SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Department of Civil Engineering

Minutes of 7th BoS Meeting

Venue

Audio Visual Room
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time

09.03.2024 at 10.00 am

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SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Department of Civil Engineering

09.03.2024

Minutes of 7th Board of Studies Meeting (UG)

The Seventh Board of Studies meeting of Department of Civil Engineering was held on 09th March 2024 at 10:00 a.m in the Audio Visual Room, Sri Manakula Vinayagar Engineering College with Head of the Department in the Chair.

The following members were present for the BoS meeting,

Sl.No	Name of the Member with Designation and official Address	Members as per UGC norms
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, Er. Surya Civil Engineering & Contractor Puducherry.	Alumni Member
8	Dr. S. Jayakumar Controller of Examinations, Professor in Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member

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9	Mr.J.Subash Chandra Boss Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
10	Mrs.A.Kalyani, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
11	Mr.C.Raj Govind, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
12	Mr.K.Srinivasan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
13	Mrs.S.Banupriya, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
14	Mr.S.Sivaprasath, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
15	Ms.G.Yamuna, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
16	Mrs.K.Nivedita, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
17	Mrs.D.Sathiyasree, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
18	Mr.G.Senthilraj, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
19	Ms.B.Pallavi, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
20	Mr.R.Badhrinadhan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
21	Mrs.S.Sinthanagorky, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member

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22	Mr.S.Tiroumalai, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
23	Mrs.V.Sivasankari, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
24	Mr.G.Anandhanarayanan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
25	Mr.S.Manikandan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
26	Mr.V.Murugappan Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
27	Mr. K. Raja Associate Professor, Department of Mathematics, SMVEC, Madagadipet - 605107	Internal Member
28	Dr.K.Kathikeyan Associate Professor, Department of Chemistry, SMVEC, Madagadipet - 605107	Internal Member
29	Dr.P.Rajeswari Associate Professor, Department of English, SMVEC, Madagadipet - 605107	Internal Member
30	Dr. K. Samuel Assistant Professor, Department of Physics, SMVEC, Madagadipet - 605107	Internal Member

Dr. S.Sundararaman

Chairman - BoS

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

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AGENDA OF THE MEETING

Item No. 1 : BoS / UG / CIVIL 7.1

Welcome Address, Introduction about the Institution, Achievement of College and Department and Introduction of BoS Members

Item No. 2 : BoS / UG / CIVIL 7.2

To appraise on the Governing Body, Academic Council and Finance committee composition as per UGC Regulations 2018 and 2023.

Item No. 3 : BoS / UG / CIVIL 7.3

To appraise on the previous Board of Studies composition as per UGC Regulations 2018

Item No. 4 : BoS / UG / CIVIL 7.4

To appraise on the revised Board of Studies composition as per UGC Regulations 2023

Item No. 5 : BoS / UG / Civil 7.5

To appraise on the highlights of R-2020 Regulations, Curriculum and syllabus

Item No. 6 : BoS / UG / Civil 7.6

To appraise on the suggestions received from previous meetings of BoS, Curriculum Advisory committee and stake holders for the revision of R-2020 Regulations, Curriculum and syllabus.

Item No. 7 : BoS / UG / CIVIL 7.7

To appraise on the pass percentage (First class with Distinction, First class and second class) for Engineering: Batches:2017-2021, 2018-2022 under Pondicherry University R-2013 Regulations and for 2019-2023 batch under SMVEC Autonomous Regulations R-2019

Item No. 8 : BoS / UG / CIVIL 7.8

Review of 6th BoS Minutes of Meeting

Item No. 9 : BoS / UG / CIVIL 7.9

To appraise on the Regulations, curriculum structure and approved syllabus of Regulation 2023 for I & II Semester.

Item No. 10 : BoS / UG / CIVIL 7.10

To discuss and approve the R2023 Regulation, curriculum and syllabi for III & IV Semester under Regulation 2023 for B.Tech. Civil Engineering

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Item No. 11 : BoS / UG / CIVIL 7.11

To discuss and approve on the syllabus related to award of Honors degree in Regulation 2023

Item No. 12 : BoS / UG / CIVIL 7.12

To appraise and approve the following chosen Elective Courses,

i) Professional Elective courses for VIII Semester under Regulation 2020 for the batches 2020 – 2024, 2021 – 2025 and 2022-2026

ii) Open Elective courses for IV semester and VI semester under Regulation 2020 for the batches 2021 - 2025 & 2022 -2026

Item No. 13 : BoS / UG / CIVIL 7.13

To appraise and approve on the following chosen Employability Enhancement Courses,

i) Skill Development courses for II to VI semesters under Regulation 2023 and Regulation 2020 for the batches 2023 -2027, 2022 -2026 and 2021-2025

ii) Certificate courses for II to VI semesters under Regulation 2023 and Regulation 2020 for the batches 2022 -2026, 2021-2025 & 2020 - 2024

iii) NPTEL / MOOC & online certification courses for VI semester & VIII Semester under Regulation 2020 for the batches 2020 – 2024 and 2021-2025 respectively

Item No. 14 : BoS / UG / CIVIL 7.14

To appraise and approve the Academic Calendar for Even Semester 2023 - 2024

i) Quality Circle Meeting (QCM)

ii) Continuous Assessment Test (CAT)

iii) Model Exam and End Semester Examination

iv) Redo / Discontinue students

2. A.7.7

Item No. 15 : BoS / UG / CIVIL 7.15

To appraise and approve the Department Research activities

i) Publications

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

Item No. 16 : BoS / UG / CIVIL 7.16

To appraise the members on the training activities conducted for Placement & its outcome for the batch 2020- 2024 and 2021-2025

Item No. 17 : BoS / UG / CIVIL 7.17

To appraise and approve the Industry Institute Interaction for the academic year 2023 – 2024

i) Guest Lecture/Seminar/ Workshop

ii) Industrial Visit

iii) Internship

iv) Value

v) Added Courses

Item No. 18 : BoS / UG / CIVIL 7.18

To discuss and approve the panel of examiners

Item No. 19 : BoS / UG / CIVIL 7.19

Any other item with the permission of chair

Minutes of the Meeting

Dr. S.Sundararaman, Chairman, BoS opened the meeting by welcoming the external members, internal members and thanked all for accepting to conduct the 2nd term of Board of Studies meeting in the offline mode. He deliberated on the agenda items that are to be discussed in meeting.

Item No. 1 : BoS / UG / CIVIL 7.1	The BoS Chairman Welcomed all the Academic, Alumni, Industrial experts and Internal faculty members present for the seventh Board of Studies meeting. The members were appraised on the Group of Institutions under the umbrella of Sri Manakula Vinayagar Educational Trust. The Institute Vision and Mission statements along with the achievements attained by the college and the Civil Department accomplishments were briefly highlighted to the members present.

2.A.7.8

S. Sundararaman

<table>
<tr><td>Item No. 2 : BoS / UG / CIVIL 7.2</td><td>The members were appraised on the Composition of Governing Body, Academic Council and Finance committee as per UGC Regulations of 2018 and 2023.</td></tr>
<tr><td>Item No. 3 : BoS / UG / CIVIL 7.3</td><td>The composition of the 1st term Board of Studies members as per UGC Regulations 2018 was briefed to the members present and a thanks note was submitted in the meeting for their positive suggestions and comments during their tenure.</td></tr>
<tr><td>Item No. 4 : BoS / UG / CIVIL 7.4</td><td>The Board of Chairman appraised on the revised Board of Studies composition as per UGC Regulations 2023.</td></tr>
<tr><td>Item No. 5 : BoS / UG / Civil 7.5</td><td>The members were highlighted on the salient features of R-2020 Regulations, Curriculum and syllabus for I to VIII semesters.</td></tr>
<tr><td>Item No. 6 : BoS / UG / Civil 7.6</td><td>The Board of Chairman appraised on the suggestions received from previous meetings of BoS, Curriculum Advisory committee and stake holders for the revision of R-2020 Regulations, Curriculum and syllabus. The suggestion and action taken of the meetings were presented to the members for their better understanding.
(The details of suggestion and action taken of the meetings is attached in Annexure I)</td></tr>
<tr><td>Item No. 7 : BoS / UG / CIVIL 7.7</td><td>The members were appraised on the pass percentage (First class with Distinction, First class and second class) for Engineering: Batches:2017-2021, 2018-2022 under Pondicherry University R-2013 Regulations and for 2019-2023 batch under SMVEC Autonomous Regulations R-2019</td></tr>
<tr><td>Item No. 8 : BoS / UG / CIVIL 7.8</td><td>Chairman BoS, appraised the minutes of 6th BoS, its implementation and then it is confirmed with the approval for the incorporation of minor revisions suggestion and action taken of the meetings
<table>
<tr><th>S.No</th><th>Regulation</th><th>Sem</th><th>Course code with Name</th><th>Particulars</th></tr>
<tr><td>1</td><td>2023</td><td>I</td><td>U23CEP101 / Civil Engineering Practice Laboratory</td><td>In Civil Engineering Practice Laboratory' Foundation Marking can be added.</td></tr>
<tr><td>2</td><td>2023</td><td>II</td><td>U23CET202 / Building Materials and Construction</td><td>In 'Building Materials and Construction', modern building materials can be included such as Glasses, UPVC, Tiles etc</td></tr>
<tr><td>3</td><td>2023</td><td>-</td><td>-</td><td>The following courses are suggested for International certification courses,</td></tr>
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<tr><td></td><td></td><td></td><td></td><td>a) Building Information Modeling (BIM)
b) Drones
c) Augmented Reality & Virtual Reality
d) Metal Building Software (MBS) Software
e) Rebar detailing
f) MEP</td></tr>
<tr><td>4</td><td>2023</td><td>-</td><td>-</td><td>In Curriculum 2023, in semester VII, it is not necessary to add the names of the software in the course title. Example: Simulation Software Laboratory (ANSYS) & Modeling and Analysis Laboratory (ETABS)</td></tr>
</table>
(The above corrections are approved by BoS members and the details are given in Annexure II)
</td></tr>
<tr><td>Item No. 9 : BoS / UG / CIVIL 7.9</td><td>The board chairman appraised to the members present on the Regulations, curriculum structure and approved syllabus of Regulation 2023 for I & II Semester.</td></tr>
<tr><td>Item No. 10 : BoS / UG / CIVIL 7.10</td><td>The board chairman presented the B.Tech. Degree Regulation 2023, Curriculum and Syllabi of third and fourth semesters for the B.Tech. – Civil Engineering students admitted from the academic year 2023-24.
(The details of R-2023 Syllabus for III & IV Semester is attached in Annexure III)</td></tr>
<tr><td>Item No. 11 : BoS / UG / CIVIL 7.11</td><td>A brief discussion on the syllabus related to award of Honors degree in Regulation 2023 was explained by the board chairman and approved by the board members.
(The details of syllabus related to award of Honors degree is attached in Annexure IV)</td></tr>
<tr><td>Item No. 12 : BoS / UG / CIVIL 7.12</td><td>The board chairman appraised and approve the following chosen Elective Courses,

Professional Elective courses for VIII Semester under Regulation 2020 for the batches 2020 – 2024, 2021 – 2025 and 2022-2026
Open Elective courses for IV semester and VI semester under Regulation 2020 for the batches 2021 - 2025 & 2022 -2026

<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>VIII</td><td>2020-2024</td><td>Professional Elective</td><td>U20CEE821</td><td>Structural Dynamics and Earthquake Engineering</td></tr>
<tr><td>2</td><td>2020</td><td>VIII</td><td>2020-2024</td><td>Professional Elective</td><td>U20CEE826</td><td>Coastal and Offshore Structures</td></tr>
<tr><td>3</td><td>2020</td><td>VI</td><td>2021 -2025</td><td>Professional Elective</td><td>U20CEE614</td><td>Municipal Solid Waste</td></tr>
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						Management
4	2020	IV	2020 -2024	Professional Elective	U20CEE405	Alternative Building Materials and Technologies
5	2020	IV	2022 -2026	Open Elective	U20ADO402	Introduction to Data Science
6	2020	VI	2020 -2024	Open Elective	U20EEO603	Conventional and Non – conventional energy sources

(The list of professional & open elective courses and syllabi for the chosen course has been attached in Annexure V)

Item No. 13 : BoS / UG / CIVIL 7.13

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

S.No	Regulation	Sem	Batch	Category	Course code	Course Name
1	2020	IV	2022 -2026	Skill Development Course	U20CES403	Safety in Building Construction
2	2020	VI	2020 -2024	Skill Development Course	U20CES606	Career and Professional Skill Development Program – II
3	2020	VI	2020 -2024	Skill Development Course	U20CES607	Technical Seminar
4	2020	II	2023 -2027	Certification Course	U23CEC248	Sketch Up
5	2020	IV	2022 -2026	Certification Course	U20CEC456	Internet of Things
6	2020	VI	2021 -2025	Certification Course	U20CEC673	Project Management

Discussed and approved the B.Tech. Degree NPTEL / MOOC & online certification courses for II, IV semester, & VI Semester under Regulation 2023 & Regulation 2020 for the batches 2023-2027, 2022-2026 & 2021-2025 respectively

(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)

2.A.7.11

Item No. 14 : BoS / UG / CIVIL 7.14

Discussed and approved the B.Tech. Degree Academic Calendar for Even Semester 2023 -2024. The board chairman appraised 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 appraised to the members.

a) Quality Circle Meeting (QCM)

QCM/YEAR	I YEAR	II YEAR	III YEAR	IV YEAR
QCM 1	28.03.2024	09.03.2024	26.02.2024	26.02.2024
QCM 2	03.05.2024	17.04.2024	28.03.2024	08.03.2024
QCM 3	21.05.2024	21.05.2024	11.05.2024	27.03.2024

b) Continuous Assessment Test (CAT)

QCM/YEAR	I YEAR	II YEAR	III YEAR	IV YEAR
CAT 1	01.04.2024	13.03.2024	29.02.2024	28.02.2024
CAT 2	06.05.2024	22.04.2024	01.04.2024	13.03.2024

c) Model Exam and End Semester Examination

Particulars	I Year	II Year	III Year	IV YEAR
Model Exam	22.05.2024	22.05.2024	13.05.2024	01.04.2024
Model Practical	29.05.2024	29.05.2024	22.05.2024	02.05.2024
End Semester Exam	10.06.2024	10.06.2024	24.06.2024	20.05.2024

d) Redo / Discontinue students

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

Item No. 15 : BoS / UG / CIVIL 7.15

a) Board chairman 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 their CAT Schedule, Course work ESE Result were presented before the BoS members.

Item No. 16 : BoS / UG / CIVIL 7.16

The board chairman appraised on the list of training activities conducted for Placement & stated that 80% of the students placed in the batch 2019 – 2023 to the BoS members. The following training was conducted for the students

- Technical Training
- Advanced Technical Training
- Aptitude, Verbal and Reasoning Training

2.A.7.12

	• Company Specific Training • Motivation Program and Mock Interview
Item No. 17 : BoS / UG / CIVIL 7.17	The board chairman apprised the members that 08 Guest Lecture/Seminar/ Workshop & 03 value added course have been conducted to the students on the latest technology in the field of civil engineering. In addition, all final year student's of batch 2020-2024 underwent Internship training in 24 different companies and the department student have visited 6 Industrial sites to have the practical knowledge.
Item No. 18 : BoS / UG / CIVIL 7.18	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. 19 : BoS / UG / CIVIL 7.19	• Suggestion was also given not to use course titles with Part I and II such as Mechanics of solids-I & II, Geotechnical Technical Engineering – I & II. Instead they suggested having a separate course title with name emphasizing the course content (1.Mechanics of Solids and Strength of materials 2. Soil Mechanics and Foundation Engineering) • A suggestion was given to include Artificial Intelligence and Data analytics in the higher semester of the existing civil Engineering courses. • Members opinioned that project work alone can be in the Eight semester rather than 3 Theory course and a Project work. This will make the final year students to for internship program or employment opportunity • Members suggested that instead of having a separate course for computer oriented programs there can be a course with a title "Program for Problem solving" which can have the python and C Programming • Members suggested that for undergraduate students the course of Research methodology is not needed and insisted to have a core course in that semester. • There was also an opinion on 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. • Building Material and Construction can be renamed as Building Materials inbuilt Environment • There was also a suggestion to consider in 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.

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	• BoS members suggested to give the course name in generic nomenclature than using basics or advanced naming of the courses. • The members also suggested that controller of examination can consider Model making as a part of assignment mark in the internal evaluation. • Members were on the view that in offering the Honors degree, there need not be mentioning of maximum limit of students to undergo the honours programme. Also, the number of credits offered for honours can be mentioned 18 or 20 rather than 18 to 20 credits.

The meeting was concluded at 1.00 pm with vote of thanks by **Dr.S.Sundararaman,** Head of the Department, Department of Civil Engineering

S. Sundararaman

2.8.7.14

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, Er. Surya Civil Engineering & Contractor Puducherry.	Alumni Member	
8	Dr. S. Jayakumar Controller of Examinations, Professor in Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
9	Mr.J.Subash Chandra Boss Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
10	Mrs.A.Kalyani, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	

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11	Mr.C.Raj Govind, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
12	Mr.K.Srinivasan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
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20	Mr.R.Badhrinadhan, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	

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21	Mrs.S.Sinthanagorky, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
22	Mr.S.Tiroumalai, Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
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27	Mr. K. Raja Associate Professor, Department of Mathematics, SMVEC, Madagadipet - 605107	Internal Member	
28	Dr.K.Kathikeyan Associate Professor, Department of Chemistry, SMVEC, Madagadipet - 605107	Internal Member	
29	Dr.P.Rajeswari Associate Professor, Department of English, SMVEC, Madagadipet - 605107	Internal Member	
30	Dr. K. Samuel Assistant Professor, Department of Physics, SMVEC, Madagadipet - 605107	Internal Member	

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2. A. 7. 18

Annexure I

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Suggestions and Action taken on BoS – I (18/07/2020)

S. No	Suggestions	Action taken
1.	In the First Semester, "Fundamentals of Civil and Mechanical Engineering" subject need to be removed and include preliminary study of any professional core subject (Building Materials or Building Technology).	In the First Semester Building Materials subject is added instead of "Fundamentals of Civil and Mechanical Engineering" subject.
2.	The subject in fourth semester "Operational Research" need to changed to fifth semester and the subject "Numerical Methods" in fifth semester to be in fourth semester	The Numerical Methods added in fourth semester and Operational Research changed to fifth semester
3.	Instead of mentioning the subject " E-Tabs Laboratory" in the fifth semester, it can be "Modeling and Analysis Laboratory	The "E-tabs laboratory" in the fifth semester changed to "Modeling and Analysis Laboratory

Suggestions and Action taken BoS – II (09/04/2021)

S. No	Suggestions	Action taken
1.	Members advised that in the course "Structural Analysis I", unit V is obsolete and Kani's method can be replaced with new methods of analyzing the structural elements	The new methods of analyzing the structural elements are incorporated in the unit 5 instead of Kani's method
2.	Members proposed that in the course "Revit Architecture" an inclusion of experiment containing modeling and designing of a complete structure with walkthrough need to be submitted by each student as a project	In "Revit Architecture" the experiment walkthrough is added
3	They also further discussed about the course Estimation costing and valuation laboratory, bar bending schedule need to be included as an additive exercise so that students can get knowledge on the field.	In the course Estimation costing and valuation laboratory the Estimation of bar bending schedule is added
4.	In the course "Design of RC Elements" the second textbook has to be removed and replace with titled "Reinforced Concrete Design" by Unnikrishnan Pillai and Devdas Menon. Also Indian Standard code books of 825 Part I, II and III with SP 16 need to be included in reference books	In "Design of RC Elements" the second textbook is removed and replaced with title "Reinforced Concrete Design" by Unnikrishnan Pillai and Devdas Menon. Also Indian Standard code books of 825 Part I, II and III with SP 16 included in reference books

2.8.7.21

Suggestions and Action taken on BoS – III (27/08/2021)

S. No	Suggestions	Action taken
1.	Members suggested that the Professional Elective Course "U19CEE75 / Advanced Design of RCC Structures" in the Semester VII, the method of design (Limit State or Working stress) need to be clearly mentioned. Reinforcement detailing has to be included for all structural elements design.	As per the suggestion by the members the method of design (Limit State or Working stress) and Reinforcement detailing is included for all structural elements design in Professional Elective Course "U19CEE75 / Advanced Design of RCC Structures" in the Semester VII.
2.	Members also suggested that the Professional Elective Course "U19CEE89/ Pre- Stressed Concrete Structures" in VIII Semester, topic of Unit II need to be changed as 'Design of Shear & Flexural members' instead of 'Shear & Flexure Design'	In the Professional Elective Course "U19CEE89/ Pre- Stressed Concrete Structures" in VIII Semester, topic of Unit II is changed to 'Design of Shear & Flexural members' instead of 'Shear & Flexure Design'

Suggestions and Action taken on BoS – IV (22/02/2022)

S. No	Suggestions	Action taken
1.	Members given the below suggestions for, the course "U20CEP511/ Estimation Costing and Valuation Engineering" • In Experiment 2, instead of Estimation of Residential Building – I it can be mentioned as estimation of substructure. • In Experiment 3, Estimation of Residential Building - II can be changed to estimation of super structure. • To Include the estimate of underground water tank	As per the suggestion by the members the course "U20CEP511/ Estimation Costing and Valuation Engineering" • In Experiment 2, instead of Estimation of Residential Building – I it is mentioned as estimation of substructure. • In Experiment 3, Estimation of Residential Building - II changed to estimation of super structure. • Included the estimate of underground water tank
2.	Members suggested that the Professional Elective Course "U20CEE510/ Advanced Design of RCC Structures" Unit IV and V deals with bridges and Prestressed concrete structures which are a separate subjects and cannot be kept as separate units in this subject. Instead they asked to think on the topics such as Flat slab, shear wall design and corbel grid floor system	As per the suggestion by the members the Professional Elective Course "U20CEE510/ Advanced Design of RCC Structures" the topics such as Flat slab, shear wall design and corbel grid floor system are included.

2.A.7.22

P. Sundararaman

Suggestions and Action Taken on BoS – V (24/09/2022)

S. No	Suggestions	Action taken
1.	In Project Phase I, it would be better to include simple design of RCC detailing & valuation of G+1 floor with concepts of blue print requirements	As suggested, simple design of RCC detailing & valuation of G+1 floor with concepts of blue print requirements are included

Suggestions and Action taken on BoS – VI (21/07/2023)

S. No	Suggestions	Action taken
1.	In Civil Engineering Practice Laboratory' Foundation Marking can be added.	As per the member suggestion in "Civil Engineering Practice Laboratory' Foundation Marking added
2.	In 'Building Materials and Construction', modern building materials can be included such as Glasses, UPVC, Tiles etc	As per the suggestion by the members in "Building Materials and Construction", modern building materials included such as Glasses, UPVC, Tiles etc

V. Sundaramma

21.7.23

2.0.7.24

Annexure II

2.07.25

Department	Civil Engineering			Programme: **B.Tech.**				
Semester	I			Course Category Code: **PC**			*End Semester Exam Type: **LE**	
Course Code	**U23CEP101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Civil Engineering Practice Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Basics of Civil and Mechanical Engineering	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Make a carpentry joint in the given wooden pieces	K4
	CO2 Prepare a welding joint in the given material	K4
	CO3 Make a fitting work in the given material	K4
	CO4 Prepare a different types of bonds in the brick	K4
	CO5 Prepare a basic connections involved in plumbing	K4

List of Experiments:

Carpentry Work
1. Lap joint
2. Butt joint
3. T Joint

Welding Work
4. Lap joint
5. Butt joint
6. T Joint

Fitting Work
7. V fitting
8. T fitting
9. Different types of brick bonds using the concept of line, plumb bob, right angle and water level
10. Different types of pipe joints using plumbing accessories
11. Study on tools used in carpentry, welding and fitting works
12. Setting out of foundation for Single Room Building

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

Reference Books

1. David H. Phillips 'Welding Engineering - An Introduction', second edition, Wiley; 2nd edition (February 21, 2023)
2. DK, 'Woodworking - The Complete Step-by-Step Manual', April 7, 2020
3. George Lister Sutcliffe, 'Sanitary Fittings and Plumbing (Classic Reprint)', Forgotten Books (23 April 2018)
4. K. C. JOHN, 'Mechanical workshop practice's. PHI Learning Pvt. Ltd., 27-Aug-2010

Web References

1. https://archive.nptel.ac.in/courses/112/103/112103263/
2. https://archive.nptel.ac.in/courses/124/105/124105013/
3. https://archive.nptel.ac.in/courses/105/106/105106197/
4. https://web.uettaxila.edu.pk/CMS/AUT2013/ieWPbs/notes/Workshop%20Practice%20(Fitting%20Shop).pdf
5. https://www.govinfo.gov/content/pkg/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb/pdf/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb.pdf

2.A.7. 27

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	2	1	1	1	1	-	1	1	-	2	3	1	2
2	3	1	1	1	1	1	1	-	1	1	-	2	3	1	1
3	3	1	1	1	1	1	1	-	2	1	-	2	3	1	1
4	3	1	1	1	1	1	1	-	2	2	-	2	3	1	1
5	3	1	1	1	1	1	1	-	2	2	-	2	3	1	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

2.A.7.28

V. Sudarsana

Department	Civil Engineering			Programme: B.Tech.				
Semester	II			Course Category Code: CC			*End Semester Exam Type: TE	
Course Code	U23CET202			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	Building Materials and Construction			2	1	0	3	25	75	100

Prerequisite	Basics of Civil Engineering	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Identify the building materials and processing of timber and its defects	K2
	CO2 Prevent dampness, waterproofing and damp proofing materials used in the construction	K2
	CO3 Apply various types of temporary structures and its applications in construction	K2
	CO4 Provide efficient, safe, accessible and sustainable movement within buildings	K2
	CO5 Exhibit the knowledge of building finishes and form work requirements	K2

UNIT-I	Modern Construction Materials	Periods: 09
Modern materials – Neoprene, Thermocole, decorative panels and laminates, Architectural glass and ceramics, Ferrocement, PVC, Polymer base materials, Fibre reinforced plastics – Timber – Seasoning of Timber – Timber based materials - Preservation and treatment of timber		CO1
UNIT-II	**Temporary Structures**	**Periods: 09**
Introduction- Classification of Temporary structures – Scaffoldings – Technical terms used – Brick layers, Mason's, Needle, suspended, Ladder and Tubular Scaffolding – Shoring – Pile and Pit Method — Underpinning – Method of underpinning – Centering and Shuttering		CO2
UNIT-III	**Vertical Transportation**	**Periods: 09**
Definition – Technical terms – Requirements of good stairs – Types of stairs - Straight, Dog Legged, Open Newel, Quarter Turn, Bifurcated, Geometrical and Spiral stairs – Lifts – Ramps – Escalators		CO3
UNIT-IV	**Paints, Varnishes and Distempers**	**Periods: 09**
Paints – Varnish – Distemper – Purpose, Types, Ingredients and Defects, Preparation and applications to new and old plastered surfaces, wooden and steel surfaces		CO4
UNIT-V	**Damp Proofing , Waterproofing and Anti Termite Treatment**	**Periods: 09**
Definition of technical terms – Defects – Sources – Prevention – Damp proofing and terrace water proofing methods – Pre and Post construction anti termite treatment		CO5

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

Text Books

1. S. K. Duggal, "Building Materials", (Fifth Edition), New Age Publishers, 2019
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications Pvt Ltd., New Delhi, 2008
3. S.C. Rangawala "Building Construction", Charotar Publishing House Pvt. Ltd., India, 2022

Reference Books

1. S.S.Bhavikatti, "Building Materials", Vikas Publishing House, January 2012
2. P.C. Varghese, "Building Materials", Prentice-Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2015
3. Arora . S.P. Bindra S.P . A Test book of Building Construction, Dhanpat rai & Co, New Delhi, 2010.
4. Sushil Kumar, "Building Construction", Standard Publishers Distributors, 20th Edition
5. M L Gambhir, "Building Materials", McGraw Hill Education; 1st edition, 2017

2.A.7.29

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	2	-	-	-	-	-	-	-	-	-	1	-	-
2	3	1	2	-	-	-	-	-	-	-	-	-	1	-	-
3	3	1	2	-	-	-	-	-	-	-	-	-	1	-	-
4	3	1	2	-	-	-	-	-	-	-	-	-	1	-	-
5	3	1	2	-	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 -

Medium, 3 – HighEvaluation 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

2. A. 7. 30

Curriculum - R2023

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CET713	Construction 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
							21	425	575	1000

2.A.7.31

2.A.7.32

Annexure III

2.A. 7.33

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

CIVIL ENGINEERING

ACADEMIC REGULATIONS 2023
(R - 2023)

CURRICULUM

2.A.7.35

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.

2.A.7.36

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.

2.A.7.37

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.

2.A.7.38

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.

2.A.7.39

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 Courses (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*)	-
9	Mandatory Courses (MC*)	-
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 Courses (HS)	3	5	1	1	2	-	-	3	15
2	Basic Sciences Courses (BS)	7	4	5	4	-	-	-	-	20
3	Engineering Sciences Courses (ES)	11	5	4	4	4	-	-	-	28
4	Professional Core Courses (PC)	1	7	13	10	8	15	12	-	66
5	Professional Electives Courses (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives Courses (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***

HONOURS DEGREE PROGRAMME:

The student is permitted to opt for earning an *honours degree* in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an honours degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA* (*for lateral entry) of not less than 8.0. The prescribed courses offered for Honours degree are given in **Annexure V.**

2.A.7.40

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***

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	UHV 2 (Universal Human Value)	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

2.A.7.41

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

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	Strength of Materials	PC	2	1	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
							23	675	625	1300

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

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	2	1	0	3	25	75	100
4	U23CET407	Design of RC Elements	PC	2	1	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

2.A.7.42

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
							22	625	575	1200

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

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	2	1	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	U23ITPC03	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
							21	600	600	1200

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

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	2	1	0	3	25	75	100
2	U23CET611	Structural Analysis	PC	2	1	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

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Theory cum Practical										
6	U23CEB603	Instrumentation and sensor Technologies for Civil Engineering Application	PC	2	0	2	3	50	50	100
Practical										
7	U23CEP607	STAAD PRO V8i Laboratory	PC	0	0	2	1	50	50	100
8	U23CEP608	Transportation Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U23CEP609	Survey Camp	PC	0	0	0	1	50	50	100
Project Work										
10	U23CEW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CEC6XX	Certification Course – VI**	AEC	0	0	4	0	100	-	100
Mandatory Course										
12	U23CEM606	Gender Equality	MC	2	0	0	0	100	-	100
							22	625	575	1200

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
							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

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Project Work										
4	U23CEW805	Project Phase – II	PA	0	0	16	8	50	100	150
							17	125	325	450

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
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

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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

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

Annexure - III

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

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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
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

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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
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 - IV

ABILITY ENHANCEMENT COURSES–(B) SKILL ENHANCEMENT COURSES

Sl. No	Course Code	Course Title
1	U23CES301	Skill Development Course 1 *
		1) MS Office – Word, Excel, Power Point
		2) Measurements and Conversion
		3) Experience with On-Site Construction Observation and Management
2	U23CES402	Skill Development Course 2 *
		1) Basic Vasthu
		2) Safety in building construction
		3) Air Quality Monitoring

Annexure - V

Honours Programme - Green Technology and Sustainable Engineering

COURSE DETAILS

Sl. No.	Semester	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
Theory											
1	IV	U23CEH401	Energy, Environment and Renewable Energy Technologies	PC	3	1	0	4	25	75	100
2	V	U23CEH502	Bioenergy and Conversion Systems	PC	3	1	0	4	25	75	100
3	VI	U23CEH603	Bioprocess Engineering for Biofuels	PC	3	1	0	4	25	75	100
4	VII	U23CEH704	Alternate Materials for Sustainable Technology	PC	3	1	0	4	25	75	100
5	VIII	U23CEH805	Green Management	PC	3	1	0	4	25	75	100
Total								**20**	**125**	**375**	**500**

Equivalent NPTEL courses[##]

1	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	3	**12 WEEK Course**
2	Biomass Conversion and Biorefinery	3	
3	Aspects of Biochemical Engineering	3	
4	Sustainable Materials and Green Buildings	3	
5	Environment Management	3	

[##] The student shall be given an option to earn 3 credits through one equivalent 12 week NPTEL course instead of any one course listed for honours degree programme that should be completed before the commencement of eighth semester. The equivalent courses are subject to change based on its availability as per NPTEL course list.

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III SEMESTER SYLLABUS

Department	**Mathematics**			Programme: **B.Tech.**					
Semester	**Third**			Course Category Code: **BS**			*End Semester Exam Type: **TE**		
Course Code	**U23MATC03**			Periods/Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**PROBABILITY AND STATISTICS**			**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to All Branches Except CSBS)										
Prerequisite	Basic Probability									
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Understand the concept of probability.							**K3**	
	CO2	Solve the problem on Random variables.							**K3**	
	CO3	Understand the concepts of Analysis of variance.							**K3**	
	CO4	Learn the .applications of Large Samples.							**K3**	
	CO5	Analyze the problems in small samples.							**K3**	
UNIT – I	**THEORY OF PROBABILITY**						**Periods:12**			
Random Experiments - Sample Space - Exhaustive events- Axioms of probability – Conditional probability – Total probability – Bayes theorem.										**CO1**
UNIT – II	**RANDOM VARIABLES**						**Periods:12**			
Discrete Random Variable – Binomial distribution – Poisson distribution. Continuous Random Variable – Exponential distribution – Normal distribution (Excluding Derivation of Mean, Variance and MGF)										**CO2**
UNIT – III	**STATISTICS & ANALYSIS OF VARIANCES**						**Periods:12**			
Correlation – Rank correlation and Regression. Analysis of variance: One-way classifications. and two-way classifications.										**CO3**
UNIT – IV	**LARGE SAMPLES**						**Periods:12**			
Large Samples: Single Propositions – Difference of Proportions – Single Mean – Difference of Mean – Difference of Standard Deviations										**CO4**
UNIT – V	**SMALL SAMPLES**						**Periods:12**			
Test for Single and Difference Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.										**CO5**
Lecture Periods:45		**Tutorial Periods:15**		**Practical Periods: -**			**Total Periods:60**			

Text Books

1. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill, 3rd Edition, 2008.
2. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, 2019.
3. S.C. Gupta, V.K. Kapur "Fundamental of Mathematical Statistics" Sultan Chand & sons, 12th Edition, 2022.

Reference Books

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 3rd Edition,2017
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning, 15thEdition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, "An Introduction to Probability and Statistics", Wiley, 3rd Edition 2008.

Web References

1. www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

* TE – Theory Exam, LE – Lab Exam

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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	2	1	1	-	-	-	-	-	-	-	1	2	1	1
2	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
3	2	2	-	-	-	1	-	-	-	-	-	1	2	1	1
4	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
5	3	2	1	1	-	1	-	-	-	1	-	1	2	1	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	Artificial Intelligence and Data Science	Programme: B.Tech						
Semester	III	Course Category : ES			End Semester Exam Type: TE			
Course Code	U23ADTC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Programming in Python	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	Interpret the basic concepts of Python programs.	K2
	CO2	Articulate the concepts of Sets, Dictionaries and Object-Oriented concepts.	K2
	CO3	Experiment with Numpy package.	K3
	CO4	Apply and analyze Data Manipulation with Pandas.	K3
	CO5	Illustrate programming concept for Visualization with Matplotlib.	K3

UNIT-I	Introduction to Python	Periods: 09	
Structure of Python Program – Underlying mechanism of Module Execution – Branching and Looping – Problem Solving Using Branches and Loops – Functions – Lambda Functions – Lists and Mutability – Problem Solving Using Lists and Functions.			CO1

UNIT-II	Sequence Datatypes and Object-Oriented Programming	Periods: 09	
Sequences – Mapping and Sets – Dictionaries. Classes: Classes and Instances – Inheritance – Exception Handling – Introduction to Regular Expressions using "re" module.			CO2

UNIT-III	Using Numpy	Periods: 09	
Basics of NumPy – Computation on NumPy – Aggregations – Computation on Arrays – Comparisons – Masks and Boolean Arrays – Fancy Indexing – Sorting Arrays – Structured Data: NumPy's Structured Array.			CO3

UNIT-IV	Data Manipulation with Pandas	Periods: 09	
Introduction to Pandas Objects – Data indexing and Selection – Operating on Data in Pandas – Handling Missing Data – Hierarchical Indexing – Combining Data Sets. Aggregation and Grouping – Pivot Tables –Vectorized String Operations – Working with Time Series – High Performance Pandas – eval() and query().			CO4

UNIT-V	Visualization With Matplotlib	Periods: 09	
Basic functions of Matplotlib – Simple Line Plot – Scatter Plot – Density and Contour Plots – Histograms – Binnings and Density – Customizing Plot Legends – Colour Bars – Three-Dimensional Plotting in Matplotlib.			CO5

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

Text Books

1. Jake VanderPlas, "Python Data Science Handbook - Essential Tools for Working with Data", O'Reily Media Inc, 2016.
2. Zhang.Y, "An Introduction to Python and Computer Programming", Springer Publications, 2016.
3. Wesley J Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2006.

Reference Books

1. John Paul Mueller, Luca Massaron, "Python for Data Science for Dummies", 2nd Edition, John Wiley& Sons, 2019.
2. Jesus Rogel-Salazar, "Data Science and Analytics with Python", CRC Press Taylor and Francis Group, 2017.
3. Brian Draper, "Python Programming A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language", CreateSpace Independent Publishing Platform, 2016.
4. Mark Lutz, Laura Lewin, Frank Willison, "Programming Python", O'Reilly Media, 3rd Edition, 2006.
5. Gowrishankar S, Veena A, "Introduction to Python Programming", CRC Press, 2018.

Web References

1. https://nptel.ac.in/courses/106/106/106106212/
2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

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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	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	2	1	3	-	-	-	-	-	-	-	2	2	2	3
3	3	2	2	3	-	-	-	-	-	-	-	2	3	2	3
4	3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
5	3	3	2	3	-	-	-	-	-	-	-	2	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	III			Course Category Code: PC		End Semester Exam Type: TE	
Course Code	U23CET303	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Fluid Mechanics and Machinery	3	0	-	3	25	75	100

Prerequisite			
Course Outcome	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Appraise the various properties of fluids and characteristics	K3
	CO2	Analyse and calculate flow through circular conduits	K4
	CO3	Apply mathematical knowledge to predict the flow measurement and dimensional analysis	K5
	CO4	Mathematically predict the nature of flow through pipes	K4
	CO5	Distinguish the components, functions and uses of pumps and turbines	K4

UNIT – I	FLUID PROPERTIES AND FLOW CHARACTERISTICS	Periods:09
Properties of fluids - Mass density, Specific weight, Specific gravity, Viscosity, Surface tension, Capillarity, Bulk modulus, Compressibility - Hydrostatics – Pressure – Static, absolute and gauge pressure – Forces on planes – Center of pressure – Buoyancy and floatation. Flow characteristics – concept of control volume – application of continuity equation, energy equation and momentum equation.		CO1
UNIT – II	**FLOW THROUGH CIRCULAR CONDUITS**	**Periods:09**
Boundary Layer Theory: Boundary Layer thickness - Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation. Laminar flow: Laminar flow through pipes, Hagen - poissuille flow, energy loss. Turbulent flow: Turbulent flow through pipes, Darcy's equation, Minor losses, Energy and hydraulic gradients, pipes in series and parallel.		CO2
UNIT – III	**FLOW MEASUREMENT AND DIMENSIONAL ANALYSIS**	**Periods:09**
Continuity equation – Euler's equation - Bernoulli's equation – Applications – Venturimeter, Orificemeter and Pitot tube – Orifice and Mouthpiece – Notches / Weirs - Rectangular and Triangular types – End contraction – Velocity of approach. Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis		CO3
UNIT – IV	**OPEN CHANNEL FLOW**	**Periods:09**
Hydraulics Channel - Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.		CO4
UNIT – V	**PUMPS AND TURBINES**	**Periods:09**
Centrifugal pumps– working principle- work done by the impeller – performance curves – Reciprocating pump-working principle – Rotary pumps –classification. Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles – work done by water on the runner – draft tube.		CO5

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

Text Books

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.
2. Dr. R.K. Bansal "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publication, 2017
3. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016

Reference Books

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor and Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
5. John A.Roberson, "Hydraulic Engineering", John Wiley andSons,Incorporated, 2013

2.A.7.55

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2. https://www.youtube.com/watch?v=fa0zHI6nLUo&list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm
3. https://www.coursera.org/courses?query=fluid%20mechanics
4. https://www.classcentral.com/course/swayam-introduction-to-fluid-mechanics-7945
5. https://www.udemy.com/topic/fluid-mechanics

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

2. A. 7.5.6

Department	Civil Engineering			Programme: B.Tech.					
Semester	III			Course Category Code: PC			*End Semester Exam Type: TE		
Course Code	U23CET304			Periods / Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	Construction Technique, Equipment and Practices			3	0	0	3	25	75	100

Prerequisite	Building Material and Construction	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Know the different construction techniques and structural systems	K2
	CO2 Predict the earth moving equipment for different types of work	K2
	CO3 Apply the various construction practices in the field	K2
	CO4 Know about the concrete equipment in the construction field	K2
	CO5 Know the lifting equipment involved in the construction.	K2

UNIT-I	Construction Techniques	Periods: 09
Overview of Construction Industry Sectors - residential, commercial, civil engineering and industrial construction - Types of Construction Projects - Construction Materials and their Properties - concrete, steel and wood		CO1
UNIT-II	**Earthmoving Equipment**	**Periods: 09**
Equipment for earth moving operations - Equipment for foundation and pile driving - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling		CO2
UNIT-III	**Construction Practices**	**Periods: 09**
Specifications, details and sequence of activities and construction – Centering and shuttering – slip forms – Scaffoldings – De-shuttering forms – Fabrication and erection of steel trusses, frames, braced domes		CO3
UNIT-IV	**Concrete Equipment**	**Periods: 09**
Types of concrete mixer machines - Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete.		CO4
UNIT-V	**Lifting Equipment**	**Periods: 09**
Cranes, Crane motions, Principles of lifting mechanism of crane - Types of cranes - Tower cranes, Factors affecting lifting capacity of crane		CO5

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

Text Books

1. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
2. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2016.
3. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2013

Reference Books

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 2001.
2. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers,1999.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
4. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.

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1. https://www.eolss.net/sample-chapters/c05/E6-37-03-07.pdf
2. https://rdso.indianrailways.gov.in/works/uploads/File/WKS-R-1.pdf
3. https://www.jswneosteel.in/build/best-practices-in-rcc-construction.aspx
4. https://nuvonirmaan.com/construction-stages/substructure/
5. https://nuvonirmaan.com/construction-stages/superstructure/

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	2	-	-	3	-	-	-	-	-	-	1	3	3
2	3	3	2	-	-	3	-	-	-	-	-	-	1	3	3
3	3	3	2	-	-	3	-	-	-	-	-	-	1	3	3
4	3	3	2	-	-	3	-	-	-	-	-	-	1	3	3
5	3	3	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

2.A.7.58

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	Strength of Materials	2	1	-	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	K4
CO2	Calculate the strain energy for materials.	K4
CO3	Analyse the indeterminate structures and draw the shear force and bending moment diagrams for continuous beam.	K4
CO4	Determine the deflection of trusses and frames.	K4
CO5	Discuss the theories of failure and also to find the unsymmetrical bending and shear centre of the sections.	K4

UNIT- I	DEFLECTION OF BEAMS	Periods: 12
Slope and Deflection – Deflection of cantilever and simply supported beams – Macaulay's method and conjugate beam method.		CO1
UNIT- II	**ENERGY PRINCIPLES**	**Periods: 12**
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: 12**
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: 12**
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: 12**
Various theories of failure – Unsymmetrical bending of beams – 'L' and 'T' sections. Shear centre – Channel and I sections		CO5

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

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.

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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

2.A.7.60

Department	Civil Engineering	Programme: B.Tech.						
Semester	III	Course Category : PC			End Semester Exam Type:TE			
Course Code	U23CEB301	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Surveying and Geomatics	2	-	2	3	50	50	100

Prerequisite	-	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Implement the procedure of Chain Survey to find different distances and areas..	K2
	CO2 Determine the reduced level of points using levelling instruments	K2
	CO3 Locate the position of the object after finding the distance and heights using theodolite.	K3
	CO4 Apply the concepts of tacheometer surveying to find the height and distance of given object.	K2
	CO5 Implement the modern survey techniques using Total Station equipment and GPS.	K3

UNIT- I	FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING	Periods:10
Classifications and basic principles of surveying - Methods of ranging - Chain traversing - Obstacles- Tape corrections - Compass - Types of Compass- Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing- Local Attraction – Magnetic declination – Dip- Levelling- Principles and theory of Levelling – Datum- Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling- Curvature and refraction - Contouring - Digital Planimeter - Uses		CO1
UNIT- II	**THEODOLITE AND TACHEOMETRIC SURVEYING**	**Periods:10**
Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Anallactic Lens - Tacheometry surveying - Tangential and Stadia - Trigonometric levelling.		CO2
UNIT- III	**CONTROL SURVEYING AND ADJUSTMENT**	**Periods:10**
Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre– single and reciprocal observations – traversing –Sources of errors- precautions and corrections – classification of errors – true and most probable values- weighed observations – method of equal shifts –principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks		CO3
UNIT- IV	**LEVELLING & THEODOLITE**	**Periods:15**
List of Exercises 1.Reduction of Levels: (i) Height of Collimation (ii) Rise and Fall method 2. Fly levelling using Dumpy level 3.Measurements of horizontal angles by reiteration and repetition and vertical angles 4.Determination of Tacheometric Constants 5.Heights and distances by stadia Tacheometry		CO4
UNIT-V	**Modern Surveying – Total Station & GPS**	**Periods:15**
List of Exercises 1. Total Station Surveying – Measurements of Distances and angles, Slope distances, Height, Traversing, setting out, Area and Volume. 2.GPS Surveying – Co-ordinate Measurements		CO5

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

Text 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.

Reference Books

1. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
2. Subramanian, "Surveying and Levelling", Oxford University Press, 2012
3. Alfred Leick, "GPS satellite surveying", John Wiley and Sons Inc., 4th Edition, 2015.

2.A.7.61

Web References
1. https://www.allenprecision.com/page/how-to-stake-out-points-and-profile-boards-with-a-total-station/
2. https://www.elprocus.com/how-gps-system-works/
3. https://www.johnsonlevel.com/News/TheodolitesAllAboutTheodo

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	1	1	1	-	-	2	3	-	1	3	3	3
2	3	1	1	1	1	1	-	-	3	3	-	1	3	3	3
3	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3
4	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3
5	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3

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

Evaluation Methods

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)	

Department	English	Programme: B.Tech.						
Semester	III	Course Category Code: HS			*End Semester Exam Type: LE			
Course Code	U23ENPC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	General Proficiency- I	0	0	2	1	50	50	100

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret meaning and apply reading strategies in technical and non-technical context	**K3**
	CO2 Develop interpersonal communication skills professionally	**K4**
	CO3 Demonstrate various forms of formal writing	**K3**
	CO4 Decode graphical data coherently	**K2**
	CO5 Apply the techniques of verbal aptitude in competitive exams	**K3**

UNIT- I	**COMPREHENSION ANALYSIS**	**Periods:6**	
Listening: Dialogue based on social contexts (IELTS based) - Speaking: Break the iceberg (IELTS based) Submitting Video Recording - Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 2 (IELTS Academic) - Vocabulary: Synonyms (IELTS)			**CO1**
UNIT- II	**PERSONALITY DEVELOPMENT**	**Periods:6**	
Listening: Monologue about the everyday social issues (IELTS based) - Interview Videos - Speaking: Speak about the topic in the Flash Card (IELTS based) - Reading: British & American Vocabulary - Writing: SWOT Analysis - Vocabulary: Idioms and Phrases (IELTS)			**CO2**
UNIT- III	**INFERENTIAL LEARNING**	**Periods:6**	
Listening: Conversation between 4 people regarding education (IELTS based), Anecdotes - Speaking: Structure Discussion (IELTS based) - Reading: Distinguish between facts & opinions (IELTS based), - Writing: Writing Conversation to different context - Vocabulary: Phrasal Verbs (IELTS)			**CO3**
UNIT- IV	**INTERPRETATION AND FUNCTIONAL WRITING**	**Periods:6**	
Listening: Monologue on an academic subject (IELTS based), Group Discussion videos - Speaking: Group Discussion Practice - Reading: Read and review (Books, Magazines) - Writing: Writing Task 1: (IELTS Academic: Graph/ chart/tables description) - Vocabulary: Collocations (IELTS)			**CO4**
UNIT-V	**VERBAL APTITUDE - I**	**Periods:6**	
Language Enhancement: Articles, Preposition, Conjunction **Verbal Ability Enhancement:** Ordering of sentences, Blood Relation, Completing Statements- Cloze test, Spotting Errors - Sentence Improvement, Word Analogy, Word Groups **(GATE)**			**CO5**

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

Reference Books

1.Lewis, Norman, "Word Power Made Easy".Goyal Publishers and Distributors Pvt.Ltd., Latest Edition, 2020.
2.Patterson,Kerry, Joseph Grenny,Ron McMillan, Al Switzler, "Crucial Conversation Tools for talking when Stakes are High", Kindle Publication,2nd Edition, 2011.
3.Comfort, Jeremy,et.al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.
4.Agarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5.Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

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1.https://www.ielts-exam.net/grammar/
2.https://ieltsfocus.com/2017/08/02/collocations-ielts/
3.https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4.https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5.https://www.examsbook.com/word-analogy-test-questions-with-answers

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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	-	-	-	-	-	-	1	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

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

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

2.8.7.64

Department	**Mathematics**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: **BS**			*End Semester Exam Type: **LE**	
Course Code	**U23MAPC01**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics Laboratory**			**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches Except CSBS)										
Prerequisite	Matrices, Fourier Transforms, Laplace Transforms									
Course Outcome	**On completion of the course, the students will be able to**									BT Mapping (Highest Level)
	CO1	**Perform and evaluate Matrix Operations**								**K3**
	CO2	Solve Differential and Integral Equations								**K3**
	CO3	Construct Fourier series and Fourier Transforms of the given function								**K3**
	CO4	Find the Measures of Central tendency								**K3**
	CO5	Analyze Correlation and Regression lines								**K3**

List of Experiments:

1. Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix.
2. Solve the first order differential equation.
3. Find the integration of $\int_a^b f(x)dx$.
4. Find the Fourier series of f(x).
5. Find the Fourier Transform of f(x).
6. Find the Laplace Transform of f(x).
7. Find the Mean, Median and Mode.
8. Construct the Pie and Bar Diagram.
9. Find the Correlation coefficient.
10. Find the Regression lines.

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

Reference Books

1. T. Veerarajan, "Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018.
2. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.
3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.

Web References

1. https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
2. https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf
3. https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410

* TE – Theory Exam, LE – Lab Exam

2.A.7.65

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	1	-	1	-	-	-	-	-	1	1	1	1
2	3	2	1	1	-	1	-	-	-	-	-	1	1	1	1
3	2	1	-	-	-	1	-	-	-	-	-	1	1	1	1
4	2	1	-	-	-	1	-	-	-	-	-	1	1	1	1
5	3	2	1	1	-	1	-	-	-	-	-	1	1	1	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

2.A.7.66

Department	Artificial Intelligence and Data Science	Programme: B.Tech						
Semester	III	Course Category : ES			End Semester Exam Type:LE			
Course Code	U23ADPC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Programming in Python Laboratory	0	0	2	1	50	50	100
(Common to All Branches)								
Prerequisite	NIL							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Describe common Python functionality and features used for data science.	K2
CO2	Query Data Frame structures for cleaning and processing.	K2
CO3	Configure your programming environment	K3
CO4	Experiment the concept using data visualization.	K3
CO5	Analyze real time datasets,	K3

List of Exercises

1. Build a python program to implement Fibonacci series.
2. Build a python program to get a range of numbers from user and to separate even numbers and odd numbers respectively.
3. Build a function in Python to check duplicate letters. It must accept a string, i.e., a sentence. The function should return True if the sentence has any word with duplicate letters, else return False.
4. Build a program to perform arithmetic operations using lambda function.
5. Build a Python program that takes a list of numbers as input and returns a new list containing only the even numbers from the input list.
6. Build a python program to create a class called Car with attributes Company, model, and year. Implement a method that returns the age of the car in years.
7. Build a python program to create a base class called Shape that has a method called area which returns the area of the shape (set it to 0 for now). Then, create two derived classes Rectangle and Circle that inherit from the Shape class to calculate the area of derived classes.
8. Build a python program to implement aggregation using Numpy.
9. Build a python program to perform Indexing and Sorting.
10. Build a python program to perform Handling of missing data.
11. Build a python program to perform usage of Pivot table using Titanic datasets
12. Build a python program to perform use of eval () and query ()
13. Build a python program to perform Scatter Plot
14. Build a python program to perform 3D plotting
15. Implement an application to process a real time data.

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

Reference Books

1. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystyanczuk, "Python Social Media Analytics", Packt Publishing, 2017.
3. Jake VanderPlas, "Python Data Science Handbook - Essential Tools for Working with Data", O'Reily Media Inc, 2016.
4. Zhang.Y, "An Introduction to Python and Computer Programming", Springer Publications, 2016.
5. Wesley J Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2006.

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1. https://nptel.ac.in/courses/106/106/106106212/
2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

2.A.7.67

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	2	2	1	3	-	-	-	-	-	-	-	2	2	2
2	2	3	2	2	3	-	-	-	-	-	-	-	2	3	2
3	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
5	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.7.68

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23CEP303**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Fluid Mechanics and Machines Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Basics of Civil and Mechanical Engineering	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Students will be able to measure the discharge through the channels and pipes	K3
	CO2 Students will have a basic knowledge and able to calculate the different losses in pipes	K2
	CO3 Students will have confidence in calculating the forces on vanes.	K2
	CO4 To estimate performance parameters of a given Centrifugal and Reciprocating pump	K3
	CO5 To select and analyze an appropriate turbine with reference to given situation in power plants.	K3

List of Experiments:

A. FLUID FLOW LABORATORY

1. Determination of co-efficient of discharge of venturimeter
2. Determination of co-efficient of discharge of Orifice meter.
3. Determination of co-efficient of discharge of Orifice.
4. Determination of co-efficient of discharge of Notches.
5. Determination of frictional losses in pipes.
6. Determination of Minor losses in pipes
7. Study of the impact of jet on vanes.

B. FLUID MACHINERY LABORATORY

1. Study of performance characteristics of centrifugal pump
2. Study of performance characteristics of Reciprocating pump
3. Tests on Turbine

Lecture Periods: 0	**Tutorial Periods:** 0	**Practical Periods:** 30	**Total Periods:** 30

Reference Books

1. Sarbjit Singh. "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. John A. Roberson, "Hydraulic Engineering", John Wiley &Sons, Incorporated, 2013.
3. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 2010

Web References

1. https://archive.nptel.ac.in/courses/112/103/112103263/
2. https://archive.nptel.ac.in/courses/124/105/124105013/
3. https://archive.nptel.ac.in/courses/105/106/105106197/
4. https://web.uettaxila.edu.pk/CMS/AUT2013/ieWPbs/notes/Workshop%20Practice%20(Fitting%20Shop).pdf
5. https://www.govinfo.gov/content/pkg/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb/pdf/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb.pdf

2.A.7. 69

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	2	1	1	1	1	-	1	1	-	2	3	1	2
2	3	1	1	1	1	1	1	-	1	1	-	2	3	1	1
3	3	1	1	1	1	1	1	-	2	1	-	2	3	1	1
4	3	1	1	1	1	1	1	-	2	2	-	2	3	1	1
5	3	1	1	1	1	1	1	-	2	2	-	2	3	1	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

2.A.7.20

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CEC3XX**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE-III**	**0**	**0**	**4**	**-**	**100**	**-**	**100**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

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.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 50**	**Total Periods: 50**

Evaluation methods

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

2.A.7.71

Department	Civil Engineering	Programme: B.Tech.						
Semester	III	Course Category: SEC			*End Semester Exam Type: LE			
Course Code	U23CES301	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Skill Enhancement Course 1	0	0	2	-	-	100	100

1. BASIC VASTHU

Course Content:

This would involve introducing vasthu to students using various energy patterns. In this student will be given exposure to selection of land, concepts behind planning, sequence of construction as per vasthu rules and rules for various rooms

2. PLANE TABLE SURVEYING

Course Content:

A plane table is a device used in surveying and related disciplines to provide a solid and level surface on which to make field drawings, charts and maps. This would help the students to prepare a map or plan to represent an area on a horizontal plan using plane table surveying by conducting various experiments involving different methods. The students would be able to acquire practical knowledge on handling the plane table survey instruments.

3. AUTO LEVEL SURVEYING

Course Content:

The students would be given exposure to automatic level and circular spirit level. This would provide knowledge of automatic level and advanced surveying instruments using working principles of survey instruments. The students would develop skills in using circular spirit level and analyses data and to measure the horizontal distances. This would help students to improve skills to set out leveling in the field using automatic level.

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

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

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

2.A.7.22

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

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understanding the atmosphere and its components	K1
	CO2	Understanding about the Global Climate	K1
	CO3	Students able to know the impacts of climate change	K2
	CO4	Understanding on the growing scientific consensus established through the IPCC as well as the complexities and uncertainties	K1
	CO5	Ability to plan climate change mitigation and adaptation projects including the use of alternate fuels.	K1

UNIT-I	ATMOSPHERE AND ITS COMPONENTS	(8Hrs)	
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	(8Hrs)	
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	(8Hrs)	
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	(8Hrs)	
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	(8Hrs)	
Clean Development Mechanism —Carbon Trading- examples of future Clean Technology — Biodiesel — Natural Compost — Eco- Friendly Plastic —i 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: -	Tutorial Periods: -	Practical Periods:30	Total Periods:30

Text Books

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

Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. JasonSmerdon(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. https://n tel.ac.in/courses/105102089/
2. https://www.warmheartworldwide
3. https://nptel.ac.in/content/storage

2.A.7.73

Evaluation methods

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

2. A. I. 74

IV SEMESTER SYLLABUS

Department	**Mathematics**	Programme :**B.Tech.**						
Semester	**IV**	Course Category Code: **BS**			*End Semester Exam Type: **TE**			
Course Code	**U23MATC04**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**NUMERICAL METHODS AND OPTIMIZATION**	**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to EEE, ECE, ICE, BME, MECH, CIVIL & MECHATRONICS)								

Prerequisite	Basic Mathematics		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Solve Algebraic and Transcendental equations	**K2**
	CO2	Solve Simultaneous Equations by various Numerical Techniques.	**K3**
	CO3	Apply the Numerical Techniques of interpolation in various Intervals.	**K3**
	CO4	Solve Linear programming problems by using Optimization Techniques.	**K3**
	CO5	Find the solution of Transportation and Assignment Problems.	**K3**

UNIT – I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS**	**Periods:12**	
Solution of Algebraic and Transcendental equations – Bisection method - Method of False position – Newton Raphson method (single only) – Eigen value and Eigen vector by Power method.			**CO1**
UNIT – II	**LINEAR SYSTEM OF EQUATIONS**	**Periods:12**	
Solutions of Linear system of equations and Matrix Inversion – Gauss Elimination and Gauss - Jordan methods. Iterative methods – Gauss Jacobi – Gauss Seidel.			**CO2**
UNIT – III	**INTERPOLATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**Periods:12**	
Interpolation by Newton's Forward and Backward Difference formula for equal intervals – Lagrange's method for unequal intervals. Integration by Trapezoidal and Simpson's rules (Single integration only). Fourth order Runge-Kutta method for solving first order Differential Equations.			**CO3**
UNIT – IV	**LINEAR PROGRAMMING PROBLEMS**	**Periods:12**	
Linear Programming Problems – Graphical Method – Simplex Method: Big M method – Two phase method.			**CO4**
UNIT – V	**TRANSPORTATION AND ASSIGNMENT PROBLEMS**	**Periods:12**	
Transportation Problems – Initial basic feasible solution using North-West Corner rule, Least Cost Method, Vogel's Approximation Method – Optimality in Transportation Problem by Modified Distribution (MODI) Method. Assignment Problems – Solutions of Assignment Problems by Hungarian Method – Unbalanced Assignment Problems.			**CO5**

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

Text Books

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, "Numerical Methods", S. Chand Limited, 2008.
2. R. Panneerselvam "Operations Research" Prentice Hall of India, 2nd Edition,2004.
3. P.K. Gupta, D.S. Hira, "Operations Research", S. Chand, 5th Edition, 2018.

Reference Books

1. AtulGoyal, Madhuchanda Rakshit Suchet Kumar, "Numerical Methods", New India publishing Agency, 1st Edition, 2019.
2. Rajesh Kumar Gupta, "Numerical Methods - Fundamental and Applications", Cambridge University Press, 1st Edition, 2019.
3. S.Kalavathy, "Operation Research" ,Vikas Publishing house,4th Edition,2012.
4. Kevin J. Hastings, "Introduction to the Mathematics of Operations Research with Mathematica", Taylor and Francis, 2nd Edition, 2019.
5. T. Veerarajan, "Operations Research", McGraw Hill, 1st Edition, 2018.

2. A.7.25

Web References
1. https://nptel.ac.in/courses/111106101/
2. https://www.geektonight.com/operation-research-notes-pdf/#.XrXzoP8za00
3. https://freecomputerbooks.com/Numerical-Methods-with-Applications.html
4. https://www.pphmj.com/journals/IJNMA.htm
5. https://nptel.ac.in/courses/106/108/106108056/

* TE – Theory Exam, LE – Lab Exam

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	2	2	1	-	1	-	-	-	-	-	1	1	1	1
2	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
3	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
4	3	3	3	2	1	1	1	-	-	-	1	1	1	1	1
5	3	3	3	2	1	1	1	-	-	-	1	1	1	1	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

2.A.7.77

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	IV	Course Category: ES			End Semester Exam Type: TE			
Course Code	U23CSTC03	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Data Structures	3	0	0	3	25	75	100

(Common to All Branches except CSBS and FT)

Prerequisite	Any Programming Knowledge	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Compute time and space complexity for given problems	K2
	CO2 Demonstrate stack, queue and its operation.	K2
	CO3 Illustrate the various operations of linked list.	K3
	CO4 Use the concepts of tree for various applications.	K3
	CO5 Outline the various Tables, Graphs and Sets techniques.	K3

UNIT - I	Basic Terminologies of Data Structures	Periods:09
Introduction: Basic Terminologies – Asymptotic Notations: Complexity analysis. Array and its operations - Searching: Linear Search and Binary Search Techniques. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort. Performance and Comparison among the sorting methods.		CO1
UNIT - II	**Stack and Queue Operations**	**Periods:09**
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.		CO2
UNIT - III	**Linked List Operations**	**Periods:09**
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing - Searching - Insertion - Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.		CO3
UNIT - IV	**Trees**	**Periods:09**
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree - Threaded Binary Tree - Binary Search Tree - Binary Tree Traversals - AVL Tree- Red Black Tree.		CO4
UNIT - V	**Graphs, Tables and Sets**	**Periods:09**
Graph: Basic Terminologies and Representations - Graph traversal algorithms. Tables: Different types of tables - Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.		CO5

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

Text Books

1. Ellis Horowitz, Sartaj Sahni," Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. D. Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.
2. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c" . Prentice-Hall of India, Second Edition, 2007.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second. Edition,2006.
4. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.
5. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Addison- Wesley Publishing Company, Illustrated Edition, 1995.

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1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

* TE – Theory Exam, LE – Lab Exam

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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	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	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
	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

2. A.T.79

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	2	1	0	3	25	75	100
Prerequisite								

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:12
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:12**
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:12**
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:12**
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:12**
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: 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. 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 Compan

2.A.7.80

Web References
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

2.A.7.81

S. Sudaaraman

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PC			End Semester Exam Type: TE			
Course Code	U23CET407	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	DESIGN OF RC ELEMENTS	2	1	-	3	25	75	100

Prerequisite	Concrete Technology	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 To gain basic knowledge on design philosophy in WSM, ULM, LSM	K3
	CO2 To understand the design concepts in beam by LSM	K3
	CO3 To understand the design concepts in slab by LSM	K3
	CO4 To understand the basic design concepts in column by LSM	K3
	CO5 To gain knowledge on design of Footing and staircase by LSM	K3

UNIT – I	BASICS OF STRUCTURAL DESIGN	Periods:12
Role of structural engineer in structural design – elements of structures – reinforced concrete – ductility versus brittleness – methods of design - advantages of limit state method over other methods - design codes and specification - Introduction to working stress method- Permissible stresses - Factor of Safety-modular ratio and cracking moment-IS 456 - limit state philosophy as detailed in current IS code.		CO1
UNIT – II	**LIMIT STATE DESIGN OF BEAMS**	**Periods:12**
Introduction to flexural members – Behavior of RC beam under flexure - Design of singly reinforced, doubly reinforced and flanged sections. Design for bond, shear and torsion.		CO2
UNIT – III	**LIMIT STATE DESIGN OF SLABS**	**Periods:12**
Introduction -Types of slabs- General design considerations- Design of one-way and two-way slabs. Design of continuous (one-way only) slabs- Design of flat slabs.		CO3
UNIT – IV	**LIMIT STATE DESIGN OF COLUMNS**	**Periods:12**
Design of compression members – Effective length – Design short column under axial compression, axial compression and biaxial bending - Design of slender columns – Braced and un-braced slender column.		CO4
UNIT – V	**LIMIT STATE DESIGN OF FOOTING AND STAIRCASE**	**Periods:12**
Design of Footings - Isolated footing with axial and eccentric loading- Combined Rectangular and Trapezoidal footing for two columns only, Design of Stair Case (ordinary and doglegged)		CO5

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

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. M.L Gambir, Design of Reinforced Concrete Structures, PHI Publications, 2008
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. Unnikrishna Pillai and Devdas Menon, 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://www.youtube.com/watch?v=1_SXPr_YTOU
3. https://nptel.ac.in/content/storage2/courses/105105104/pdf/m9l20.pdf

S. Sudarsanam

2.A.7.82

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

2.A.7.83

Department	Civil Engineering			Programme: B.Tech.					
Semester	IV			Course Category : PC			End Semester Exam Type: TE		
Course Code	U23CEB402			Periods/Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	Concrete Technology			2	-	2	3	50	50	100
Prerequisite	Basics of Civil Engineering								
Course Outcomes	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Acquire knowledge on the testing of aggregates and its properties.							K2
	CO2	Understand the properties of concrete in fresh state							K2
	CO3	Comprehend the properties of concrete in hardened concrete							K3
	CO4	Acquire knowledge on the properties of cement and aggregate							K2
	CO5	Evaluate the workability of fresh Concrete and strength characteristics of hardened concrete							K3
UNIT- I	Aggregate						Periods:10		
Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.									CO1
UNIT- II	Fresh Concrete						Periods:10		
Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.									CO2
UNIT- III	Hardened Concrete						Periods:10		
Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.									CO3
UNIT- IV	Tests on Cement, Aggregates and Mix design						Periods:15		
List of Exercises 1. a) Setting time b) Compressive strength. 2. a) Water Absorption b) Impact Test c) Crushing Test 3. IS method of mix design of normal concrete as per IS: 10262									CO4
UNIT-V	Test on Fresh and Hardened Concrete						Periods:15		
List of Exercises 1. a) Slump cone test b) Compacting factor test 2. a) Compressive Test b) Flexural Strength Test									CO5
Lecture Periods:30		Tutorial Periods:-		Practical Periods:30			Total Periods:60		

Text Books

1. M.S.Shetty, "Concrete Technology", S.Chand & Co., 8th Edition, 2019
2. Gambir M. L, Concrete Technology, Tata MC-Graw Hill-Education, 2013.
3. A.M.Neville, "Properties of Concrete"– Pearson Education Limited, 5th Edition, 2012

Reference Books

1. Zongjin Li, Advanced Concrete Technology, John Wiley & Sons – 2011
2. Metha P. K, "Concrete: Microstructure, properties and Materials", McGraw-Hill, 2014.
3. IS: 12269-1987, Specification for 53 grade ordinary Portland Cement, BIS, New Delhi.
4. IS: 383 – 1970, Specification for Coarse and fine natural sources for Concrete, BIS, New Delhi
5. IS: 10262-2009, Concrete Mix Proportioning - Guidelines

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://nptel.ac.in/courses/105106176/
3. https://nptel.ac.in/courses/105/104/105104030/

2.8.7.84

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	2	2
2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

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

Evaluation Methods

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)	

2.0.7.85

Department	English	Programme: B.Tech.						
Semester	IV	Course Category Code: HS			*End Semester Exam Type: LE			
Course Code	U23ENPC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	General Proficiency- II	0	0	2	1	50	50	100

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Infer ideas to attend international standardized test by broadening receptive and productive skills	K2
	CO2 Interpret the types of writing in different state of affairs	K3
	CO3 Acquire meticulous exposure in speaking and get rid of performance anxiety	K2
	CO4 Articulate the ideas and opinions effectively and coherently	K2
	CO5 Progress the skills to compete in various competitive exams like GATE, GRE, UPSC, etc.	K4

UNIT- I	CAREER SKILLS	Periods:6
Listening: Listening at specific contexts - Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps) - Reading: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) - Writing: Integrated Writing Task (TOEFL) - Vocabulary: Synonyms and Antonyms (IELTS)		CO1
UNIT- II	**CORPORATE SKILLS**	**Periods:6**
Listening: Listening English news and reproducing in own words - Speaking: Team Presentation - Reading: Short texts and Longer Passages (cloze reading) - Writing: Analytical Writing: Analyzing an issue and Argument task (GRE based) - Vocabulary: Prefix and Suffix		CO2
UNIT- III	**FUNCTIONAL SKILLS**	**Periods:6**
Listening: Listening TED Talks - Speaking: Brainstorming & Individual Presentation - Reading: Text Completion (GRE Based) - Writing: Picture Inference - Vocabulary: Word Formation		CO3
UNIT- IV	**TRANSFERRABLE SKILLS**	**Periods:6**
Listening: Listening Documentaries and making notes - Speaking: Mock Interview - Reading: Read texts on emerging trends - Writing: Agreeing & Disagreeing Essay (IELTS) - Vocabulary: Euphemism, Redundancy, Clichés and Intensifiers		CO4
UNIT-V	**VERBAL APTITUDE - II**	**Periods:6**
Transformational Grammar: Tenses, Change of Voice, Concord **Verbal Ability Enhancement:** Letter Series, Coding &Decoding, Sentence Equivalence (GRE)Analytical Reasoning and Logical Reasoning (GATE), Syllogism, One-word Substitution, Jumbled Sentences		CO5

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

Reference Books

1. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
2. Prasad, Hari Mohan, Sinha, Uma Rani, "Objective English for Competitive Examinations", Tata Mc Graw Hill: Noida,2010.
3. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
4. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford, 2007.
5. Murphy, Raymond English Grammar in Use with answers: Reference and Practice for Intermediate students, Cambridge: CUP,2004.

Web References

1.https://www.englishclub.com/grammar/nouns-compound.htm
2.https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3.https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4.https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5.http://www.englishvocabularyexercises.com/general-vocabulary/

2.A7.86

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	-	-	-	-	-	-	1	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

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

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

2.A. 7.87

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23CSPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches Except CSBS and FT)								
Prerequisite	Basic Programming Knowledge							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Analyse the algorithm's / program's efficiency in terms of time and space complexity.	**K3**
	CO2	Solve the given problem by identifying the appropriate Data Structure.	**K3**
	CO3	Solve the problems of searching and sorting techniques.	**K3**
	CO4	Solve problems in linear Data Structures.	**K4**
	CO5	Solve problems in non-linear Data Structures.	**K4**

List of Exercises:

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a) Delete an element from list b) Search for a key element in list c) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
   a) Preorder b) Inorder c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.
11. Write a C program to implement the Set operations.
    a) Union b) Intersection c) Difference.

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

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069

* TE – Theory Exam, LE – Lab Exam

2.A.F.88

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	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.07.89

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	U23CEP404	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Geotechnical Engineering Laboratory	0	0	2	1	50	50	100

Prerequisite	Basics of Civil and Mechanical Engineering	
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 Understand the concept of insuit density and compaction characteristic of soil sample	K2
	CO3 Understand about the techniques and method to determine the index properties and Engineering properties of soil sample	K2
	CO4 Understand about the techniques and method to determine the Engineering properties of soil sample	K3
	CO5 Understand the concept and method to determine the penetration value N of the soil	K3

List of Experiments:

DETERMINATION OF INDEX PROPERTIES

1. Determination of Grain size distribution (Sieve Analysis, Hydrometer Analysis)
2. Determination of Specific gravity of soil grains (Pycnometer, Density bottle)
3. Determination of Atterberg limits Test
   - -Liquid limit,
   - -Plastic limit
   - -shrinkage limit Test
4. Determination of swell index Test

DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

5. Determination of Field density test (Core cutter and sand replacement methods)
6. Determination of moisture - Density relationship using Standard Proctor Test

DETERMINATION OF ENGINEERING PROPERTIES

7. Determination of Permeability (Constant Head, Falling Head methods)
8. Determination of Direct shear test on Cohesion less soil
9. Determination of Unconfined compression test on cohesive soil
10. Determination of Triaxial compression test on cohesive soil
11. Demonstration of one dimensional consolidation Test
12. Demonstration of Standard Penetration Test (SPT)

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

Reference Books

1. Arora K.R 'Soil Mechanics and Foundation Engineering' Standard Publishers PVt.Ltd, 7TH Edition,(2019).
2. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, (2017).
3. Santosh kumar Garg 'Soil Mechanics and Foundation Engineering (In S.I. Units),Khanna Publishers,(2014).
4. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
5. Indian Standards on Soil Engineering, Part 1 Laboratory Testing of Soils for Civil Engineering Purposes —SP 3 (Part 1): 1987ll, Bureau of Indian Standards, New Delhi, 1987.

Web References

1. https://nptel.ac.in/courses/105103
2. https://nptel.ac.in/courses/105/101/105101083/
3. https://nptel.ac.in/courses/105105176/

2.A.7.90

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	2	1	1	1	1	-	1	1	-	2	3	1	2
2	3	1	1	1	1	1	1	-	1	1	-	2	3	1	1
3	3	1	1	1	1	1	1	-	2	1	-	2	3	1	1
4	3	1	1	1	1	1	1	-	2	2	-	2	3	1	1
5	3	1	1	1	1	1	1	-	2	2	-	2	3	1	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

2.A.7.91

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category: AEC				*End Semester Exam Type: -		
Course Code	U23CEC4XX	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	CERTIFICATION COURSE-IV	0	0	4	-	100	-	100

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

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.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 50	Total Periods: 50

Evaluation methods

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

2.A.J.92

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category: SEC			*End Semester Exam Type: LE			
Course Code	U23CES402	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Skill Enhancement Course – II*	0	0	2	-	-	100	100

1. SAFETY IN BUIDING CONSTRUCTION

Course Content:

This would involve training students for safety practices in building construction. The students would be given exercise to use the management tools that will allow structuring a safety plan suited to the project, complying with the local laws and regulations in force

2. AIR QUALITY MONITORING

Course Content:

This would help the students to understand the monitoring and measurement of air pollutants by studying about the air quality and preparation of action plan. Students would be given exposure to various sources of pollutants, measuring and assessing them; and how to manage it.

3. EXPERIENCE WITH ON-SITE CONSTRUCTION OBSERVATION AND MANAGEMENT

Course Content:

This would involve training of students with various drawings and specifications by understanding the construction progress and reports for materials and the concept of testing and inspections. In this students would be given exposure to on-site observations, verification of contractor performance, specialty reports for materials such as concrete and asphalt, pre-final and final inspections

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

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

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

2.A.7.93

P. Sudarsana

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category: MC			*End Semester Exam Type: TE			
Course Code	U23CEM404	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Right to Information and Good Governance	2	0	0	-	-	100	100

UNIT-I	Introduction	(9Hrs)	
Conceptual background — Right to know — Open Government — Transparency in governance and accountability — Right to information under the Indian Constitution - Article 19 (I)(a) and Article 21 of the Constitution — Role of NGOs and movement for right to information — Right to Information Act, 2005 — Scope and objectives.			CO1
UNIT-II	**Obligation of Public Authorities**	**(9Hrs)**	
Obligations of public authorities: Section 4 Designation of Public Information Officers: Section 5 Disposal of request: Section 7 Exemption from disclosure of information: Section 8 Grounds for rejection to access in certain cases: Section 9 Severability: Section 10 Third party information: Section 11			CO2
UNIT-III	**Central and State Information Commission**	**(9Hrs)**	
Constitution of Central and State Information Commissions Terms of office and conditions of service Removal of Chief Information Commissioner or Information Commissioner. Powers and functions of Information Commissions.			CO3
UNIT- IV	**Judiciary and Right to Information Act**	**(9Hrs)**	
Protection of right to access the information — Role of the Supreme Court and High Courts — Recent attempts of dilution of the right to information Law			CO4
UNIT- V	**Right to Information Act, 2005 and its relevance to other laws**	**(9Hrs)**	
Public Records Act, 1993 Whistle Blowers Protection Act, 2014 Official Secrets Act, 1923			CO5

Evaluation Method

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

2.A.7.94

Professional Elective - I

Department	Civil Engineering			Programme: B.Tech.			
Semester	IV			Course Category Code: PE		End Semester Exam Type: TE	
Course Code	U23CEE401	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	COMPOSITE STRUCTURES	3	0	-	3	25	75	100

Prerequisite	Design of Steel Structures	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the mechanism of composite action between steel and concrete and thereby determining capacity of shear studs	**K3**
	CO2 Design a composite beams with or without profile decking sheet either simply supported or continuous end conditions using Indian and Euro code-4	**K3**
	CO3 Design a composite slab with the provision of profile decking sheet using Euro code – 4	**K3**
	CO4 Design an encased as well as in-filled composite columns using Euro code – 4.	**K3**
	CO5 Understand the mechanism of connections in composite structures and the concept of sandwich construction	**K3**

UNIT – I	**INTRODUCTION**	**Periods:12**	
Composite Structures- Advantages, Types and Materials used, Shear Connection- Composite action-No interaction-Full interaction, slip in composite structures. Shear Connectors- Types (Rigid, Flexible and Bond), strength of shear connectors – Test on shear connectors.			**CO1**
UNIT – II	**DESIGN OF COMPOSITE BEAMS**	**Periods:12**	
propped condition – un-propped condition – simply supported and continuous beams – beam with and without profile sheeted deck slab – Analysis and design of composite beams without profile sheet and with profile sheet.			**CO2**
UNIT – III	**DESIGN OF COMPOSITE SLABS**	**Periods:12**	
Composite floors – Introduction of composite floors – shear transferring mechanism in profile deck system – Bending resistance of composite slab – Design consideration of composite floor - propped condition – un-propped condition. Design of simply supported and continuous Composite floor.			**CO3**
UNIT – IV	**DESIGN OF COMPOSITE COLUMNS**	**Periods:12**	
Types of Composite columns – design of encased columns – design of in-filled columns – axial and uni-axially loaded columns.			**CO4**
UNIT – V	**MISCELLANIES TOPICS**	**Periods:12**	
Case studies on steel concrete composite construction in buildings, Composite bridges, Connections in composite structures, Steel concrete composite sandwich construction.			**CO5**

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

Text Books

1. Johnson R.P., "Composite Structures of Steel and Concrete"' Volume-I, Black Well Scientific Publication, U.K., 1994.
2. Teaching Resources for "Structural Steel Design". Vol.2 of 3, Institute of Steel Development and Growth (INSDAG), 2000.
3. Collings D., "Steel Concrete Composite Buildings", Thomas Telford Ltd, 2010

Reference Books

1. Narayanan R, "Composite steel structures – Advances, design and construction", Elsevier, Applied science, UK, 1987.
2. IS: 11384, Code of practice for composite construction in Structural Steel and Concrete.
3. Provisions of IS 800 : 2007, Code of practice for General construction in Steel .

Web References

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides- systems of equation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf

2.A.7.95

V. Indirama

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	-	-	-	-	-	-	-	-	3	-	-
2	1	2	-	3	-	-	-	-	-	-	-	-	3	-	-
3	1	2	-	3	-	-	-	-	-	-	-	-	3	-	-
4	1	2	-	3	-	-	-	-	-	-	-	-	3	-	-
5	1	2	-	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

2.A.7.96

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CEE402	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	RENEWABLE ENERGY SOURCES	3	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 the physics of solar radiation.	K1
	CO2	Classify the solar energy collectors and methodologies of storing solar energy	K3
	CO3	Gain Knowledge in applying solar energy in a useful way.	K3
	CO4	Learn Knowledge in wind energy and biomass with its economic aspects	K4
	CO5	Gain Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.	K3

UNIT – I	PRINCIPLES OF SOLAR RADIATION	Periods:10
Role and potential of new and renewable source-physics of the sun- the solar constant- solar energy-- Environmental impact of solar power- extraterrestrial and terrestrial solar radiation- solar radiation on titled surface- instruments for measuring solar radiation and sun shine- solar radiation data.		CO1
UNIT – II	**SOLAR ENERGY COLLECTION**	**Periods:08**
Flat plate and concentrating collectors- classification of concentrating collectors-orientation and thermal analysis-advanced collectors.		CO2
UNIT – III	**SOLAR ENERGY STORAGE AND APPLICATIONS**	**Periods:07**
Different methods-Sensible-latent heat and stratified storage-solar ponds. Solar Applications- solar heating/cooling technique- solar distillation and drying- photovoltaic energy conversion-Application.		CO3
UNIT – IV	**WIND ENERGY**	**Periods:10**
Sources and potentials- horizontal and vertical axis windmills- performance characteristics,-Betz criteria BIO- MASS: Principles of Bio-Conversion- Anaerobic/aerobic digestion,-types of Bio-gas digesters- gas yield- combustion- characteristics of bio-gas-utilization for cooking- I.C Engine operation and economic aspects.		CO4
UNIT – V	**GEOTHERMAL ENERGY**	**Periods:09**
Resources- types of wells- methods of harvesting the energy,-potential in India. OCEAN ENERGY: OTEC- Principles utilization-setting of OTEC plants-thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques-mini-hydropower plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC- Carnot cycle- limitations-and principles of DEC.		CO5

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

Text Books

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell and Wier, "Renewable Energy Resources", CRC Press (Taylor and Francis), 2011
3. Reneweble energy resources: Tiwari and ghosal, Narosa publication.

Reference Books

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R and Kumar K.U , "Renewable Energy Technologies",Narosa Publishing House, 2004
3. Mittal K M , "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi,2010

Web References

1. https://nptel.ac.in/courses/121/106/121106014/
2. https://nptel.ac.in/courses/112105051/
3. https://nptel.ac.in/content/storage2/courses/121106014/Week8/lecture24.pdf

2.A.9.97

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

2.A.7. 98

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PE				End Semester Exam Type: TE		
Course Code	U23CEE403	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	BUILDING SERVICES	3	0	-	3	25	75	100

Prerequisite	Basic Mathematics	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Find essential services for the building	K3
	CO2 Choose appropriate equipment for building	K3
	CO3 Select lighting facilities in the building	K3
	CO4 Choose suitable air conditioning system for the building	K3
	CO5 Choose fire safety systems for various types of building	K3

UNIT – I	MACHINERIES	Periods:12
Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers - DC/AC motors – Generators – Laboratory services - Gas, water, air and electricity.		CO1
UNIT – II	**ELECTRICAL SYSTEMS IN BUILDINGS**	**Periods:12**
Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice – Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations.		CO2
UNIT – III	**PRINCIPLES OF ILLUMINATION AND DESIGN**	**Periods:12**
Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.		CO3
UNIT – IV	**REFRIGERATION PRINCIPLES AND APPLICATIONS**	**Periods:12**
Refrigerants - Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers – Window type and packaged air - conditioners - Chilled water plant - Fan coil systems - Water piping – Cooling load – Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C.Systems.		CO4
UNIT – V	**FIRE SAFETY INSTALLATION**	**Periods:12**
Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C.systems.		CO5

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

Text Books

1. M.K. Ven R. Udayakumar, 'A textbook on building services', Eswar Press, Chennai, 2007.
2. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 2000.
3. Jain,V.K., "Fire Safety in Buildings", New Age International (P) Ltd.,2nd Edition Year, 2015.
4. S.M.Patil, Building Services, Seema Publication, Mumbai 2015.
5. P.S.Gahlot, Building repair and Maintenance Management, CBS Publishers & Distribution (P) Ltd.,2015.

Reference Books

1. E.R. Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc.,NewYork,1968.
2. Handbook for Building Engineers in Metric systems, NBC, NewDelhi,1968
3. Philips Lighting in Architectural Design, McGraw-Hill, NewYork,1964.
4. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London,1972.
5. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", JohnWiley and Sons, London, 1988.
6. A.F.C.Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London,1980.
7. National Building code of India – 2005, Bureau of Indian Standards, NewDelhi.

2.A.2.99

Web References
1. https://nptel.ac.in/courses/105/107/105107156/
2. https://nptel.ac.in/courses/105/102/105102176/
3. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce30/
4. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ce09/5.https://nptel.ac.in/courses/105/102/105102175/

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	2	3	3	3	2	2	3	2	2	3	3	3	3
2	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
3	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
4	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
5	3	3	2	3	3	3	2	2	3	2	2	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

2.A.7.100

Department	Civil Engineering	Programme : B.Tech.						
Semester	IV	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CEE404	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Remote Sensing and GIS	2	1	-	3	25	75	100

Prerequisite	Surveying and Geomatics	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Recognize the physics of Remote sensing and to identify the principles	K2
	CO2 Know about the various platforms and orbits used for launching remote sensing satellites.	K2
	CO3 Differentiate the types and configuration of various satellites and sensors.	K2
	CO4 Recognize the importance of the basics of Geographical Information System.	K2
	CO5 Perform data analysis techniques using GIS for various applications of Civil Engineering.	K2

UNIT- I	PHYSICS OF REMOTE SENSING	Periods: 09
Remote Sensing - Definition - Components - Electro Magnetic Spectrum – Basic wave theory – Particle theory – Stefan Boltzmann law – Wien's-Displacement Law - Radiometric quantities - Effects of AtmosphereScattering – Different types –Absorption-Atmospheric window- Energy interaction with surface features – Spectral reflectance of vegetation, soil and water –atmospheric influence on spectral response patterns- multi concept in Remote sensing		CO1

UNIT- II	PLATFORMS	Periods: 09
Orbit elements – Types of orbits – Motions of planets and satellites – Launch of space vehicle – Orbit perturbations and maneuvers – escape velocity - Types and characteristics of different remote sensing platforms – sun synchronous and geo synchronous satellites.		CO2

UNIT - III	OPTICAL SENSORS	Periods: 09
Classification of remote sensors – selection of sensor parameters - resolution concept - Spectral, Radiometric and temporal resolution – Quality of images in optical systems – imaging mode – photographic camera – optomechanical scanners – push broom and whiskbroom cameras – Panchromatic, multi spectral , hyperspectral scanners – geometric characteristics of scanner imagery - Earth resource satellites operating with optical sensors- Landsat, SPOT, IRS, WorldView.		CO3

UNIT - IV	FUNDAMENTALS OF GIS	Periods: 09
Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.		CO4

UNIT - V	DATA ANALYSIS & APPLICATIONS	Periods: 09
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Elevation models - 3D data collection and utilization- Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.		CO5

Lecture Periods: 30	Tutorial Periods: 15	Practical Periods: -	Total Periods: 45

Text Books

1. Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, Seventh edition of John Wiley & Sons-2015, ISBN : 978-1-118-91947-7
2. Bhatta B, Remote Sensing and GIS, Edition: 2021, Oxford Press, ISBN: 9780199496648, 9780199496648.

Reference Books

6. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
7. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995
8. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman & Co,1978.
9. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995.
10. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.

2.A.7.101

Web References
https://www.arcgis.com/apps/Cascade/index.html?
https://mgimond.github.io/Spatial/introGIS.html

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

2.A.7.102

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PE			*End Semester Exam Type: TE			
Course Code	U23CEE405	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Alternative Building Materials and Technologies	3	0	0	3	25	75	100

Prerequisite	Building Material and Construction	
Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the various energies involved in the construction	K2
	CO2 Understand the different types alternative materials	K2
	CO3 Identify various eco-friendly materials	K2
	CO4 Recognize suitable alternative building technologies	K2
	CO5 Apply the cost concept involved in the planning of construction	K3

UNIT-I	Introduction	Periods: 09
Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions.		CO1

UNIT-II	Sustainable Materials	Periods: 09
Characteristics of building blocks for walls - Stones and Laterite blocks - Bricks and hollow clay blocks - Concrete blocks - Stabilized mud blocks - Fal-G Blocks - Manufacture of stabilized blocks.		CO2

UNIT-III	Alternative Building Materials	Periods: 09
Fibre reinforced concretes – Types: metal and synthetic - Properties and applications - Fibre reinforced plastics – Types: organic and synthetic - Properties and applications. Building materials from agro and industrial wastes - Types of agro wastes - Types of industrial and mine wastes - Properties and applications		CO3

UNIT-IV	Alternative Building Technologies	Periods: 09
Alternatives for wall constructions, composite masonry, confined masonry, cavity walls, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique, 3D Printing Technology. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs		CO4

UNIT-V	Machines & Planning Control	Periods: 09
Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives		CO5

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

Text Books

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publishers, 2017.
2. BT Ashwini Manjunath, "Alternative Building Materials and Technology", Medtech Publisher, 2017.
3. Trevor M. Letcher and Janet L. Scott, "Materials for a Sustainable Future", Royal Society of Chemistry, 2012

Reference Books

1. S Christian Johnson, "Concrete Technology", Dipti Press, 2017.
2. G.C Sahu and Jayagopal Jena, "Building Materials and Construction", McGraw hill Publication, 2015.
3. B C Punmia and Ashok kumar jain, "Building Construction", Laxmi Publication, 2019.
4. M.S. Shetty, "Concrete Technology (Theory and Practice)", S. Chand & Company Ltd., 2019.
5. S.K. Duggal, "Building Materials", 5th edition, New age International Publication, 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

2.A.7.103

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	3	2	-	2	1	3	3	2	2
2	2	-	-	-	3	2	3	2	-	2	1	3	3	3	2
3	3	-	-	-	3	3	3	3	-	2	1	3	3	3	2
4	3	-	-	-	3	3	3	3	3	3	1	3	3	3	2
5	3	-	-	2	2	3	3	3	3	3	1	3	3	2	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	10		5	5	5	75	100

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

2.A.7.104

V. Sudarsanam

2.A.7.105

Annexure IV

2.11.7.06

S. Sundaramoorthy

2.A.7.107

Department	Civil Engineering	Programme: B.Tech.						
Semester	IV	Course Category Code: PC			*End Semester Exam Type: TE			
Course Code	U23CEH401	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ENERGY ENVIRONMENT AND RENEWABLE ENERGY TECHNOLOGIES	3	1	-	4	25	75	100

Course Outcome	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	K1
CO2	Appreciate energy ecosystems and its impact on environment	K3
CO3	Learn basics of various types of renewable.	K2
CO4	Understand about clean energy technologies.	K2
CO5	Serve as bridge to advanced courses in renewable energy	K2

UNIT – I	Energy	Periods:8	
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:9**	
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:10**	
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:9**	
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:9**	
Test for Single and Difference Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.			CO5
Lecture Periods:45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, Jean- Philippe; Zaccour, Georges (Eds.), 2005.
2. Energy and the Environment, Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A., 2nd Edition, John Wiley, 2006

Reference Books

1. Energy and the Challenge of Sustainability, World Energy assessment, UNDP, N York, 2000.
2. 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.

* TE – Theory Exam, LE – Lab Exam

2.A.7.108

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	-	-	-	-	1	1	-	-
2	2	1	1	-	-	-	2	-	-	-	-	1	1	-	-
3	2	1	-	-	-	-	2	-	-	-	-	1	1	-	-
4	2	1	1	-	-	-	2	-	-	-	-	1	1	-	-
5	2	1	1	-	-	-	2	-	-	-	-	1	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

2.A.7.109

Department	Civil Engineering			Programme: B.Tech.					
Semester	V			Course Category Code: PC			*End Semester Exam Type: TE		
Course Code	U23CEH502			Periods/Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	BIOENERGY AND CONVERSION SYSTEMS			3	1	-	4	25	75	100
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Learn fundamentals of biochemistry and biological systems for energy application.							K3	
	CO2	Realization of global bioenergy potential, and scenario of bioenergy in India							K3	
	CO3	Understand various biofuel types and characteristics.							K3	
	CO4	Understanding of various types of bioenergy conversion systems in practice							K3	
	CO5	Acquire basic knowledge on microbial culture, biomass harvest and biofuel production and Know the national and international biofuel Standards							K3	

UNIT – I	Biological Systems	Periods:10
Introduction to Biomolecules: Classification of amino acids, carbohydrates and nucleotides; Structure and properties of carbohydrate polymers, proteins and nucleic acids; Classification and utility of lipids and fatty acids; Functional roles of biomolecules – energy carriers, enzyme cofactors and biochemical regulation. From biomolecules to cells - biological systems. Biomass mass resources.		CO1
UNIT – II	**Biochemical Pathways and Chemical Kinetics**	**Periods:8**
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	**Biomass Energy Resource`**	**Periods:10**
Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration, Environmental Benefits. Bioconversion of lignocellulosic feedstock to sugars - Bioconversion of sugars and starches to fuels - Difference of the technologies of starch ethanol and cellulosic ethanol.		CO3
UNIT – IV	**Thermochemical & Chemical Conversions**	**Periods:9**
Thermo chemical conversion: Combustion, gasification, pyrolysis, hydrothermal liquefaction, hydropyrolysis, torrefaction, choice of thermal process based on biomass type and product requirement. Chemical Conversion: Chemical Conversion: Hydrolysis & hydrogenation - Solvent extraction of hydrocarbons - Solvolysis of wood - Biocrude and biodiesel - Chemicals from biomas		CO4
UNIT – V	**Power Generation**	**Periods:9**
Utilisation of gasifier for electricity generation - Operation of spark ignition and compression ignition engine with woodgas – Methanol - ethanol & biogas - Biomass integrated gasification/combined cycles systems - Sustainable cofiring of biomass with coal - Biomass productivity		CO5

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

Text Books

1. Renewable Energy, Third Edition, Bent Sorensen, Academic Press August 2004
2. Lehninger's Principles of Biochemistry by David L. Nelson and Michael M. Cox, Macmillan Worth publisher, 2009.

Reference Books

1. Biochemistry 6th edition by Jeremy M Berg, Lubert Stryer, John L. Tymoczko, 2008.
2. Voet and Voet's Biochemistry, D. Voet and J. Voet 3rd Edition, John Wiley and Sons Inc., 2005
3. Biochemistry, 5th Ed by Eric E Conn, Paul K Stumpf, George Bruening and Roy H Doi, 2009
4. Biofuels - Securing the Planet's Future Energy Needs, Edited by A Demirbas Springer 2009
5. Biomass Assessment Handbook - Bioenergy for a sustainable environment Edited by Frank Rosillo-Calle, Sarah Hemstock, Peter de Groot and Jeremy Woods, Earthscan November 2006

* TE – Theory Exam, LE – Lab Exam

2.8.7.110

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	-	-	-	-	1	1	1	1
2	3	1	1	1	-	-	1	-	-	-	-	1	1	1	1
3	3	1	1	1	-	-	1	-	-	-	-	1	1	1	1
4	3	1	1	1	-	-	1	-	-	-	-	1	1	1	1
5	3	1	1	1	-	-	1	-	-	-	-	1	1	1	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

2.A.7.111

Department	Civil Engineering			Programme: B.Tech.					
Semester	VI			Course Category Code: PC			*End Semester Exam Type: TE		
Course Code	U23CEH603	Periods/Week			Credit	Maximum Marks			
		L	T	P	C	CAM	ESE	TM	
Course Name	Bioprocess Engineering for Biofuels	3	1	-	4	25	75	100	

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	After studying this subject, students would be able to measure the extent of biochemical growth types of biochemical interactions for living processes.	K2
CO2	Ability to analyze the microbial growth kinetics	K2
CO3	The student can design a fermenter for the bioprocessing of different products.	K2
CO4	The student can scale up the bioprocess for large scale production	K2
CO5	Students can monitor the bioprocess for higher production efficiency	K2

UNIT – I	Engineering Biology	Periods:9
Overview of bioprocess engineering, Biological systems, Cellular components and cell growth, Bioenergetics and cellular metabolism, Metabolic pathways, Autotrophic metabolism, Anaerobic metabolism, Metabolism of hydrocarbons, Biosynthesis.		CO1
UNIT – II	**Enzyme Kinetic**	**Periods:9**
Enzymes and its function, Enzyme synthesis, Mechanism of enzymatic action, Enzyme kinetics, Single enzyme kinetics, Michaelis–Menten kinetics, Model of complex enzyme kinetics, Immobilized enzyme systems, Enzymatic processes		CO2
UNIT – III	**Cellular growth `**	**Periods:9**
Building blocks of cellular components, Cellular growth and models, Growth curves, Kinetic of cell growth, Batch growth kinetics, Continuous growth kinetics, Determination of growth parameters, Stoichiometry of microbial growth, Yield coefficients for cell mass.		CO3
UNIT – IV	**Reactor design**	**Periods:9**
Principles of bioprocess, Batch, fed-batch, and continuous processes Chemostat systems, Operation and performance of the process systems, Types of bioreactors in bioprocesse, Instrumentation and control of bioreactors, Reactor design considerations, Scale-up and scale-down of bioprocesses, Immobilized cell system, Passive and active immobilization, Solid-state fermentation		CO4
UNIT – V	**Bioprocess Applications and Product Recovery**	**Periods:9**
Anaerobic bioprocessing, Cellulosic ethanol production, Biological production of 2-butanol, Lactic acid production, Aerobic fermentation, Renewable chemicals production, Product separation process, Cell disruption and mechanical separation, Filtration, Centrifugation, Coagulation, Flocculation, Separation of soluble products, Biosafety and Bioethics		CO5

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

Text Books

1.Bailey, J. E., & Ollis, D. F. (2018). Biochemical engineering fundamentals. McGraw-Hill.

2.Shuler, M. L., & Kargi, F., (2006). Bioprocess Engineering Basic Concept Pearson Education, Inc

Reference Books

1.Cornish-Bowden, A. (2013). Fundamentals of enzyme kinetics. John Wiley & Sons

2.Liu, S. (2020). Bioprocess engineering: kinetics, sustainability, and reactor design. Elsevier

3.Doble M., Kruthiventi, A. K., & Gaikar, V. G. (2004). Biotransformation and bioprocesses. CRC Press.

* TE – Theory Exam, LE – Lab Exam

2.A.7.112

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	1	-	-	1	-	-	-	-	1	2	1	1
2	3	2	1	1	-	-	1	-	-	-	-	1	2	1	1
3	2	2	1	1	-	-	1	-	-	-	-	1	2	1	1
4	3	2	1	1	-	-	1	-	-	-	-	1	2	1	1
5	3	2	1	1	-	-	1	-	-	-	-	1	2	1	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

2.A.7.13

Department	Civil Engineering			Programme: B.Tech.				
Semester	VII			Course Category Code: PC			*End Semester Exam Type: TE	
Course Code	U23CEH704	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Alternative materials for sustainable technologies	3	1	-	4	25	75	100

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Concepts of sustainability in construction materials	K2
CO2	Selecting materials and building elements	K2
CO3	Sustainable practices and green buildings	K2
CO4	Construction on the basis of sustainability and greenness	K2
CO5	Understand about Sustainable Material Measurement Properties	K2

UNIT – I	Introduction	Periods:9	
Introduction and definition of Sustainability. Sustainable construction, Carbon cycle and role of construction material such as concrete and steel, etc. CO2 contribution from cement and other construction materials. Prefabricated and pre-engineered buildings, High-performance concrete, Contemporary innovative building materials and their applications in Architecture, Alternate building materials and construction technologies			CO1
UNIT – II	**Construction materials and indoor air quality**	**Periods:9**	
Construction materials and indoor air quality. No/Low cement concrete. Recycled and manufactured aggregate. Role of QC and durability. Life cycle and sustainability. Components of embodied energy, calculation of embodied energy for construction materials			CO2
UNIT – III	**Exergy concept and primary energy**	**Periods:8**	
Embodied energy via-a-vis operational energy in conditioned building. Life Cycle energy use. Control of energy use in building, ECBC code, codes in neighboring tropical countries, OTTV concepts and calculations.			CO3
UNIT – IV	**Structural Materials, Wall Systems and Flooring**	**Periods:8**	
Natural /Conventional Building materials, Traditional and vernacular methods in India, Rammed earth construction, Hi-Tech Glass Polymers, Wall Systems: Framing, Insulation, Wallboards, Flooring, low VOC paints, materials & adhesives, building acoustics, Coating Materials, nanotechnologies for green buildings			CO4
UNIT – V	**Sustainable Material Measurement Properties**	**Periods:10**	
Fibers- metal and synthetic, Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Building materials from agro and industrial wastes, measurement of building materials properties calculations and carbon footprint calculation			CO5

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

Text Books

1.Wu Chung, H. Advanced Civil Infrastructure Materials, First Edition, Woodhead Publishing Limited, 2006

2.Newman, J. and Choo, Ban Sang, Advanced Concrete Technology-Processes, 1st Edition, Elsevier, 2003

Reference Books

1.Newman, J. and Choo, Ban Sang, Advanced Concrete Technology-Constituent Materials, 1st Edition, Elsevier, 2003.

2.Sustainability of Construction Materials, A volume in Woodhead Publishing Series in Civil and Structural Engineering Edited by J. Khatib ISBN: 978-1-84569-349-7

3.Kubba, S, LEED Practices, Certification, and Accreditation Hand book, 1st ed. Elsevier, 2010

4.Minsitry of Power, Energy Conservation Building Code 2007, Revised Version, Bureau of Energy Efficiency, 2008.

5.Architectural Energy Corporation, Building Envelope Stringency Analysis, International Institute for Energy Conservation, 2004.

6.Indian Building Congress, Practical Handbook on Energy Conservation in Buildings, 1st ed. Nabhi Publication, 2008

* TE – Theory Exam, LE – Lab Exam

2.A.7.114

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	1	-	-	1	-	-	-	-	1	2	1	1
2	3	2	1	1	-	-	1	-	-	-	-	1	2	1	1
3	3	2	1	1	-	-	1	-	-	-	-	1	2	1	1
4	3	2	1	1	-	-	1	-	-	-	-	1	2	1	1
5	3	2	1	1	-	-	1	-	-	-	-	1	2	1	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

2.A.7.115

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VIII**			Course Category Code: **PC**			*End Semester Exam Type: **TE**	
Course Code	**U23CEH805**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Green Management**	**3**	**1**	**-**	**4**	**25**	**75**	**100**

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understand about Green Management	**K2**
	CO2	Know about Organizational Environment	**K2**
	CO3	The student can understand Approaches from Ecological Economics	**K2**
	CO4	Understand about Environmental Reporting and ISO 14001	**K2**
	CO5	The student can understand Green Techniques and Methods	**K2**

UNIT – I	**Introduction to Green Management**	**Periods:9**	
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:9**	
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:8**	
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:8**	
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:10**	
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:**	**Practical Periods: -**	**Total Periods:45**

Text Books

1.Green Management and Green Technologies: Exploring the Causal• Relationship by Jazmin SeijasNogarida , ZEW Publications

2.The Green Energy Management Book by Leo A. Meyer, LAMA books

Reference Books

1.Green Marketing and Management: A global Perspective by John F. Whaik,Qbase Technologies

2.Green Project Management by Richard Maltzman And David Shiden, CRC Press Books.

3.Green and World by Andrew S. Winston, Yale Press B

* TE – Theory Exam, LE – Lab Exam

2.A.7.16

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	2	1	1	-	-	1	-	-	-	-	1	2	1	1
2	2	2	1	1	-	-	1	-	-	-	-	1	2	1	1
3	2	2	1	1	-	-	1	-	-	-	-	1	2	1	1
4	2	2	1	1	-	-	1	-	-	-	-	1	2	1	1
5	2	2	1	1	-	-	1	-	-	-	-	1	2	1	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

2.A.T 117

Annexure V

2.A.7.118

2. A. 7.119

PROFESSIONAL ELECTIVE COURSES (R2020)

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U20CEE401	Engineering Geology
2	U20CEE402	Geographic Information System
3	U20CEE403	Building Services
4	U20CEE404	Renewable Energy Sources
5	U20CEE405	Alternative Building Materials and Technologies
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U20CEE611	Rock Engineering
2	U20CEE612	Intellectual Property Rights
3	U20CEE613	Shoring scaffolding and Form Work
4	U20CEE614	Municipal Solid Waste Management
5	U20CEE615	Design of Industrial Structures
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CEE821	Structural Dynamics and Earthquake Engineering
2	U20CEE822	Housing - Planning and Management
3	U20CEE823	Tall Structures
4	U20CEE824	Industrial Waste Disposal and Treatment
5	U20CEE825	Prefabricated Structures
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U20CEE826	Coastal and Offshore Structures
2	U20CEE827	Pavement Engineering
3	U20CEE828	Repair and Rehabilitation of Structures
4	U20CEE829	Environmental Impact Assessment
5	U20CEE830	Pre- Stressed Concrete Structures

V. Sudarsana

2.A.7.120

U20CEE405	ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

Gain knowledge on energy in building materials
Aware about different types of alternative building materials
Understand the Sustainable materials for construction
Learn about the alternative building technologies
Understand the concepts of equipment for construction and also planning control.

Course Outcomes

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

CO1 – Understand the various energies involved in the construction **(K2)CO2**
– Understand the different types alternative materials**(K2)**
CO3 - Identify various eco-friendly materials **(K2)**
CO4 - Recognize suitable alternative building technologies **(K2)**
CO5 - Apply the cost concept involved in the planning of construction **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION **(9 Hrs)**

Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life- cycle energy, Global warming and construction industry, Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions.

UNIT II ALTERNATIVE BUILDNG MATERIALS **(9 Hrs)**

Characteristics of building blocks for walls - Stones and Laterite blocks - Bricks and hollow clay blocks - Concrete blocks - Stabilized mud blocks - Fal-G Blocks - Manufacture of stabilized blocks.

UNIT III SUSTAINABLE MATERIALS **(9 Hrs)**

Fibre reinforced concretes – Types: metal and synthetic - Properties and applications - Fibre reinforced plastics – Types: organic and synthetic - Properties and applications. Building materials from agro and industrialwastes - Types of agro wastes - Types of industrial and mine wastes - Properties and applications

UNIT IV ALTERNATIVE BUILDING TECHNOLOGIES **(9 Hrs)**

Alternatives for wall constructions, composite masonry, confined masonry, cavity walls, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique, 3D Printing Technology. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs.

UNIT V MACHINES & PLANNING CONTROL **(9 Hrs)**

Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

2.A.7.121

Text Books

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publishers, 2017.
2. BT Ashwini Manjunath, "Alternative Building Materials and Technology", Medtech Publisher, 2017.
3. Trevor M. Letcher and Janet L. Scott, "Materials for a Sustainable Future", Royal Society of Chemistry,2012

Reference Books

1. S Christian Johnson, "Concrete Technology", Dipti Press, 2017.
2. G.C Sahu and Jayagopal Jena, "Building Materials and Construction", McGraw hill Publication, 2015.
3. B C Punmia and Ashok kumar jain, "Building Construction", Laxmi Publication, 2019.
4. M.S. Shetty, "Concrete Technology (Theory and Practice)", S. Chand & Company Ltd., 2019.
5. S.K. Duggal, "Building Materials", 5th edition, New age International Publication, 2020.

Web Reference

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	-	-	-	-	3	3	2	-	2	1	3	3	2	2
CO2	2	-	-	-	3	2	3	2	-	2	1	3	3	3	2
CO3	3	-	-	-	3	3	3	3	-	2	1	3	3	3	2
CO4	3	-	-	-	3	3	3	3	3	3	1	3	3	3	2
CO5	3	-	-	2	2	3	3	3	3	3	1	3	3	2	2

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

2.A.7.122

U20CEE614	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Impart knowledge on sources and generation of municipal solid waste.
- Gain adequate knowledge in reduction and recycle of waste.
- Understand the concept of collection methods and routes.
- Gain knowledge about the transport method of municipal solid waste
- Impart knowledge of disposal method of waste.

Course Outcomes

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

CO 1 - Understand the nature and characteristics of municipal solid wastes.**(K2)**

CO 2 - Understand the concept of reduction, reuse and recycling of waste. **(K4)**

CO 3 - Plan and design systems for storage, collection, transport, processing and disposal of municipal solid Waste.**(K3)**

CO 4 - Understand the issues on solid waste management from an integrated source.**(K4)**

CO 5 - Design and operate sanitary landfill.**(K5)**

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

UNIT I SOURCES AND CHARACTERISTICS **(9 Hrs)**

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics –functional Elements of solid waste management – Requirements and salient features of Solid waste management rules (2016) -Role of public and NGO"s- Public Private participation – Elements of integrated Municipal Solid Waste Management Plan.

UNIT II SOURCE REDUCTION, WASTE STORAGE AND RECYCLING **(8 Hrs)**

Waste Management Hierarchy –3R-Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers - segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics, and Construction/Demolition wastes.

UNIT III COLLECTION AND TRANSFER OF WASTES **(8 Hrs)**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance- options under Indian conditions – Field problems- solving.

UNIT IV PROCESSING OF WASTES **(12 Hrs)**

Objective(s) of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste -composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V WASTE DISPOSAL **(8 Hrs)**

Land disposal of solid waste- Sanitary landfills – site selection- design and operation of sanitary landfills – Landfill liners– Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation.

2.A.7.123

Text Books

1. William A. Worrell, P. AarneVesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press,Taylor and Francis, New York.
3. George Tchobanoglouset.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.
4. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, "Waste Management", Springer, 1994.

Reference Books

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization. Government of India, New Delhi.
2. George Tchobanoglous and FrankKreith (2002).Handbook of Solid waste management, McGraw Hill, New York.
3. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
4. R.E.Landreth and P.A.Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.

Web References

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	1	2	2	3	3	3	3	3	3	2	3	3	3	3	2
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	2

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

2.A.7.124

U20CEE826	COASTAL AND OFFSHORE STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the various components in Harbour and offshore structures.
- Understand the planning and design principles of various components in Docks and harbours.
- Gain knowledge about types, forces, design concepts and foundation for offshore structures.
- Understand about the types of offshore structure.
- Understand about the design and installation of offshore pipelines.

Course Outcomes

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

CO 1 - Understand the classification of Harbours and details of different ports **(K2)**
CO 2 - Learn the terminology and fundamental concepts of planning **(K2)**
CO 3 - Students able to designing coastal and types of dock structures **(K3)**
CO 4 - Understand the types of offshore structures with different environmental conditions. **(K2)**
CO 5 - Learn the costal foundation and Submarine pipelines **(K2)**

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

UNIT I GROWTH OF PORTS **(9 Hrs)**

History of Port – Classification of Harbours - Factors affecting the growth of Port. Requirement of a Harbour - General Planning - Site investigation. Description of selected Indian ports.

UNIT II HARBOUR PLANNING (TECHNICAL) **(9 Hrs)**

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

UNIT III HARBOUR STRUCTURES **(9 Hrs)**

Break waters: Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures –Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

UNIT VI OFFSHORE STRUCTURE **(9 Hrs)**

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

UNIT V CONSTRUCTION OF OFFSHORE STRUCTURES **(9 Hrs)**

Foundations for offshore structures – Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines

Text Books

1. Narasimhan and S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I and Vol – II, NIOT- Chennai
2. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 and 2)" Elsevier Publications
3. Offshore Structures, Marine Foundations and Sediment Processes (v. 2) (Handbook of Coastal and Ocean Engineering), Gulf Publishing Co, 1990

Reference Books

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures, McGraw-Hill, 2007
3. Harbour Dock & Tunnel Engineering, R. Srinivasan, Charotar Publishing House pvt. Ltd.; 27th edition
4. C.M. Wang, Large Floating Structures: Technological Advances, Springer; 2015th edition, 2014
5. Angus Mather, Offshore Engineering, Witherby Seamanship International; Third Edition, 2011

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Web References

1. https://nptel.ac.in/courses/114/106/114106025/
2. https://nptel.ac.in/courses/114/106/114106011/
3. https://nptel.ac.in/courses/114/106/114106035/

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	-	-	-	-	-	-	-	2	2	1
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	1	2
CO3	2	1	2	-	1	-	-	-	-	-	-	-	3	3	2
CO4	2	-	-	-	-	-	-	-	-	-	-	-	2	2	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-	3	3	2

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

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U20CEE821	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the concept of degree of freedom
- Gain the knowledge about the multiple degree of freedom
- Familiar with the basic knowledge on Earthquake Engineering
- Know the basic response of structures to earthquake
- Study the design aspects on earthquake engineering

Course Outcomes

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

CO1 - Understand the concept of degree of freedom **(K3)**
CO2 - Grab the knowledge on Multiple degree of freedom **(K3)**
CO3 - Understand with the basic knowledge on Earthquake Engineering. **(K3)**
CO4 - Know the basic response of structures to earthquake **(K3)**
CO5 - Understand the design on Earthquake Engineering **(K4)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I SINGLE DEGREE OF FREEDOM **(9 Hrs)**

Definition of degree of freedom – Degree of freedom – idealization of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alembert's principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM **(9 Hrs)**

Formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING **(9 Hrs)**

Elements of Engineering Seismology – Definitions, introduction Seismic hazard, Earthquake phenomenon – Seismotectonic - Seismic Instrumentation- Characteristic of strong earthquake motion – Estimation of earthquake parameters.

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE **(9 Hrs)**

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V DESIGN METHODOLOGY **(9 Hrs)**

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Lateral load analysis – Design and detailing as per IS:13920 – 1993.

2.1.7. 127

Text Books

1. Chopra, A.K., "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Pearson, 5th Edition, 2017.
2. Clough R.W, and Penzien J, "Dynamics of Structures", 2nd Edition, McGraw- Hill International Edition, 2003.
3. Mario Paz, "Structural Dynamics Theory and Computations", 5th Edition, CBS Publishers, 2012.

Reference Books

1. Kappos, A., "Dynamic Loading and Design of Structures", CRC Press, 2014
2. Craig, R.R., Kurdila, A.J., "Fundamentals of Structural Dynamics", John Wiley and Sons, 2nd Edition, 2011.
3. Bollinger, G.A., "Blast Vibration Analysis", Courier Dover Publications, 2018
4. Dr. K. Jagannadha Rao Er. Srinavas Vasam, "Structural Dynamics And Earthquake Engineering" S.K. Kataria Publisher, 2018
5. Gopinath R, "Structural Dynamics and Earthquake Engineering", Yes Dee Publishing Pvt Ltd, 2021

Web References

1. https://nptel.ac.in/courses/105/106/105106151/
2. https://nptel.ac.in/courses/105/101/105101006/
3. https://nptel.ac.in/courses/105/104/105104189/

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	2	-	-	-	-	3	-	-	-	-	3	3	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2	3
CO4	-	2	2	-	-	2	2	2	-	-	-	-	3	2	3
CO5	-	3	3	2	3	2	2	2	1	1	1	1	3	2	3

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

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OPEN ELECTIVE COURSE (R2020)

Open Elective – I (Offered in Semester IV)				
1	U20EEO401	Solar Photovoltaic Fundamental and applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE
2	U20EEO402	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT
3	U20ECO401	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U20ECO402	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U20CSO401	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U20CSO402	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
9	U20ICO401	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT
11	U20MEO401	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
12	U20MEO402	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
18	U20CCO401	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20CCO402	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
20	U20ADO401	Knowledge Representation and Reasoning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20ADO402	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics, AI&DS**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**)				
1	U20EEO503/ U20EEO603	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS, FT
5	U20CSO503/ U20CSO603	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, CCE, BME, AI&DS
6	U20CSO504/ U20CSO604	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, FT
7	U20ITO503/ U20ITO603	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U20ITO504/ U20ITO604	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics, AI&DS

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9	U20ICO503/ U20ICO603	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME, AI&DS
11	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
15	U20BMO503/ U20BMO603	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics
16	U20BMO504/ U20BMO604	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL , Mechatronics
17	U20CCO503/ U20CCO603	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
18	U20CCO504/ U20CCO604	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
20	U20ADO504/ U20ADO604	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

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		L	T	P	C	Hrs
U20ADO402	**INTRODUCTION TO DATA SCIENCE** (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

Course Outcomes

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

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science.**(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

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

UNIT I INTRODUCTION TO DATA SCIENCE **(9 Hrs)**

Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES **(9 Hrs)**

Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS **(9 Hrs)**

Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS **(9 Hrs)**

Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS **(9 Hrs)**

Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.
3. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, "Ethics and Data Science", O' Reilly, 1st edition, 2018.

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Reference Books

1. Hector Guerrero, "Excel Data Analysis: Modeling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. Mc Owan, "The Power of Computational Thinking", World Scientific Publishing, 2017.
3. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

Web Resources

1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. https://www.javatpoint.com/data-science
3. https://www.coursera.org/browse/data-science /

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	2	2	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	1	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	2	1	1	2	1	-	-	1	-	-	-	-	-	-	-

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

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		L	T	P	C	Hrs
U20EEO603	**CONVENTIONAL AND NON-CONVENTIONAL ENERGY SOURCES**					
	(Common to ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To get knowledge on the status of conventional and non-conventional energy resources in world.
- To have a clear idea about the operation of conventional power plant and its associated equipment's.
- To learn about the concept of energy harvesting of solar through thermal and PV module
- To understand the technological basis for harnessing wind energy.
- To get a clear knowledge on power generation using Ocean, Tidal Energy and Bio-Energy

Course Outcomes

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

CO1 – Identify the world and Indian energy scenario and the necessity of renewable energy sources **(K1)**

CO2 – Gain knowledge for the generation of electrical power from various power plants **(K1)**

CO3 – Analyze and compare the various solar harvesting techniques **(K3)**

CO4 – Describe the aerodynamics of wind turbines and calculate their power, energy production**(K1)**

CO5 – Describe the construction and working principle of various equipment's used in Ocean, Tidal Energy and Bio-Energy power plants**(K2)**

UNIT I ENERGY RESOURCES **(9 Hrs)**

Perspective of energy resources – Forms of Energy – Conventional and non-conventional sources of energy– World's energy status - Energy reserves in India. Limitations of Conventional sources of energy efficiency – Renewable Energy Sources – Energy parameters – Energy Intensity - Gross Domestic product.

UNIT II POWER PLANTS **(9 Hrs)**

Thermal power plant – layout, working principle. Gas turbine power plant – layout, working principle. Nuclear power plants: fuels, nuclear fuel cycle, reactors and nuclear waste management. Hydro Electric plants – Types, energy conversion schemes, environmental aspects.

UNIT III SOLAR ENERGY SYSTEMS **(9 Hrs)**

Solar radiation - Principles of solar energy collection –Types of collector – working principles - Characteristics - efficiency - Solar Energy applications – water heaters, air heaters, solar cooling; solar drying and power generation – solar tower concept – solar pump. Photovoltaic (PV) technology – photovoltaic effect – modelling - Characteristics – efficiency of solar cells.

UNIT IV WIND ENERGY SYSTEMS **(9 Hrs)**

General theory of wind mills – Types of wind mills – performance of wind machines–wind power – efficiency. Merits and Limitations of Wind energy system – Modes of wind power generation.

UNIT V ALTERNATE ENERGY SYSTEMS **(9 Hrs)**

Ocean and Tidal energy conversion - working principle of OTEC – Anderson closed cycle OTEC System. Tidal power – tides - tidal range - types of tidal power plants, single basin and double basins schemes. Bio-mass Energy – Biogas plants.

Text Books

1. S. Rao and Dr. B. B. Parulekar, "Energy Technology", Khanna Publication, 3rd Edition, 1999.
2. B. H. Khan, "Non-Conventional Energy Resources", Tata McGraw Hill Education, 2nd Edition, 2009.
3. D. P. Kothari, K. C. Singal, Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", PHI, 2011

Reference Books

1. G. D. Rai, "Non-conventional energy sources", Khanna Publication. 4th Edition, 2002.
2. Pulfrey, David. L, "Photo voltaic Power Generation", Van Nostrand reinhold Company, 1983.
3. Abbasik, "Renewable Energy Sources and their Environment", PHI, 2008.
4. Steve Doty, Wayne C. Turner, "Energy Management Handbook", Fairmont Press, 8th Edition, 2012.
5. S.A.Abbasi and N. Abbasi, "Renewable Energy Sources and Their Environmental Impact", PHI, 2001.

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Web References

1. https://www.tutorialspoint.com/renewable_energy/index.htm
2. https://nptel.ac.in/courses/112/107/112107291/
3. https://byjus.com/physics/conventional-and-nonconventional-sources-of-energy/
4. https://www.jagranjosh.com/general-knowledge/nonconventional-sources-of-energy-1448698715-1
5. https://wb.gov.in/departments-power-and-non-conventional-energy-sources.aspx

COs / POs and PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2	PSO3
1	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
2	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
3	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
4	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
5	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-

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

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Annexure VI

EMPLOYABILITY ENHANCEMENT COURSES – (B).SKILL DEVELOPMENT COURSES

Sl. No	Course Code	Course Title
1	U20CES201	Skill Development Course 1 *
		1) MS Office – Word, Excel, Power Point
		2) Measurements and Conversion
		3) Traditional construction in modern age
2	U20CES302	Skill Development Course 2 *
		1) Basic Vasthu
		2) Contour and Leveling
		3) Auto level surveying
3	U20CES403	Skill Development Course 3 *
		1) Safety in building construction
		2) Air Quality Monitoring
		3) Experience with On-Site Construction Observation and Management
4	U20CES504	Skill Development Course 4 : Career and Professional Skill Development Program - I
5	U20CES505	Skill Development Course 5 : Presentation Skills using ICT
6	U20CES606	Skill Development Course 6 : Career and Professional Skill Development Program - II
7	U20CES607	Skill Development Course 7 : Technical Seminar
8	U20CES608	Skill Development Course 8 : NPTEL / MOOC – I
9	U20CES809	Skill Development Course 9 : NPTEL / MOOC - II

2. A. 7. 138

U20CES403	SKILL DEVELOPMENT COURSE 3 (Choose any one of the following course)	L	T	P	C	Hrs
		0	0	2	-	30

1. SAFETY IN BUIDING CONSTRUCTION

Course Content:

This would involve training students for safety practices in building construction. The students would be given exercise to use the management tools that will allow structuring a safety plan suited to the project, complying with the local laws and regulations in force

2. AIR QUALITY MONITORING

Course Content:

This would help the students to understand the monitoring and measurement of air pollutants by studying about the air quality and preparation of action plan. Students would be given exposure to various sources of pollutants, measuring and assessing them; and how to manage it.

3. EXPERIENCE WITH ON-SITE CONSTRUCTION OBSERVATION AND MANAGEMENT

Course Content:

This would involve training of students with various drawings and specifications by understanding the construction progress and reports for materials and the concept of testing and inspections. In this students would be given exposure to on-site observations, verification of contractor performance, specialty reports for materials such as concrete and asphalt, pre-final and final inspections

2. A. 2.139

U20CES606	SKILL DEVELOPMENT COURSE 6 (Career and Professional Skill Development Program - II)	L	T	P	C	Hrs
		0	0	2	0	30

1. **LOGICAL REASONING:**
   - Syllogism
   - Coding Inequalities
   - Coding & Decoding
   - Blood Relationship
   - Direction Sense
   - Number Series
   - Odd Man Out
   - Ranking Test
   - Logical Analogy
2. **ANALYTICAL REASONING & CRITICAL REASONING:**
   - Analytical Thinking
   - Seating Arrangement
   - Selection Decision Table – Eligibility Test
   - Numerical Puzzles
   - Data Sufficiency
   - Critical Reasoning
3. **NON VERBAL REASONING:**
   - Cubes & Dices
   - Sequence Oriented, Analogy Oriented, Coding Oriented
   - Figure & Factual Analysis
   - Water & Mirror Image
   - Paper Cutting Problems
4. **FUNCTIONAL GRAMMAR:**
   - Naming &Substituting Words - (Noun &Pronoun)
   - Qualifying Words - (Adverb)
   - Describing Words - (Adjectives)
   - Action Words - (Verb)
   - Positioning Words - (Preposition)
   - Connecting / Linking Words - (Conjunction)
   - Articles
   - Tenses
5. **VERBAL APTITUDE – I:**
   - Error Correction & Spotting Errors
   - Error Detection
   - Sentence Correction & Improvement
   - Phrases & Idioms
   - Sentence Completion
   - Cloze Test
   - One Word Substitute
6. **VERBAL APTITUDE – II:**
   - Reading Comprehension
   - Para Jumbled Sentences
   - Vocabulary Development
   - Essay Writing

2. A.2.140

U20CES607	SKILL DEVELOPMENT COURSE 7 (Technical Seminar)	L	T	P	C	Hrs
		0	0	2	0	30

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

Course Outcomes

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

CO1 - Review, prepare and present technological developments.

CO2 - Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/technology, for duration of about 20 minutes.
- In a session of three periods per week, 8 to 10 students are expected to present the seminar.
- Each student is expected to present atleast twice during the semester and the student is evaluatedbased on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks aregiven based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student andmaintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.

2.A.7.141

SKILL DEVELOPMENT COURSE 9

U20CES608

(NPTEL / MOOC - I)

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is 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. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation

2. A-7-142

EMPLOYABILITY ENHANCEMENT COURSES – CERTIFICATION COURSES

R-2020 Course Title	R-2023 Course Title
AutoCAD for Civil	AutoCAD for Civil
Python Programming	Sketch Up
Total Station	Total Station
Internet of Things	3ds Max
STAAD PRO V8i	Rebar detailing
Project Management	Primavera

2.A.7.143

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CEC3XX**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE-III**	**0**	**0**	**4**	**-**	**100**	**-**	**100**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

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.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 50**	**Total Periods: 50**

Evaluation methods

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

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DEPARTMENT OF CIVIL ENGINEERING
NPTEL COURSE LIST

Sl.No.	List of Subjects
1	Geotechnical Engineering - II Foundation Engineering
2	Landscape Architecture and Site Planning - Basic Fundamentals
3	Electronic Waste Management - Issues and Challenges
4	Plastic Waste Management
5	Architectural Conservation and Historic Preservation
6	Geosynthetics and Reinforced Soil Structures
7	Applied Environmental Microbiology
8	Digital Land Surveying And Mapping (DLS&M)
9	Geographic Information Systems
10	Basic Construction materials
11	Remote Sensing: Principles and Applications
12	Introduction to Civil Engineering Profession
13	Maintenance and Repair of Concrete Structures
14	Mechanical Characterization of Bituminous Materials
15	Geotechnical Engineering - I
16	Safety in Construction
17	Natural Hazards
18	Development and Applications of Special Concretes
19	Principles of Construction Management
20	Construction Methods and Equipment Management
21	Scheduling Techniques in Projects
22	Advanced Soil Mechanics
23	Introduction to Accounting and Finance for Civil Engineers
24	Water and Waste water treatment
25	Soil Structure Interaction
26	Geology and Soil Mechanics
27	Geomorphology
28	Water supply Engineering
29	Hydraulic Engineering
30	Structural Dynamics
31	Advanced Foundation Engineering
32	Rock Engineering
33	Urban Transportation Systems Planning
34	Environmental Remediation of Contaminated Sites
35	Geotechnical Engineering Laboratory

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SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

25 YEARS

DEPARTMENT OF CIVIL ENGINEERING

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 Buildings, 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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Annexure VII

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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**
1.	Dr. M. Uma Maguesvari	Associate Professor, Department of Civil Engineering, Rajalakshmi Engineering College, Chennai – 602105.	9443444595	umamaguesvari@gmail.com
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4.	Dr. K. Rex	Professor and Head, Department of Civil Engineering, Agni College of Technology, Chennai – 600130.	9381026207	rex_lk@rediffmail.com
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Specialization		Structural Engineering		
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Specialization		Structural Engineering		
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Specialization	Environmental Engineering			
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Specialization	Concrete Technology			
S.No	**Name of the Examiner**	**Designation & Institution Name**	**Mobile No**	**Mail ID**
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Specialization	Geotechnical Engineering			
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Specialization	Remote Sensing and GIS			
S.No	**Name of the Examiner**	**Designation & Institution Name**	**Mobile No**	**Mail ID**
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Specialization	Water and Wastewater Management			
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Specialization	Fluid Mechanics and Machinery			
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