources/economics/market-structure.
4.	https://www.britannica.com/money/macroeconomics
5.	https://www2.deloitte.com/us/en/insights/economy/global-economic-outlook/weekly-update.html

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	1	1	1	--	1	1	--	--	--	2	2	--	3	2	1
CO2	1	1	1	2	2	2	2	--	--	3	3	3	3	2	1
CO3	1	1	1	2	-	2	2	--	--	3	-	3	3	2	1
CO4	1	1	-	2	2	2	2	2	--	3	3	3	3	2	1
CO5	1	1	1	2	2	-	2	2	--	3	3	3	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MBA	Programme : B.Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	INTELLECTUAL PROPERTY RIGHTS	3	0	0	3	25	75	100
Common to ALL Branches								
Prerequisite	Nil							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Describe the Concept and Importance of Intellectual Property Rights (IPR).	K2
	CO2	Describe the procedures for patent registration, including recognizing legal remedies for infringement.	K3
	CO3	Apply copyright laws to hypothetical scenarios involving academic integrity and plagiarism.	K3
	CO4	Infer the different types of trademarks and understand the registration process and infringement issues.	K4
	CO5	Explain the legalities surrounding industrial designs, geographical indications, and their protection mechanisms.	K2

UNIT-I-	Overview of Intellectual Property	Periods: 9
Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Trade Secret – International protection of IPR- Major International conventions and agreements: WTO/TRIPS Agreement, Paris Convention, The Berne Convention, Universal Copyright Convention, WIPO Convention, Madrid Agreement, Nice Agreement and TRIPS Agreement		CO1

UNIT-II	Law of Patents	Periods: 9
Meaning and Nature of Patent - Subject matter of Patent - Registration Procedure, Patentable and Non-patentable Inventions - Process and product Patent, Legal Requirements for Patents – Patent document: Specification and Claims - Granting of Patents - Transfer of Patent rights - Infringement of Patents and Remedies - Evergreening of Patents		CO2

UNIT-III	Law of Copyrights	Periods: 9
Meaning and Nature of Copyright - Subject matter of copyright - Law of Copyrights - Authorship and Ownership of copyright, Registration Procedure, Assignment and Licensing of copyright - Infringement of Copyrights and Remedies - Emerging new trends in Copyrights - Related Rights: Celebrity Rights, Academic Integrity or Plagiarism: An Intellectual Theft - Copyrights with special reference to software.		CO3

UNIT-IV	Law of Trademarks	Periods: 9
Meaning and Nature of Trademarks - Different kinds of Trademarks - Registrable and Non-Registrable Trademarks - Registration of Trademarks - Grounds for refusal of Registration: Absolute Ground and Relative Ground - Assignment and Licensing of trademarks - Infringement, Remedies and Penalties - Offenses relating to Trademarks - Passing off action – Deceptive similarity - Defenses - Emerging New trends in trademarks		CO4

UNIT-V	Other Forms of IPR	Periods: 9
Meaning and nature of Industrial Design - Subject Matter - Procedure for registration - Infringement of Copyrights in designs - Remedies for Infringement - Trade secret Law-Determination of Trade Secret Status - Liability for misappropriations of Trade Secrets- Protection for submission-Trade Secret litigation - Meaning and Nature of Geographical Indication (GI) - Procedure for registration - Infringement of Geographical indication - Remedies for Infringement.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods: 45

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Text Books
1. Nithyananda, K. V. Intellectual Property Rights: Protection and Management, 2nd edition, Cengage Learning India Private Limited, 2019.
2. Neeraj, P., and Khusdeep, D. Intellectual Property Rights, 2nd edition, PHI Learning Private Limited, 2018.
Reference Books
1. Ahuja, V. K. Law Relating to Intellectual Property Rights, 2nd edition, Lexis Nexis, 2017.
2. Bouchoux, Deborah E. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 4th edition., Cengage Learning, 2013.
3. Ganguli P. Intellectual Property Rights: Unleashing the Knowledge Economy. Tata McGraw-Hill Publishing Company; 2022.
4. Jyoti Rattan. Intellectual Property Rights, 2nd edition, Bharat Law House, 2024.
5. Surendra Malik and Sudeep Malik, Supreme Court on Intellectual Property, Eastern Book Company, 2022.
Web References
1. https://www.wipo.int/about-ip/en/
2. https://www.uspto.gov/patents/basics/general-information-patents
3. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
4. https://www.epo.org/about-us/annual-reports-statistics/annual-report.html
5. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India
6. https://www.inta.org/trademarks/trademark-basics/.

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	3	2	2	-	2	1	2	3	2	1
CO2	1	2	-	2	-	3	2	2	-	2	1	1	3	2	1
CO3	-	2	-	-	-	2	2	3	-	2	-	1	3	2	1
CO4	1	1	-	-	-	3	2	2	-	2	1	1	3	2	1
CO5	1	2	-	-	-	3	3	2	-	2	1	1	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MBA	Programme : B.Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC03	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	FINANCE FOR ENGINEERS	3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite	Nil	
Course Outcomes	*On completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Explain the objectives, scope, and role of financial management in engineering, and differentiate between profit maximization and wealth maximization.	K2
	CO2 Apply the concepts of the time value of money to engineering projects and use investment appraisal techniques such as NPV, IRR, and Payback Period for decision-making.	K3
	CO3 Demonstrate the steps in the capital budgeting process and apply techniques like cost-benefit and sensitivity analysis for evaluating engineering projects.	K3
	CO4 Analyze financial statements, including balance sheets and income statements, from an engineering perspective, and evaluate financial ratios to assess the financial performance of engineering projects.	K4
	CO5 Analyze different types of costs, such as fixed, variable, and marginal costs, and evaluate cost-benefit analysis and break-even analysis for engineering decision-making.	K4

UNIT-I-	Introduction to Financial Management	Periods: 9
Overview of Financial Management: Objectives, Scope, and Role in Engineering - Financial Planning and Strategy: Short-Term and Long-Term Planning - Basic Concepts: Profit Maximization vs Wealth Maximization - Role of Engineering Managers in Financial Decision - Making, Relationship between Finance and Other Engineering Disciplines.		CO1

UNIT-II	Time Value of Money and Investment Decisions	Periods: 9
Time Value of Money: Concept, Importance and Applications in Engineering Project, Present Value and Future Value Calculations - Investment Appraisal Techniques: Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR) (Theory only) and Profitability Index (PI) - Risk Analysis in Investment Decision Making.		CO2

UNIT-III	Capital Budgeting for Engineering Projects	Periods: 9
Capital Budgeting Process: Steps and Key considerations, Techniques for Evaluating Engineering Project, Cash-Flow Estimation for Project, Cost - Benefit Analysis in Engineering Project, Sensitivity Analysis, and Decision Trees for Project Evaluation.		CO3

UNIT-IV	Financial Statements and Ratio Analysis	Periods: 9
Introduction to Financial Statements: Balance Sheet, Income Statement, and an Engineering Perspective on Financial Statement Interpretation - Financial Ratios: Liquidity, Profitability - Engineering Case Studies on Financial Performance Evaluation - Limitations of Ratio Analysis in Engineering Projects.		CO4

UNIT-V	Cost Estimation and Engineering Economic Analysis	Periods: 9
Introduction to Cost Estimation in Engineering - Types of Costs: Fixed, Variable, Marginal, and Sunk Costs, Cost-Benefit Analysis in Engineering Projects, Break-Even Analysis and Its Application in Engineering Decision Making - Engineering Economic Analysis: Replacement Analysis.		CO5

Lecture Periods: 45	Tutorial Periods: 0	Practical Periods: 0	Total Periods: 45

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Text Books	
1.	Sullivan WG, Wicks EM, Koelling CP. Engineering Economy. 17th edition. Pearson; 2020.
2.	Brealey RA, Myers SC, Allen F. Principles of Corporate Finance. 19th edition. McGraw-Hill Education; 2022.
3.	Brigham EF, Houston JF. Fundamentals of Financial Management. 15th edition. Cengage Learning; 2019.
Reference Books	
1.	Ranganath BJ, Sinha KK. Financial Management for Engineers. 4th edition. Vikas Publishing House; 2018.
2.	Crundwell F. Finance for Engineers: Evaluation and Funding of Capital Projects. Springer; 2017.
Web References	
1.	https://www.netsuite.com/portal/resource/articles/financial-management/financial-management.shtml
2.	https://www.investopedia.com/ask/answers/033015/why-time-value-money-tvm-important-concept-investors.asp
3.	https://omnicard.in/blogs/capital-budgeting-24042024
4.	https://www.linkedin.com/pulse/role-capital-budgeting-process-engineering-studies-ashraf
5.	https://corporatefinanceinstitute.com/resources/accounting/financial-ratios/
6.	https://www.dau.edu/acquipedia-article/engineering-cost-estimation-method

*TE-Theory Exam, LE-Lab Exam

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	1	2	-	-	-	1	1	1	-	2	1	1	3	2	1
CO2	1	2	1	-	1	2	1	2	-	3	1	-	3	2	1
CO3	-	3	3	-	1	3	1	2	-	3	1	1	3	2	1
CO4	1	2	-	2	1	1	2	1	1	2	1	-	3	2	1
CO5	-	3	-	-	2	3	2	2	1	2	2	3	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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