Department of Civil Engineering

Minutes of 3rd BoS Meeting

Venue

Seminar Hall, Department of Civil Engineering
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time

27.08.2021 at 10.00 am

Department of Civil Engineering

31.08.2021

Minutes of 3rd Board of Studies Meeting (UG)

The third Board of Studies meeting of Department of Civil Engineering was held on 27th August 2021 at 10:00 a.m in the Seminar hall, University Block, 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 R Senthil Professor& HOD Civil, Division of Structural Engineering, Department of Civil Engineering, College of Engg., Guindy, Anna University, Chennai	Subject Expert (Pondicherry University Nominee)
3	Dr.R.Malathy Professor and Dean (Research) Dept. of Civil Engineering, Sona College of Technology, Salem	Subject Expert (Academic Council Nominee)
4	Dr A Rose Enid Teresa Professor and Head Rajalakshmi Engineering College, Chennai	Subject Expert (Academic Council Nominee)
5	Dr.B.Parthiban Assistant Manager – Structural Designer, Fujita Engineering India Pvt. Ltd., Chennai	Representative from Industry
6	Shri. G. Abdul Hakkim Design Engineer	Alumni Member

	Emmarde Steel Private Limited, Puducherry	
7	Dr. S. Jayakumar Controller of Examinations Professor in Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
8	Ms.G . Yamuna Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
9	Mr. K. Srinivasan Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
10	Ms. A. Aswini Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member
11	Dr.M.A. Ishrath Jahan Associate Professor, Department of English, SMVEC, Madagadipet - 605107	Internal Member
12	Dr.T Sivaranjini Assistant Professor, Department of Physics, SMVEC, Madagadipet - 605107	Internal Member
13	Dr.S.Deepa Professor, Department of Chemistry, SMVEC, Madagadipet - 605107	Internal Member
14	Mr.M.Devanathan Assistant Professor, Department of Mathematics, SMVEC, Madagadipet - 605107	Internal Member

Agenda of the Meeting

1. Confirmation of 2nd BoS Meeting

2. To discuss and approve the B.Tech. Degree Professional Elective Courses for VII semester under Pondicherry University Regulation 2013 for the students admitted in the Academic Year 2018 – 19 (Final Year) and V semester under Regulation 2019 for the students admitted in the Academic Year 2019-20 (Third Year)

3. To discuss and approve the B.Tech. Degree Open Elective Course for the V semester under Regulation 2019 for the students admitted in the Academic Year 2019-20 (Third Year)

4. To discuss and approve the B.Tech. Degree Certification Course for the V semester under Regulation 2019 for the students admitted in the Academic Year 2019-20 (Third Year)

5. To discuss and approve the B.Tech. Degree, Skill Development Courses for the V semester under Regulation 2019 for the students admitted in the Academic Year 2019-20 (Third Year)

6. To discuss and approve the syllabi for VII & VIII Semester under Regulation 2019 for B.Tech. Civil Engineering in the Academic Year 2022-23 for the students admitted in the year 2019-20

7. To discuss and approve the panel of examiners

8. To discuss and approve the modification in conducting the Continuous Assessment Test (CAT) for III Year & I Year of Regulation 2019 & Regulation 2020 respectively for the students admitted in the Academic Year 2019 – 2020 & 2020 – 2021.

9. To discuss and approve the Ph.D programme admission and course work

10. Any other item with the permission of chair

Minutes of the Meeting

Dr. S. Sundararaman, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

BoS / 2021 / CIVIL / UG / 3.1

Chairman BoS, appraised the minutes of 2nd BoS, its implementation and then it is confirmed with the approval for the incorporation of minor revisions needed as mentioned below.

S.No	Regulation	Semester	Subject Name with code	Unit	Particulars
1	2019	V	U19CET52 / Structural Analysis I	V	Members advised that in the course "U19CET52 / Structural Analysis I", Unit V is obsolete and Kani's method can be replaced with new methods of analyzing the structural elements
2	2019	V	U19CEP52/ Revit Architecture	-	Members proposed that in the course "U19CEP52/ 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
3	2019	V	U19CEP54 / Estimation costing and valuation laboratory	-	They also further discussed about the course U19CEP54 / 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

	4	2019	VI	U19CET63/ Design of RC Elements	-	In the course "U19CET63/ 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

- For analytical papers, an option of incorporating usage of C programing language to solve some problems in any one of the five units can be added so that this will make the students to gain interest in solving with the help of computer knowledge

The above corrections are approved by BoS members and the details are given in Annexure- I.

BoS / 2021 / CIVIL / UG / 3.2	Then Discussed and approved the B.Tech. Degree Professional Elective Course "U19CEE51/ Ground Improvement Techniques" has been chosen for V semester under R2019 for the B.Tech – Civil students admitted in the Year 2019 – 20 (Third Year). **The list of professional elective courses and syllabi for the chosen course of U19CEE51/ Ground Improvement Techniques has been attached in Annexure II.**
BoS / 2021 / CIVIL / UG / 3.3	Discussed and approved the B.Tech. Degree Open Elective Course "U19HSO54 / Project Management for Engineers" has been chosen for V semester under R2019 for the B.Tech – Civil students admitted in the Academic Year 2019 – 20 (Third Year) **The list of Open elective courses and syllabi for the chosen of course U19HSO54 / Project Management for Engineers has been attached in Annexure III.**

<table>
<tr><td>BoS / 2021 / CIVIL / UG / 3.4</td><td>Discussed and approved the B.Tech. Degree Certification Course “U19CECX9/ Total Station” has been chosen for V semester under Regulation 2019 for the B.Tech - Civil students admitted in the Academic Year 2019-20 (Third Year)
The list of Certification courses, chosen course of U19CECX9 / Total Station has been highlighted and attached in Annexure IV.</td></tr>
<tr><td>BoS / 2021 / CIVIL / UG / 3.5</td><td>Discussed and approved the B.Tech. Degree “Skill Development Courses 5: U19CES51/ Foreign Language/ IELTS – I and Skill Development Courses 6: U19CES52/ Presentation Skills using ICT” has been chosen for V semester under R2019 for the B.Tech – Civil students admitted in the Academic Year 2019 – 20 (Third Year)
The list of Skill Development Courses, chosen course of Skill Development Courses 5: U19CES51/ Foreign Language/ IELTS – I and Skill Development Courses 6: U19CES52/ Presentation Skills using ICT has been highlighted and attached in Annexure V.</td></tr>
<tr><td>BoS / 2021 / CIVIL / UG / 3.6</td><td>The SMVEC Autonomous Regulation R-2019 curriculum for 1 to 8 semesters and syllabi for 7th and 8th semesters, for B.Tech – Civil Engineering were discussed and the following comments were given by BoS members.
• Members suggested that all the courses can have 3 text books & 5 reference books instead of 5 text books.
<table>
<tr><th>S.No</th><th>Regulation</th><th>Semester</th><th>Subject Name with code</th><th>Unit</th><th>Particulars</th></tr>
<tr><td>1</td><td>2019</td><td>VII</td><td>U19CEE75 / Advanced Design of RCC Structures</td><td>II</td><td>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</td></tr>
</table></td></tr>
</table>

					structural elements design.
2	2019	VIII	U19CET81 / Construction Management	III	Members advised that in VIII Semester, the course “U19CET81/ Construction Management”, incorporation of MS - Excel to understand concepts of Project Planning & Scheduling
3	2019	VIII	U19CEE84/ Design of Industrial Structures	III, IV & V	In VIII Semester, the Professional Elective Course “U19CEE84 /Design of Industrial Structures”, the topic of Unit III & IV need to be rephrased as ‘Design of Industrial Steel Structures & Design of Industrial RCC Structures’ respectively. Also in Unit V, Introduction to Design of Mezzanine building, prefabrication & its erection concepts can be introduced.
4	2019	VIII	U19CEE89/ Pre- Stressed Concrete	II	Members also suggested that the Professional

				Structures		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'

The above corrections are incorporated in VII & VIII Semester and the Syllabi are approved by the BoS members. (Given in Annexure- VI)

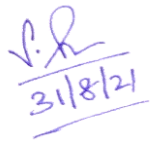
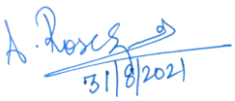
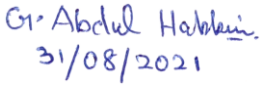
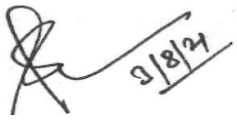
- They also further discussed about the NPTEL Courses floated in VI & VII semester & suggested to choose & map with the core Civil Engineering courses.

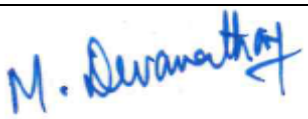
The list of NPTEL Courses for Civil Engineering has been listed in Annexure VII.

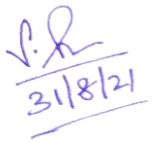
BoS / 2021 / CIVIL / UG / 3.8	The list of question paper setters and Evaluators (given in **Annexure- VIII)** was presented and recommended by the BoS members to the Academic Council.
BoS / 2021 / CIVIL / UG / 3.9	Discussed and approved the modification in conducting the Continuous Assessment Test (CAT) for III Year & I Year of Regulation 2019 & Regulation 2020 respectively for the students admitted in the Academic Year 2019 – 2020 & 2020 – 2021.
BoS / 2021 / CIVIL / UG / 3.10	Discussed and approved the Ph.D programme admission and course work.

BoS / 2021 / CIVIL / UG / 3.11	The Board of Studies Members discussed on the conduction of End Semester Examination in August 2021. All the members appreciated the efforts taken by SMVEC to conduct proctored mode of online / offline / blended mode.

The meeting was concluded at 12:00 pm with vote of thanks by **Dr. S. Sundararaman**, Head of Department, and Department of Civil Engineering.

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 R Senthil Professor& HOD Civil, Division of Structural Engineering, Department of Civil Engineering, College of Engg., Guindy, Anna University, Chennai	Subject Expert (Pondicherry University Nominee)	
3	Dr.R.Malathy Professor and Dean (Research) Dept. of Civil Engineering, Sona College of Technology, Salem	Subject Expert (Academic Council Nominee)	
4	Dr A Rose Enid Teresa Professor and Head Rajalakshmi Engineering College, Chennai	Subject Expert (Academic Council Nominee)	
5	Dr.B.Parthiban Assistant Manager – Structural Designer, Fujita Engineering India Pvt. Ltd., Chennai	Representative from Industry	
6	Shri. G. Abdul Hakkim Design Engineer Emmarde Steel Private Limited, Puducherry	Alumni Member	
7	Dr. S. Jayakumar Controller of Examinations Professor in Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
8	Ms. G. Yamuna Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	

9	Mr. K. Srinivasan Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
10	Ms. A.Aswini Assistant Professor, Department of Civil Engineering, SMVEC, Madagadipet - 605107	Internal Member	
11	Dr M.A. Ishrath Jahan Associate Professor, Department of English, SMVEC, Madagadipet - 605107	Internal Member	
12	Dr.T Sivaranjini Assistant Professor, Department of Physics, SMVEC, Madagadipet - 605107	Internal Member	
13	Dr.S.Deepa Professor, Department of Chemistry, SMVEC, Madagadipet - 605107	Internal Member	
14	Mr.M.Devanathan Assistant Professor, Department of Mathematics, SMVEC, Madagadipet - 605107	Internal Member	



Dr.S.Sundararaman
HOD/Civil
Chairman –BoS (Civil)

Annexure I

U19CET52	STRUCTURAL ANALYSIS - I	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Analyze statically indeterminate beams by using Force method
- Analyze the pin jointed frame by using Force method
- Analyze statically indeterminate beams and frames by using Slope deflection method
- Analyze statically indeterminate beams and frames by using Moment distribution method
- Analyze the statically determinate and indeterminate structures of suspension bridges

Course Outcomes

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

CO1 - Determine the degree of static indeterminacy to understand the concept of force method **(K4)**
CO2 - Analyze the member forces, deflection for a pin jointed frames by using force method **(K3)**
CO3 - Perform analysis of indeterminate beam and frame by slope deflection method **(K4)**
CO4 - Perform analysis of indeterminate beam and frame by moment distribution method **(K4)**
CO5 - Analyze the determinate and indeterminate structures of suspension bridges **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I FORCE METHOD (12 Hrs)

Concept of degree of Static indeterminacy and Kinematic indeterminacy – Analysis of continuous beams..

UNIT II REDUNDANT FRAME (12 Hrs)

Structural member: Definition, degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of trusses by Method of Joints.

UNIT III SLOPE DEFLECTION METHOD (12 Hrs)

Slope deflection equations – Equilibrium conditions – Analysis of continuous beams and rigid frames with and without sway – Support settlements – Symmetry portal frames.

UNIT IV MOMENT DISTRIBUTION METHOD (12 Hrs)

Stiffness and carry over factors – Distribution and carry over moments – Analysis of continuous beams and rigid frames with and without sway – Support settlements – Symmetry portal frames (Analyse the problem with C program)

UNIT V SUSPENSION BRIDGES (12 Hrs)

Analysis of Suspension bridges with statically determinate structures of two hinged stiffening girders and statically indeterminate structures of three hinged stiffening girders

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition

4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

U19CEP52	REVIT ARCHITECTURE	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

The course should enable the students to:

- Get exposed to the usage of software
- Learn the concepts of planning and orientations.
- Create a full 3D Elements like walls, doors, windows, components, floors, ceilings, roofs, stairs.
- Create a full 3D architectural project model
- Learn the concept of walkthrough in Revit Architecture.

Course Outcomes

At the end of Course students will be able to

CO1 - Describe building information modeling methodology and its benefits. **(K3)**

CO2 - Use different parts of the Revit Architecture user interface and work with different types of architectural elements and families. **(K3)**

CO3 - Use the different views listed in the Project Browser, control the visibility and graphical **(K3)**

CO4 - Representation of objects in architecture model, and work with elevation, section, and 3D views. **(K4)**

CO5 - Set up a project and transfer standards between projects, add and modify levels in project model, create and modify grids. **(K4)**

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

List of Experiments

1. Introduction
2. Core concepts
3. Touring the Revit Workspace
4. Starting a Project in Revit
5. Levels, Grids, and Columns
6. Using walls
7. Doors and Windows
8. How to use components
9. Use of columns and their types
10. Use of stairs and their types
11. Railing in Revit
12. Ramps
13. Floors
14. Roof
15. Text
16. Camera
17. Walk through
18. 3D modeling of Residential building

Reference Books

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Build Environment", Tata McGraw Hill Publishers Limited, 2019.
2. Dr. N. Kumaraswamy, A. KameswaraRao, Charotar Publishing- Building planning and Drawing,2017

3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2018.

Web References

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

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

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

U19CEP54	ESTIMATION COSTING AND VALUATION LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the basics knowledge of estimation, costing and valuation of civil engineering works.
- Analyze the estimate gives an idea of time required for the completion of the work.
- Understand the standard schedule of rates of the current year.
- Provide the knowledge on various cost estimate for civil projects
- Analyze the rates and estimate the various construction works

Course Outcomes

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

CO1 - Measure and Estimate various elements in Civil Engineering works **(K2)**
CO2 - Prepare Detailed Estimate for a given building **(K3)**
CO3 - Rate analysis for different types of works **(K2)**
CO4 - Estimate the material quantities, prepare a bill of quantities and tender documents of project **(K2)**
CO5 - Prepare value estimates and report for a residential building. **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

1. Introduction about Estimation, Costing and Valuation
2. Estimation on Residential Building – I
3. Estimation on Residential Building - II
4. Estimation on Septic tank with Soak pit
5. Estimation on Isolated Footing with column
6. Estimation on Box Culvert
7. Estimation on Earthwork with embankment
8. Estimation on Bituminous road
9. Analysis of Rates
10. Valuation
11. Estimation of bar bending schedule

Text Books

1. B. N. Dutta, “Estimating and Costing in Civil Engineering”, CBS Publishers and Distributors Pvt Ltd, New Delhi, 28th Edition, 2020
2. M. Chakraborti, “Estimating, Costing, Specification and Valuation in Civil Engineering”., Chakraborti, 29th revised Edition, 2006
3. A.K. Upadhyay, Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation, S K Kataria and Sons; Reprint 2013 edition, 2013
4. G. S. Birdie, A text book of Estimating and Costing, Dhanpat Rai Publishing Company Private Limited-New Delhi; Sixth edition (2014)
5. Dr. R P Rethaliya, Mayur R Rethaliya, Estimating costing and valuation, Atul Prakashan Publisher, January 2018

Reference Books

1. D.D Kohli and R.C Kohli, “A Text Book of Estimating and Costing (Civil)”, S. Chand and Company Ltd., 2013

2. V. N. Vazirani, S. P. Chandola, Civil Engineering Estimating, Costing & Valuation, Khanna Publishers, 1968
3. Rangwala, Estimation, Costing and Valuation, Charotar Publishing house Pvt Ltd, 17th Edition, 2017
4. S.P. Mahajan, Sanjay Mahajan, Quantity Surveying and Valuation book, Tech India Publication series, 2017
5. Govt of Tamil Nadu PWD – "Standard Schedule of Rates", 2017-18

Web References

1. https://mis.wbprd.gov.in/Engineering/Document/BoxCulvertorMinorBridgeSampleEstimate.pdf
2. https://www.cphbooks.in/product/estimating-costing-and-valuation/
3. https://www.flipkart.com/estimating-costing-civil-engineering-theory-practice-including-specification-valuation

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

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

U19CET63 **DESIGN OF RC ELEMENTS**

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

The course should enable the students to

- Gain knowledge on methods available for designing reinforced concrete structures
- Be familiar with design of beam using limit state method
- Know the behavior of RC beam in shear and torsion
- Be acquainted with the design of slab and column using limit state method
- Understand the design of footing and staircase using limit state method

Course Outcomes

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

CO1 - Select the methods for designing reinforced concrete structures **(K3)**
CO2 - Design the beam using limit state method **(K3)**
CO3 - Design RC members for combined bending shear and torsion using Limit State Method. **(K3)**
CO4 - Design the slab and column using limit state method **(K3)**
CO5 - Design the footing and staircase using limit state method **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES (12 Hrs)

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.

UNIT II LIMIT STATE DESIGN OF BEAM (12 Hrs)

Introduction to flexural members - Behaviour of RCC beam under flexure – Design of singly and doubly reinforced rectangular (using C programming) and flanged beams for flexure, bond, shear and torsion.

UNIT III LIMIT STATE DESIGN FOR SHEAR, TORSION, BOND AND ANCHORAGE (12 Hrs)

Behaviour of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of RC members for combined bending shear and torsion- use of design aids.

UNIT III LIMIT STATE DESIGN OF SLAB AND COLUMN (12 Hrs)

Design of one way and two way slabs - Design of continuous (one-way only) slabs. Types of columns - design of short columns for axial, uni-axial and bi axial bending - design of long columns- use of design aids

.

UNIT V LIMIT STATE DESIGN OF FOOTING AND STAIRCASE (12 Hrs)

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)

Text Books

1. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
2. Unnikrishnan Pillai and Devadas Menon, "Reinforced Concrete Design", Tata Mc-Graw Hill, 2012
3. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2012
4. N. Krishnaraju, and R. N.Pranesh," Reinforced Concrete Design", New Age International Pvt. Ltd.,2009

5. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi, 2008.

Reference Books

1. Mallick, D.K. and Gupta A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company, 2007
2. Syal, I.C. and Goel, A.K., “Reinforced Concrete Structures”, A.H. Wheelers and Co. Pvt. Ltd., 2012
3. Ram Chandra.N. and Virendra Gehlot, “Limit State Design”, Standard Book House, 2004.
4. Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
5. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2007
6. IS 875:Part1 1987, Code of practice for design loads (Other Than Earthquake) for buildings and structures: Part 1 dead loads - Unit weights of building materials and stored materials
7. S 875 : Part 2 : 1987, Code of practice for design loads (Other Than Earthquake) for buildings and structures: Part 2 imposed loads
8. IS 875 : Part 3 : 2015, Design Loads (Other than Earthquake) for Buildings and Structures - Code of Practice Part 3 Wind Loads
9. SP 64 (S & T) : 2001, Explanatory handbook on Indian standard code of practice for design loads (Other Than Earthquake) for buildings and structures

Web References

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://www.youtube.com/watch?v=1_SXPr_YTOU
3. https://onlinecourses.nptel.ac.in/noc20_ce39/preview

COs/POs/PSOs Mapping

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

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

U19CET61	DESIGN OF STEEL STRUCTURES	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Gain knowledge on the limit state design of steel structures and the design of connections
- Be familiar with the design concepts of steel structural members subjected to tension.
- Understand the design concepts of the structural steel members subjected to compression.
- Be familiar with the design concepts of structural members subjected to bending.
- Be acquainted with the design of connections

Course Outcomes

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

CO1 – Design steel structural joints using bolts and welds. **(K5)**
CO2 – Design the structural members subjected to tension**. (K5)**
CO3 – Design single and compound compression members and the laced and battened columns. **(K5)**
CO4 – Design laterally supported and unsupported beams subjected to axial bending. **(K5)**
CO5 – Design the steel connection. **(K5)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT– I INTRODUCTION TO LIMIT STATE DESIGN (12Hrs)

Properties of steel - Structural steel sections - types of connections, terminologies, failures in bolted and welded joints, Design of Joints – lap joint, single cover butt joint and double cover butt joint using bolts and welds under axial loading - Efficiency of joints (Using C Programming).

UNIT – II DESIGN OF TENSION MEMBERS (12 Hrs)

Types of sections - Design of single and double angle tension member under Axial Loading using bolts and welds – Concept of shear lag –Design of tension Splices- Use of Lug Angles.

UNIT – III DESIGN OF COMPRESSION MEMBERS (12 Hrs)

Theory of columns - Modes of failures, Design of axially loaded compression members, design of Built- up columns, Design of Lacings and Battens, Design of Column Splices.

UNIT – IV DESIGN OF FLEXURAL MEMBERS (12 Hrs)

Modes of failures, Design of beam, design of laterally supported beam, design of laterally unsupported beam, design of built up beam – plate girder and gantry girder (design procedure).

UNIT – V DESIGN OF CONNECTIONS (12 Hrs)

Types of end connections- Design of stiffened seated connection using bolts and welds, design of unstiffened seated connection using bolts and welds. Design of Column base under axial loading – slab base and gusseted base.

Text Books

1. N.Subramanian , "Design of Steel Structures" , Oxford University press, 2018.
2. S.K.Duggal, “Limit State Design of Steel Structures”, Tata McGrraw Hill Education Pvt. Ltd, 2019
3. Dayaratnam.P, “Design of Steel Structures”, Wheeler and Co Ltd., Allahabad, 2012
4. S.S.Bhavikatti, “Design of Steel Structures “, I.K. International Publishing House, 2019
5. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
6. IS 800 -2007, General Construction in Steel - Code of Practice.
7. SP 6-1 (1964): ISI Handbook for Structural Engineers -Part1 Structural Steel Sections [CED 7: Structural Engineering and structural sections]

Reference Books

1. Dr.Ramachandra, Virendra Gehlot, "Limit State Design of Steel Structures", Standard Publishers, 2012
2. Dr. V.L.Shah, S.S.Karve, "Limit State Design of Steel Structures", Structures Publications, 2012.
3. Punmia B.C, Ahok Kumar Jain and Arun Kumar Jain, “Comprehensive Design of Steel Structures”, Lakshmi publications (P) Ltd., New Delhi, 2015.
4. Arya, A.S. and Ajmani, J.L., “Design of Steel Structures”, Nem Chand and Bros, Roorkee, 2011.
5. Salmon and Johnson, “Steel Structures- Design and Behaviour”, Intext Educational Publishers, 1993

Web References

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

COs/POs/PSOs Mapping

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

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

U19CET62	STRUCTURAL ANALYSIS – II	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Analyze the different types of arches and cables with different end conditions
- Analyze statically determinate and indeterminate beams for ILD by using Rolling load and Muller Breslau's Principle
- Analyze statically indeterminate beams and frames by using Flexibility Matrix method
- Analyze statically indeterminate beams and frames by using Stiffness Matrix method
- Understand the concept of shape factor for various sections and plastic analysis of a beam and frame

Course Outcomes

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

CO1 -Familiarized in finding the normal thrust, radial shear and bending moment in arches and horizontal thrust and tension in the cables with same and different level **(K3)**

CO2 - Draw influence line diagram for various types of moving loads and indeterminate structures on beam by Muller Breslau principle **(K3)**

CO3 - Analyze the basic concept of static indeterminacy of beam and frame by using force method **(K4)**

CO4 - Analyze the basic concept of kinematic indeterminacy of beam and frame by using displacement method **(K4)**

CO5 - Familiarize about shape factor of different sections and analyze the beams and frames by plastic theory **(K3)**

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

UNIT I ARCHES AND CABLES (12 Hrs)

Arches as structural forms - Examples of arch structures - Types of arches - Analysis of three hinged and two hinged - Settlement and temperature effects - Analysis of forces in cables

UNIT II INFLUENCE LINES FOR DETERMINATE AND INDETERMINATE STRUCTURES (12 Hrs)

ILD for simply supported Moving loads –single and several point loads – maximum bending moment and maximum shear force –absolute maximum bending moment – Muller - Breslau's Theorem - principle and its application. Influence lines for continuous beams.

UNIT III FLEXIBILITY MATRIX METHOD (12 Hrs)

Equilibrium and compatibility - Determinate Vs Indeterminate structures - Indeterminacy - Primary structure - Compatibility conditions - Analysis of indeterminate continuous beams (with redundancy restricted to two).

UNIT IV STIFFNESS MATRIX METHOD (12 Hrs)

Displacement method or stiffness method - General – Procedure – Stiffness matrix – Procedure for stiffness matrix – Stiffness coefficient - comparison of Flexibility and Stiffness methods - Analysis of indeterminate continuous beams (with redundancy restricted to two) (Analysis the problem with C program)

UNIT V PLASTIC ANALYSIS OF STRUCTURES (12 Hrs)

Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism - Upper and lower bound theorems - Plastic moment of resistance - Analysis of indeterminate beams and symmetry portal frames

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 2, Laxmi Publications Pvt. Ltd, New Delhi, 2017, 3rd Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2018, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, " Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Pandit G.S, and Gupta S. P, "Structural Analysis a Matrix Approach", Tata McGraw Hill Publications, New Delhi, 2008
5. L.S. Negi and R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
2. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
3. Thandavamoorthy, "Analysis of Structures", Oxford and IBH Publishers, New Delhi.2008
4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Web References

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

COs/POs/PSOs Mapping

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

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

Annexure II

PROFESSIONAL ELECTIVE COURSE

Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE51	Ground Improvement Techniques
2	U19CEE52	Fundamentals of Nano Science
3	U19CEE53	Smart City
4	U19CEE54	Air and Noise Pollution
5	U19CEE55	Prefabricated Structures

U19CEE51 **GROUND IMPROVEMENT TECHNIQUES**

L	T	P	C	Hours
3	0	0	3	45

Course Objectives

This course should enable the students to

- Study the geotechnical problems in various types of soils and suggestions
- Learn the suitable dewatering techniques
- Study the apt ground improvement technique for various types of soils and site conditions.
- Study the earth reinforcement techniques.
- Learn the appropriate grouting materials and techniques to strengthen the soil.

Course Outcomes

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

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

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

CO3 - Identify the apt ground improvement technique for various types of soils and site conditions. **(K3)**

CO4 - Apply the earth reinforcement techniques for retaining walls and slopes. **(K3)**

CO5 - Select the appropriate grouting materials and techniques to strengthen the soil. **(K2)**

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

UNIT I INTRODUCTION (9 Hrs)

Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

UNIT II DRAINAGE AND DEWATERING (9 Hrs)

Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

UNIT III IN-SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS (9 Hrs)

In-situ densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains - Stone columns - Lime piles - Installation techniques only - relative merits of various methods and their limitations.

UNIT IV EARTH REINFORCEMENT (9 Hrs)

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - use of Geotextiles for filtration, drainage and separation in road and other works. Prevention of land sliding and techniques adopted for the same.

UNIT V GROUT TECHNIQUES (9 Hrs)

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

Annexure III

OPEN ELECTIVE COURSES

Open Elective – II / Open Elective – III				
1	U19HSO51 / U19HSO61	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics**)
2	U19HSO52 / U19HSO62	Intellectual Property and Rights	MBA	
3	U19HSO53 / U19HSO63	Marketing Management and Research	MBA	
4	U19HSO54 / U19HSO64	Project Management for Engineers	MBA	
5	U19HSO55 / U19HSO65	Finance for Engineers	MBA	

U19HSO54 PROJECT MANAGEMENT FOR ENGINEERS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

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

Course Outcomes

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

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

UNIT I PROJECT MANAGEMENT CONCEPTS (9 Hrs)

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

UNIT II PROJECT FEASIBILITY ANALYSIS (9 Hrs)

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

UNIT III PROJECT SCHEDULING & NETWORK TECHNIQUES (9 Hrs)

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

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

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

UNIT V PROJECT CLOSURE AND MANAGING PROJECT (9 Hrs)

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

Text Books

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

Reference Books

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

Web Resources

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

COs/POs/PSOs Mapping

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

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

Annexure IV

EMPLOYABILITY ENHANCEMENT COURSES –(A).CERTIFICATION COURSES

Sl. No	Course Code	Course Title
1	U19CECX1	3ds Max
2	U19CECX2	Advance Structural Analysis of Building using E-tabs
3	U19CECX3	AutoCad for Civil
4	U19CECX4	Bridge Analysis
5	U19CECX5	Internet of Things
6	U19CECX6	Project Management
7	U19CECX7	Python Programming
8	U19CECX8	STAAD Pro V8i
9	U19CECX9	Total Station

Annexure V

EMPLOYABILITY ENHANCEMENT COURSES – (B).SKILL DEVELOPMENT COURSES

Sl. No	Course Code	Course Title
1	U19CES31	Skill Development Course 1 : General Proficiency – I
2	U19CES32	Skill Development Courses 2 * 1) MS Office – Word, Excel, Power Point 2) Plane Table surveying 3) Auto level survey
3	U19CES41	Skill Development Course 3 : General Proficiency – II
4	U19CES42	Skill Development Courses 4 * 1) Measurements and Conversion 2) Air Quality Monitoring 3) Experience with On-Site Construction Observation and Management
5	U19CES51	Skill Development Course 5 : Foreign Language/ IELTS –I
6	U19CES52	Skill Development Course 6 : Presentation Skills using ICT
7	U19CES61	Skill Development Course 7 : Foreign Language/ IELTS – II
8	U19CES62	Skill Development Course 8 : Technical Seminar
9	U19CES63	Skill Development Course 9 : NPTEL/MOOC – I
10	U19CES81	Skill Development Course 10 : NPTEL/MOOC-II

U19CES51 **SKILL DEVELOPMENT COURSE 5**
(Foreign Language / IELTS - I)

L	T	P	C	Hrs
0	0	2	-	30

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

	SKILL DEVELOPMENT COURSE 6	L	T	P	C	Hrs
U19CES52	(Presentation Skills using ICT)	**0**	**0**	**2**	**0**	**30**

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

CT skills

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

Teaching tools

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

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

Annexure VI

U19CET71	HYDROLOGY AND WATER RESOURCES ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the hydrologic cycle, precipitation and its estimation.
- Understand the features of precipitation, rain gauge density, DAD curve, evaporation, transpiration and infiltration.
- Understand the occurrence, movement and augmentation of ground water through Darcy's law, recuperation test, pumping test and artificial recharge methods.
- Gain knowledge about runoff, estimation, modeling of runoff, and hydrograph.
- Gain knowledge about estimation, forecasting, control of flood, and concept of Muskingum method.

Course Outcomes

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

CO1- Understand the different forms of precipitation and also capable to analysis the missing precipitation data.**(K2)**

CO2 - Gain the knowledge in the various techniques and methods involved to quantify the total evaporation loss for water from the water bodies**(K3)**

CO3 - Understand the ground water concepts and identify the yield capacity of any given ground water sources **(K2)**

CO4 - Capable to solve and analyses the runoff problems **(K4)**

CO5 - Capable to solve and analyses the flood problems **(K4)**

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

UNIT I PRECIPITATION AND SURFACE WATER HYDROLOGY (9 Hrs)

Hydrologic cycle, precipitation, stream flow, evaporation, transpiration and infiltration, types and measurement of precipitation, gauge networks, hyetographs, average depth of precipitation over the basin, mass rainfall curves, intensity duration curves – estimates of missing data and adjustment of records.

UNIT II EVAPO-TRANSPIRATION AND INFILTRATION (9 Hrs)

Evaporation, factors affecting, measurement and estimation of evaporation, transpiration, factors affecting and determination of transpiration, methods of estimating evapo-transpiration, factors affecting and measurement of infiltration, infiltration indices.

UNIT III GROUND WATER HYDROLOGY (9 Hrs)

Occurrence and movement of ground water - Permeability and Transmissibility - Darcy's Law – Ground water yield - Aquifers and their types - Infiltration wells and Infiltration galleries - Measurement of yield - Recuperation test - Pumping test – Steady flow analysis only - Artificial recharge – Methods.

UNIT IV RUNOFF (9 Hrs)

Runoff - Components of stream flow - Catchment characteristics - Factors affecting runoff - Estimation of runoff - Flow duration curve - Rainfall-runoff modeling - Hydrograph - Unit hydrograph - S-curve hydrograph - Synthetic hydrograph - Application.

UNIT V FLOOD ESTIMATION AND FORECASTING (9 Hrs)

Estimation of peak flood - Flood frequency studies - Methods of flood control - Flood routing thorough a reservoir - Channel flow routing - Muskingum method - Flood forecasting and warning.

Text Books

1. Santosh kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, 2018.
2. Satyanarayana murthy.C., Water Resources Engineering Principles & Practice, New Age International (P) Ltd, 2019.
3. Subramanya.K, Engineering Hydrology, Tata McGraw-Hill, 2019.

Reference Books

1. Varshney, R.S., Engineering Hydroloy, Nem Chand & Bros., 2017.
2. Larry W Mays, Ven Te Chow, David R Maidment, Applied Hydrology, Tata McGraw-Hill, 2016.
3. Jayarami Reddi.P, Text Book of Hydrology, Lakshmi Publications, 2017.
4. Todd D.K., "Groundwater Hydrology", John Wiley & Sons, Inc, New York, 2015.
5. Bear J., "Hydraulics of Groundwater", McGraw-Hill, New York, 2012.

Web References

1. https://nptel.ac.in/courses/105/101/105101002/
2. https://nptel.ac.in/courses/105/104/105104103/
3. https://nptel.ac.in/courses/105/108/105108130/

COs/POs/PSOs Mapping

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

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

U19CET72 TRANSPORTATION ENGINEERING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the geometric design of highways
- Gain the knowledge about the pavement components and design of their elements
- Familiar with the basic elements and design principles of Railway track
- Understand the basic elements and design principles of Airport layout
- Familiar with the basic elements of harbor engineering

Course Outcomes

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

CO1 - Understand & Analyze the geometric design of highways **(K3)**
CO2 - Understand the various test procedures for highway materials and design theories **(K2)**
CO3 - Design the railway track **(K4)**
CO4 - Prepare airport layout and design traffic control **(K3)**
CO5 - Understand the various concepts and components of harbor **(K2)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I HIGHWAY GEOMETRY (9 Hrs)

Significance of highway planning –Factors influencing highway alignment –Engineering surveys for alignment, conventional and modern methods -Classification of highways –Typical cross sections - Cross sectional elements - Sight Distances, Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]- Gradients and its types, Design of Horizontal Alignments - Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments - Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves

UNIT II PAVEMENT COMPONENT AND DESIGN (9 Hrs)

Pavement components - Types of pavements - Highway materials –– Tests on aggregates and Tests on bitumen - Calculation of stresses – Single layer, Two layer theory, Westergaard's theory, Bradbury theory (Problems in stress calculation) - Pavement Design Factors in the design of flexible and rigid pavements- CBR methods - IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58) (Problems in design of flexible pavement) - Highway drainage and its types - Pavement failures - Pavement evaluation – Benkelman beam deflection method

UNIT III RAILWAY ENGINEERING (9 Hrs)

Permanent way and its elements – Functions, requirements and types of Rails, Sleepers and Ballast - Rail fixtures and fastenings - Gauge and its types -Coning of wheels - Defects in rails - Super elevation – Cant deficiency, negative cant (Problems) - Widening of gauge on curves (Problems) - Transition Curves and Shift (Problems) - Points and crossings – Turn outs - Design of turnouts (Problems) – Stations and Yards - classification of stations and yards

UNIT IV AIRPORT ENGINEERING (9 Hrs)

Components of Airport - Airport organization – Types of airport - Runway orientation - Wind rose diagram (Problems), Basic runway length and corrections, Geometric design of Runway (Problems on Runway length) Runway Marking – Runway Lighting - Design of exit taxiway (Problems), Airport drainage

UNIT V HARBOUR ENGINEERING (9 Hrs)

Definition of Terms - Harbors, Ports, Docks, Tides and Waves, Littoral Drift, Satellite Ports - Requirements and Classification of Harbors - Site Selection & Investigation - Dry and Wet Docks - Position of Light Houses, Navigating Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping

Text Books

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

Reference Books

1. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
2. Rangwala, “Airport Engineering”, Charotar Publishing House, 2018.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 2018.
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017

Web References

1. https://nptel.ac.in/courses/105101087/
2. https://nptel.ac.in/courses/105107123/
3. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

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

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

U19CEP71 BUSINESS BASICS FOR ENTREPRENEUR

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

This course should enable the students to

- Develop a clear understanding on Business Plans and their significance.
- Be familiar with various forms of business appropriate for an individual entrepreneur
- Understand various ways of judging a successful opportunity for an entrepreneur
- Know the ways to formulate a successful Operation Plan
- Be aware of things to know to prepare effective financial and marketing plans

Course Outcomes

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

CO1 - Impact comprehensive knowledge of an entrepreneurial ecosystem**. (K6)**
CO2 - Understand the need and significance of Business Plan in the success of an Enterprise. **(K2)**
CO3 - Understand the ways to judge the economic and business viability of proposed venture. **(K2)**
CO4 - Utilize the elements of success of entrepreneurial ventures. **(K3)**
CO5 - Evaluate the effectiveness of different entrepreneurial strategies. **(K5)**

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

UNIT I THE ENTREPRENEURIAL PERSPECTIVE (6 Hrs)

Entrepreneurship and Family Business Management, Entrepreneurship theory and practice, The Nature and Importance of Entrepreneurs, The Entrepreneurial and Intrapreneurial Mind, The Individual Entrepreneur, International Entrepreneurship Opportunities

UNIT II CREATING AND STARTING THE VENTURE (6 Hrs)

Creativity and the Business Idea, Legal Issues for the Entrepreneur, the Business Plan, the Marketing Plan, the Financial Plan, the Organizational Plan

UNIT III FINANCING THE VENTURE (6 Hrs)

Raising Finance, scaling up the venture, NDA'S and term sheet, Sources of the Capital, Informal Risk Capital and Venture Capital

Report Submission:

- Grooming Entrepreneurial Mind-set
- Interaction with Business Leaders/Bankers/Venture Capitalists
- Finding and evaluating an idea
- Develop a business plan
- Financing for a company start-up
- Setting up a company-legal entity
- Entrepreneurial development and employment creation
- Effects of creativity and innovation on the entrepreneurial performance of family business

Text Books

1. Friend, G., & Zehle, S. (2004). Guide to business planning. Profile Books Limited.
2. Lasher, W. (2010). The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business. Broadway Books.
3. Arjun Kakkar. (2009). Small Business Management: Concepts and Techniques for improving Decisions. Global India Publications.

Reference Books

1. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
2. Arthur R. DeThomas – Writing a Convincing Business Plan.
3. Ben Horowitz – The Hard Thing About Hard Things.
4. Guy Kawasaki – The Art of Start 2.0
5. Hal Shelton – The Secrets to Writing a Successful Business Plan.

Web References

1. https://www.waveapps.com/blog/entrepreneurship/importance-of-a-business-plan
2. https://www.entrepreneur.com/article/200516
3. https://smallbusinessbc.ca/article/how-to-use-viability-to-test-if-you-should-invest-in-your-business/
4. https://www.infoentrepreneurs.org/en/guides/strategic-planning/
5. http://www.marketingmo.com/strategic-planning/marketing-plans-budgets/
6. https://www.mbda.gov/page/loan-documentation

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

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

U19CEP72	IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the concepts of hydraulic design and to draw detailed drawings of hydraulic Structures.
- Introduce the design concepts of major units associated with water and sewage treatment

Course Outcomes

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

CO1 - Design and draw plan, elevation and sections of irrigation structures in detail.**(K3)**

CO2 - Design the sewage treatment plant units and draw the general arrangement **(K3)**

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

LIST OF EXERCISES

PART A

1) **TANK IRRIGATION STRUCTURES**
   Detailed drawings of foundation details, plan and elevation
   a) Tank surplus weirs
   b) Tank sluices weirs
2) **CANAL TRANSMISSION STRUCTURES**
   Detailed drawings of foundation details, plan and elevation
   a) Canal head works and Canal regulator
   b) Canal drops and Notch type

PART B

1) General layout of water and Waste treatment of plant.
2) Design and drawing of infiltration gallery.
3) Drawing of raw water - Intake towers - Manholes - Sewer lines
4) Design and drawing Slow sand filter - Rapid sand filter
5) Design and drawing of Trickling filters - Activated Sludge process
6) Design and drawing of Septic tanks and disposal arrangements

Reference Books

1. Peary, H.S., ROWE, D.R., Tchobanoglous, G., “Environmental Engineering”, McGraw- Hill Book Co., New Delhi, 1995.
2. Metcalf and Eddy, “Wastewater Engineering, Treatment and Reuse”, Tata McGraw-Hill, New Delhi, 2010.
3. Qasim,S.R., Motley, E.M and Zhu.G. “Water works Engineering – Planning, Design and Operation”, Prentice Hall, New Delhi, 2009.
4. Qasim, S. R. “Wastewater Treatment Plants, Planning, Design and Operation”, CRC Press, New York, 2010
5. Varshney, R.S., Engineering Hydroloy, Nem Chand & Bros., 2017

Web References

1. https://nptel.ac.in/courses/126/105/126105010/
2. https://nptel.ac.in/courses/105/105/105105110/
3. https://nptel.ac.in/courses/105/102/105102159/

COs/POs/PSOs Mapping

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

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

U19CEP73 TRANSPORTATION ENGINEERING LABORATORY

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the procedures of testing of road aggregates
- Understand the procedures of testing of bitumen
- Understand the Marshall mix design
- Understand the procedures of testing of bituminous mix
- Familiar with test on subgrade soil

Course Outcomes

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

CO1 - Carry out the test on aggregate **(K3)**
CO2 - Conduct the test on bitumen **(K3)**
CO3 - Design the pavement **(K4)**
CO4 - Investigate the test on bituminous mix **(K3)**
CO5 - Carry out the test on subgrade soil **(K3)**

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

LIST OF EXPERIMENTS

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

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

III. Tests on Bituminous Mix
1. Marshall's test on bituminous mixes
2. Bitumen Extraction test by Centrifuge Extractor

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

Reference Books

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

5. Indian Standard (IS), Methods of test for soil, Part 16 (Second Revision), IS: 2720 (Part 16) – 1987.

Web References

1. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-21.pdf
2. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf
3. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.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
CO1	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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

U19CEP74 COMPREHENSIVE VIVA VOCE

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To assess the overall knowledge of the student in the relevant field of Engineering acquired over 4 years of study in the undergraduate program.

Course Outcomes

CO 1 - The students will be able to attend the various Competitive examinations such as GATE, IES Examination etc. **(K3)**

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

Description

- Students' batch will be formed and each batch will prepare MCQ's question for concerned subjects.
- The student will be tested for his understanding of basic principles of the core Civil Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective type from all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

COs/POs/PSOs Mapping

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

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

U19CEW71	PROJECT PHASE - I	L	T	P	PW	C	Hrs
		0	0	0	4	2	60

Course Objectives

This course should enable the students to

- Encouraged to get hands on experience to work in various area of civil engineering.

Course Outcomes

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

CO1 - Perceive the problems and to find suitable solutions. **(K5)**

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

Description

The students to work in groups of not more than four members in each group on a project involving analytical, experimental, design or combination of these in the area of Civil Engineering. Each project shall have an internal guide. The student is required to do literature survey, formulate the problem and form a methodology in arriving at the solution of the problem. The evaluation is based on internal review committee and guide for 50 marks. The End Semester Examination for the project work shall consist of an evaluation of the project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner (25 marks) and an internal examiner (25 marks).

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

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

		L	T	P	C	Hrs
U19CEW72	**INTERNSHIP/INPLANT TRAINING**	**0**	**0**	**0**	**2**	**3 to 4 Weeks**

Course Objectives

This course should enable the students to

- Expose to the industrial environment
- Understand and sharpen the real time technical / managerial skills required in the civil engineering job.
- Expose on the current technological developments relevant to civil engineering domain.
- Communicate effectively on complex engineering activities
- Create conditions conducive to quest for knowledge and its applicability on the job.

Course Outcomes

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

CO1 - Be a source of highly motivated pre-professionals. **(K3)**

CO2 - Bring new perspectives to problem solving. **(K4)**

CO3 - Implement/Develop Technology solutions which will improve quality of life **(K4)**

CO4 - Develop an ability to communicate effectively (oral and written communication, report writing, presentation skills) **(K4)**

CO5 - Identify and to address their own educational needs in a changing world. **(K4)**

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

DESCRIPTION

Students may undergo training or internship during summer / winter vacation at Industry/ Research organization / University (after due approval from the Mentor, Class advisor and Departmental Consultative Committee (DCC). In such cases, the internship/training should be undergone continuously (without break) in one organization. Normally no extension of time is allowed. However, DCC may provide relaxation based on the exceptional case. The students are allowed to undergo three to four weeks internship in established industry / Esteemed institution during vacation period.

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
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CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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

U19CET81 CONSTRUCTION MANAGEMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the importance and basic functions of construction management
- Gain knowledge about various organization and planning system of construction
- Understand the scheduling and network analysis of project
- Impart the basic concepts of Contract and Tender
- Understand the M.I.S and labor, safety and related regulation

Course Outcomes

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

CO1 - Understand construction management importance **(K2)**
CO2 –Understand the various organization in the construction **(K2)**
CO3 –Become aware on scheduling and analysis **(K5)**
CO4 - Become aware on Contract and Tender **(K2)**
CO5 - Understand the M.I.S and labor, safety and related regulation **(K2)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I CONSTRUCTION PROJECT MANAGEMENT (9 Hrs)

Construction Project- Project Categories, Management objectives, functions- Project Development Process- Project Life Cycle- Project Team-Role of Project Manager-Management failure.

UNIT II ORGANIZATION AND PLANNING (9 Hrs)

Definition, Levels of Organization, Principles of Organization, process of organizing, Span of Control, Authority, Responsibility and Delegation –Forms of Organizations-merits and demerits of each.

UNIT III SCHEDULING AND NETWORK ANALYSIS (9 Hrs)

Scheduling: Definition, objectives, Importance of Planning, Scheduling and Controlling of Projects. Network Techniques in Construction Management- PERT, CPM, Time& cost optimization(MS Excel)

UNIT IV CONTRACTS (9 Hrs)

Contract and Contract document, Specification, Condition of Contract, Tender and Tender documents- Arbitration- M. Book-Muster roll.

UNIT V M.I.S APPLICATIONS AND CONSTRUCTION (9 Hrs)

Labour Legislations-Safety in Construction: Objectives, Steps in Safety Programme, Safety Costs, Safety Codes, Occupational Safety and Hazards, Accidents- Causes of Accident

Text Books

1. Clifford J Schexnayder, Kraig Knutson, Construction Management Fundamentals, Tata McGraw-Hill, 2011.
2. Ps Gahlot, Bm Dhir, Construction Planning & Management, New Age International (P) Ltd., 2014
3. Srinath,L.S., “PERT and CPM Principles and Applications “, Affiliated East West Press, 2015

Reference Books

1. Ravindra.S.V., Krishnamurthy.K.G., Construction & Project Management, CBS Publishers, 2010.
2. Steven McCabe, “Quality Improvement Techniques in Construction.” Longman, 2016
3. Moder.J., C.Phillips and Davis, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1995.
4. Shrivastava. U.K, Construction Planning & Management, Galgotia Publications Pvt. Ltd.,2014.
5. Ravindra.S.V., Krishnamurthy.K.G., Construction & Project Management, CBS Publishers, 2010.

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1. https://nptel.ac.in/courses/105/104/105104161/
2. https://nptel.ac.in/courses/105/103/105103093/
3. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce20/ /

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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

U19CEP81 ENTREPRENEURSHIP MANAGEMENT

L	T	P	C	Hrs
0	0	2	1	35

Course Objectives

This course should enable the students to

- Develop an ability to identify the critical challenges hindering growth of entrepreneurs
- Understand the significance of Finance Skills, Branding, and Sales Skills for an Entrepreneur
- Be aware of various Government Schemes and Subsidies available for Entrepreneurs

Course Outcomes

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

CO1- Develop and demonstrate the business models. **(K2)**
CO2 - Practice cash management, brand building and enhancing turnover. **(K5)**
CO3 - Understand various schemes and subsidies that are offered by various Government agencies. **(K2)**
CO4 - Effectively tackle growth challenges of their venture. **(K5)**
CO5 - Manage and grow their business in terms of expansion and look for partnerships. **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I ENTRPRENEURIAL SKILLS 1 (6 Hrs)

Introduction to Business Model Generation , Developing Lean Business Model for the Business Idea, Developing Prototype and Evaluating assumptions in Business Model using prototype cheaply, Presentation of Business Model, Business Fair

UNIT II ENTREPRENEURIAL SKILLS 2 (6 Hrs)

Financial Skills – Cash Management – Problems of Poor Cash Management – Learning to be Frugal. Branding – Building a 'niche' follower for your product/service – Developing and Establishing a Brand, Sales skills – KPI of Success of Entrepreneurship – Ensuring Growth in Turnover

UNIT III ENTREPRENEURIAL OPPORTUNITIES (6 Hrs)

Awareness of Government Schemes and Subsidies for various Entrepreneurial Categories – Special Schemes for Women Entrepreneurs – Understanding the Procedure and Documentation Process for availing the Government Schemes – Venture Capital – Crowd funding – Angel Investors.

Report Submission:

1. How can I get first 100 customers to pay for my products/services?
2. Information technology as a resource
3. Marketing skill and promotion for entrepreneurs
4. Assessment of factors affecting performance of women entrepreneurs
5. Entrepreneurship as a tool for sustainable employment
6. Examination of problem facing small scale business
7. Survival strategies in small business
8. The role of insurance in minimizing business risk

Text Books

1. Storey, D. J., & Greene, F. J. (2010). Small business and entrepreneurship. Financial Times/Prentice Hall.
2. Scarborough, N. M. (2011). Essentials of entrepreneurship and small business management. Prentice Hall.
3. Gupta C.B., & Srinivasan N.P. (2020). Entrepreneurial Development. Sultan Chand and Sons

Reference Books

1. Brian Tracy – The Psychology of Selling.
2. Dale Carnegie – How to Win Friends & Influence People.
3. Robert Kiyosaki and Sharon Lechter – Rich Dad, Poor Dad.
4. Reid Hoffman – The Startup of You: Adapt to the Future, Invest in Yourself, and Transform Your Career.
5. Michael E. Gerber – The E-Myth Revisited.
6. Chris Guillebeau – The Art of Non-Conformity.
7. Eric Ries – The Lean Startup.
8. Kevin D. Johnson – The Entrepreneur Mind.

Web References

1. https://www.helpguide.org/articles/stress/stress-management.htm
2. https://bscdesigner.com/8-entrepreneurial-kpis.htm
3. https://www.inc.com/ilya-pozin/5-problems-most-entrepreneurs-face.html
4. https://www.inc.com/jessica-stillman/how-to-network-with-super-successful-people.html
5. https://www.entrepreneur.com/article/251603
6. https://seraf-investor.com/compass/article/understanding-crowdfunding

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

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

U19CEW81	PROJECT PHASE- II	L	T	P	PW	C	Hrs
		0	0	0	16	8	240

Course Objectives

This course should enable the students to

- Expose students to design problem related to various disciplines of civil engineering.

Course Outcomes

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

CO1 - Take up any challenging practical problems and find solution by formulating proper methodology. **(K5)**

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

DESCRIPTION

The students will be encouraged to handle the field problems independently in Project work phase II with the extension of the project work Phase-I started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal review committee for 40 marks. The End Semester Examination for the project work shall consist of an evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner (25 marks) , an internal examiner (25 marks) and Publication of paper / Prototypes / Patents , etc (10marks).

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

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

PROFESSIONAL ELECTIVE COURSES

U19CEE71 SITE INVESTIGATION METHODS AND PRACTICES	L	T	P	C	Hrs
	3	0	0	3	45

Course Objectives

This course should enable the students to

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

Course Outcomes

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

CO1 - Interpret the aerial photographs. **(K2)**
CO2 - Understand the various test procedures for geophysical methods. **(K2)**
CO3 - Prepare a log report. **(K2)**
CO4 - Familiarize with the exploration methods. **(K2)**
CO5 - Write technical report on site works. **(K2)**

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

UNIT I INTRODUCTION (9 Hrs)

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

UNIT II GEOLOGICAL METHODS (9 Hrs)

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

UNIT III GEOPHYSICAL EXPLORATION (9 Hrs)

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

UNIT IV SAMPLING METHODS (9 Hrs)

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

UNIT V REPORT PREPARATION (9 Hrs)

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

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

U19CEE72	URBAN PLANNING AND DEVELOPMENT	L	T	P	C	Hours
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge about Urbanisation and Suburbanisation
- Understand about principles of planning, goals and objectives.
- Evaluate various developmental plans in different zones
- Understand the implementation process of the urban projects and its design problems.
- Understand about the Standards and Regulations of urban system.

Course Outcomes

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

CO1 - Describe basic issues in urban planning. **(K2)**
CO2 - Formulate plans for urban and rural development. **(K2)**
CO3 - Plan and analyze socio economic aspects of urban and rural planning. **(K2)**
CO4 - Implement Project Formulation activities. **(K2)**
CO5 - Know about the Legislation and regulations about the urban planning system. **(K2)**

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

UNIT I BASIC ISSUES (9 Hrs)

Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.

UNIT II PLANNING PROCESS (9Hrs)

Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objective(s), Delineation of Planning Areas, Surveys and Questionnaire Design.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION (9 Hrs)

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights , Special Economic Zones- Development of small town and smart cities-case studies

UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS (9 Hrs)

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM (9 Hrs)

Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries

Text Books

1. Goel, S.L “Urban Development and Management”, Deep and Deep publications, New Delhi 2003
2. George Chadwick, “A Systems view of planning”, Pergamon press, Oxford 1978
3. Singh V.B, “Revitalised Urban Administration in India”, Kalpaz publication, Delhi, 2002

Reference Books

1. "Tamil Nadu Town and Country Planning Act 1971", Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – "A Planning Guide to Beginners", M.A Publications, Chennai, 2005
3. "CMDA, Second Master Plan for Chennai", Chennai 2013
4. Edwin S.Mills and Charles M.Becker, "Studies in Urban development", A World Bank publication, 2010
5. Catanese A J, "Urban Planning", McGraw Hill publication January 2014.

Web References

1. https://nptel.ac.in/courses/124/107/124107007/
2. https://nptel.ac.in/courses/127/101/127101014/
3. https://www.youtube.com/watch?v=URLOGQhJWj0

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

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

U19CEE73 BRIDGE ENGINEERING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge about the investigation of Bridges and loading standards.
- Understand the Bridge substructure.
- Understand the Bridge superstructure
- Understand the design concepts in bridges.
- Familiar about bridge maintenance and rehabilitation techniques adopted in bridge

Course Outcomes

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

CO1 - Gain knowledge on investigation and loading standards of bridge. **(K2)**
CO2 - Select the suitable types of foundation, design of abutment, wing walls and setting out piers and abutment. **(K2)**
CO3 - Compare and choose the right types of super structure. **(K2)**
CO4 - Design steel and concrete bridges. **(K3)**
CO5 - Choose the suitable maintenance and rehabilitation techniques of bridge. **(K2)**

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

UNIT I INTRODUCTION (9 Hrs)

Introduction to bridges Investigations of minor and major bridge – Topography, catchment, hydrology, Geotechnical aspects, Construction Resources. Loading standard for road and railway bridges

UNIT II SUBSTRUCTURE (9 Hrs)

Choice of Foundation for piers and abutments –Types. Load on Foundation – Design of Well foundation, sinking process, tilt correction. Design of Pile Foundation. Design of wing wall and abutment. Setting out for piers and abutments for Major and Minor Bridges.

UNIT III SUPERSTRUCTURE (9 Hrs)

Choices of superstructure types Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge - Temperature Analysis - Distortional Analysis - Effects of Differential settlement of supports. Bearing and types.

UNIT IV DESIGN OF BRIDGE (9 Hrs)

Design of Bridges – IRC code – Pigeaud's method – Coulomb's method – design of Slab Bridge – T Beam Bridge. Design of Truss Bridges – Design of Plate girder bridges.

UNIT V MAINTENANCE (9 Hrs)

Maintenance-Inspection of bridges, Maintenance of substructure girders-Load testing on bridges-Temporary and movable bridges. Causes of bridge failure. Rehabilitation techniques for concrete bridges

Text Books

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 2010
2. M. K. Pant, Bridge Engineering, S.K Katariaand Sons, 2016
3. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 2017.

Reference Books

1. Victor.D.J, Essentials of Bridge Engineering, Oxford IBH Publishers 2013.
2. David Blockey, Bridges, Oxford University Press, 2013.
3. Phatak D.R., “Bridge Engineering”, Satya Prakashan, New Delhi, 1990.
4. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013
5. Raina, V.K., Analysis, Design and Construction of Bridges, Tata McGraw Hill(2010)

Web References

1. https://nptel.ac.in/courses/105/102/105102088/
2. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce23/
3. https://nptel.ac.in/courses/105/105/105105165/

COs/POs/PSOs Mapping

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

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

U19CEE74 POLLUTION CONTROL AND MONITORING

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the factors that must be satisfied for Water pollution control.
- Gain knowledge about air pollution, sources and its effects on human.
- Gain adequate knowledge about environmental, industrial noise and control legislation.
- Understand about the sources, collection and disposal method of solid waste.
- Understand the relationship between social, legislative and biological constraints in a modern developed society

Course Outcomes

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

CO1 -Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water.**(K2)**

CO2 -Analyze the sources, effect of air pollution, air quality monitoring and control system.**(K3)**

CO3 -Use advanced methods for monitoring and modeling for noise pollution and preventive temporal patterns for noise pollution.**(K3)**

CO4 -Understand the generation and preventive measures of solid waste.**(K2)**

CO5 -Analyze the method of sanitation for various field **(K3)**

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

UNIT I WATER POLLUTION & CONTROL (9 Hrs)

Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.

UNIT II AIR POLLUTION AND CONTROL (9 Hrs)

Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation.

UNIT III NOISE POLLUTION AND CONTROL (9 Hrs)

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

UNIT IV SOLID WASTE MANAGEMENT (9 Hrs)

Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.

UNIT V ENVIRONMENTAL SANITATION (9 Hrs)

Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurization of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.

Text Books

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

Reference Books

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

Web References

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

COs/POs/PSOs Mapping

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

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

U19CEE75 ADVANCED DESIGN OF RCC STRUCTURES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the unified analysis of reinforced concrete structures
- Gain knowledge about the design of special reinforced concrete elements
- Understand the concept on yield line theory of slabs and to design flat slabs.
- Understand the design RCC slab culvert and bridge
- Analyze the prestressed concrete sections and design of beams.

Course Outcomes

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

CO1 - Analyze reinforced concrete structures **(K4)**
CO2 – Design special reinforced concrete elements **(K4)**
CO3 – Create an awareness on yield line theory of slabs and to design flat slabs. **(K2)**
CO4 - Design RCC slab culvert and bridge **(K5)**
CO5 - Analyze prestressed concrete sections and design of beams. **(K5)**

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

UNIT I INTRODUCTION TO ANALYSIS OF REINFORCED CONCRETE STRUCTURES (9 Hrs)

Introduction to strut-tie model, equilibrium truss model, Bernoulli compatibility truss model, Mohr compatibility truss model, Introduction to non linear behavior of structures.

UNIT II DESIGN OF SPECIAL REINFORCED CONCRETE ELEMENTS (WSM) (9 Hrs)

Design of Deep Beams (using C programming), Checking for Local Failures, Detailing of Deep Beams, Design of shear walls, Design of Corbels, Design of Nibs, Design of pile cap. Reinforcement detailing for all design.

UNIT III FLAT SLABS AND YIELD LINE THEORY (9 Hrs)

Concept and Advantages of Flat Slab - Design of flat slab using Direct Design method as per BIS code, use of design aids (SP16) - Introduction to yield line theory - Design of square and rectangular slabs for collapse loads using Yield line theory of slab - Design of circular and triangular slabs for collapse loads using Yield line theory of slabs.

UNIT IV DESIGN OF BRIDGES (9 Hrs)

Types of bridges and culverts - Simply supported girder bridges, Balanced cantilever and their behavior - Introduction to IRC Loading, impact loading - Codal Provisions for design - Design of slab culvert for Class AA, 70R, Class A.

UNIT V PRESTRESSED CONCRETE STRUCTURES (9 Hrs)

Basic concepts, Principle of prestressing methods and materials required - Stress and Strength concept and Load balancing concept - Analysis of sections subjected to flexure, Losses of prestress using Simple cable profile - Introduction to design of beams.

Text Books

1. Varghese.P.C, “Advanced Reinforced Concrete Design”, Pretince-Hall India, 2005..
2. Unnikrishna Pillai.S and Devadas Menon, “Reinforced Concrete Design,” Tata MacGraw Hill Publishing

Company Limited, Second Edition, New Delhi, 2010
3. Krishnaraju .N, Pranesh .R.N, “Design of Reinforced concrete IS: 456-2000”, New age International Publication (P) Ltd., New Delhi, 2003.

Reference Books

1. Krishnaraju .N, “Prestressed Concrete”, Tata McGraw-Hill Education, 2008, New Delhi.
2. Punmia.B.C, Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publications, New Delhi, 2007..
3. Johnson Victor.D, “Essentials Of Bridge Engineering”, 6/E, Oxford & IBH Publishing Company Pvt. Ltd.,Fourth edition, 2007.
4. IS : 456-2000 - Plain and Reinforced Concrete - Code of Practice
5. SP – 16 - Design Aids for Reinforced Concrete
6. IS : 1343:2012 - Prestressed concrete-code of practice
7. IRC 6-2010 - Standard Specifications and Code of Practice for Road Bridges Section : II Loads And Stresses

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

COs/POs/PSOs Mapping

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

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

U19CEE80	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.

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

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

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

U19CEE81	HOUSING - PLANNING AND MANAGEMENT	L	T	P	C	Hours
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Train a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
- Study and understand the latest construction techniques applied to engineering Construction
- Become familiar with Building Byelaws
- Focuses on cost effective construction materials and methods.
- Emphasis is given on the principles of sustainable housing policies and programmes

Course Outcomes

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

CO 1 - Understand various strategies of housing planning in different level. **(K2)**
CO 2 - Get knowledge about various housing programs and schemes in governmental organization. **(K2)**
CO 3 - Formulate the housing Projects and design problems associated to implementation. **(K3)**
CO 4 - Undergo Performance Evaluation in various aspects. **(K2)**
CO 5 - Understand the concept of cost effective analysis of housing projects and to understand project appraisal techniques. **(K3)**

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

UNIT I INTRODUCTION TO HOUSING (10 Hrs)

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objective(s) and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES (10 Hrs)

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS (9 Hrs)

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS (8 Hrs)

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept- Building Centers – Concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL (8 Hrs)

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects – Viability Gap Funding - Pricing of Housing Units.

Text Books

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.
3. “Development Control Rules for Chennai Metropolitan Area, CMA”, Chennai, 2004.

Reference Books

1. Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2011
3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA 2010
4. “Development Control Rules for Chennai Metropolitan Area, CMA”, Chennai, 2004.
5. W Addington Willis, “Housing and Town Planning in Great Britain”, March 2019

Web References

1. https://nptel.ac.in/courses/124107001/
2. https://nptel.ac.in/courses/105106188/
3. https://www.youtube.com/watch?v=VI3Ef1Rytz8

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

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

U19CEE82	TALL STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).
- Understand the concept of shear wall and bracing structures in high rise building
- Understand the concept of trusses, frame and slab in high rise building
- Understand the concept of lateral deformation of rigid frame buildings structures
- Know the rudimentary principles of designing tall buildings

Course Outcomes

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

CO1 - Gain the knowledge of various structural systems used in the construction of Tall structures **(K2)**

CO2 - Capable of analyzing the tall structures using the computer based methods and approximate method of analysis **(K2)**

CO3 - Know about different types of loads, materials and design philosophy **(K2)**

CO4 - Impart knowledge about static, dynamic and stability analysis of various systems **(K2)**

CO5 - Know about recent topics of research of tall buildings **(K2)**

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

UNIT I INTRODUCTION (9 Hrs)

Tall building - support structure - development of high rise building structures - general planning considerations, dead loads - live loads-construction loads - snow, rain, and ice loads - wind loads-seismic loading – water and earth pressure loads - loads - loads due to restrained volume changes of material - impact and dynamic loads - blast loads - combination of loads

UNIT II VERTICAL STRUCTURE PLANE (9 Hrs)

Dispersion of vertical forces- dispersion of lateral forces - optimum ground level space - shear wall arrangement - behavior of shear walls under lateral loading. The floor structure or horizontal building plane floor framing systems - horizontal bracing- composite floor systems the high - rise building as related to assemblage kits skeleton frame systems - load bearing wall panel systems - panel – frame systems - multistory box systems.

UNIT III COMMON HIGH RISE BUILDING STRUCTURES (9 Hrs)

Bearing Wall Structure - Shear Core Structure - Rigid Frame Systems- Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems - Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS (9 Hrs)

Approximate analysis of bearing wall buildings the cross wall structure - long wall structure the rigid frame structure approximate analysis for vertical loading - approximate analysis for lateral loading - approximate design of rigid frame buildings-lateral deformation of rigid frame buildings the rigid frame - shear wall structure

UNIT V OTHER HIGH RISE BUILDING STRUCTURES (9 Hrs)

Deep - beam systems -high-rise suspension systems - pneumatic high -rise buildings - space frame applied to high - rise buildings - capsule architecture

Text Books

1. Wolfgang Schueller,"High-rise building Structures", John Wiley and Sons, New York 1977.
2. Bryan Stafford Smith and Alex Coull, "Tall Building Structures", Analysis and Design, John Wiley and Sons, Inc., 1991.
3. Mark Sarkisian, “Designing Tall Buildings : Structure as Architecture”, Routledge, 2016

Reference Books

1. Coull, A. and Smith, Stafford, B. "Tall Buildings", Pergamon Press, London, 1997.
2. LinT.Y. and Burry D.Stotes, "Structural Concepts and Systems for Architects and Engineers", John Wiley, 1994.
3. Lynn S. Beedle, “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1996.
4. Taranath. B.S, “Structural Analysis and Design of Tall Buildings”, Mc Graw Hill, 1998.
5. Bungale S. Taranath, “Tall Building design: Steel Concrete, and Composite systems”

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1. https://onlinelibrary.wiley.com/page/journal/15417808/homepage/forauthors.html
2. https://www.elsevier.com/physical-sciences-and-engineering/engineering/journals/damping-technologies-for-tall-buildings-new-trends-in-comfort-and-safety
3. https://onlinelibrary.wiley.com/page/journal/15417808/homepage/forauthors.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
CO1	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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

U19CEE83 INDUSTRIAL WASTE DISPOSAL AND TREATMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Have a knowledge on the uses of water by industries
- Understand the process involved in industries and their waste water production
- Learn about the treatment of waste water.
- Learn about the treatment safe disposal of treated effluents.
- Study the impact due to Textiles Tanneries, Pulp and Paper, Metal finishing, Petroleum refining, chemical industries, Sugar and distilleries, Dairy, Iron and Steel.

Course Outcomes

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

CO1- An ability to use the recent techniques.**(K3)**
CO2 - Describe the importance of Pretreatment Methods **(K3)**
CO3 - Apply the various techniques for Treatment Methods of Industrial Wastes **(K3)**
CO4 - Describe the solve problems related to Industrial Waste Water management and Disposal **(K3)**
CO5 - Carry out Industry and power plants studies case studies **(K3)**

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

UNIT I PRECIPITATION (9 Hrs)

Uses of water by Industry - Sources and types of wastewaters, quality criteria, effluent standards- Individual and common effluent treatment plants - Population equivalent, Effects of industrial wastes on streams, land, air and waste water treatment plants

UNIT II PRETREATMENT METHODS (9 Hrs)

Pretreatment Methods: Process modification – methods and materials changes – Reduce, reuse and recycle methods, housekeeping etc. to reduce waste discharge and strength of the waste and established methods for by products recovery within the plant operations.

UNIT III TREATMENT METHODS OF INDUSTRIAL WASTES (9 Hrs)

Equalization – Neutralization - Oil separation – Floatation – Precipitation –Adsorption - Aerobic and anaerobic biological treatment - High rate reactors. Chemical oxidation – Ozonation –Ion Exchange – Membrane technologies.

UNIT IV TREATMENT METHODS OF RESIDUALS (9 Hrs)

Residuals of Industrial waste treatment – Characteristics of sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge.

UNIT V CASE STUDIES (9 Hrs)

Industry and power plants - manufacturing process description - wastewater characteristics and waste treatment flow sheet for typical industries – Textiles – Tanneries – Pulp and Paper –Metal finishing – Petroleum refining – Chemical industries - Sugar and distilleries –Dairy –Iron and Steel- Fertilizers –Nuclear power plants.

Text Books

1. Eckenfelder. W.W., Industrial Water Pollution Control, McGraw Hill, 2017.
2. Arceivala.S.J. Wastewater Treatment for Pollution Control, Tata Mc.Graw Hill. 2018
3. Santosh kumar Garg, Industrial Waste Disposal and Treatment, Khanna Publishers, 2018.

Reference Books

1. Nemerow,N.L., Theories and Practices of Industrial Wastes Treatment, Addisson and Wesley, 2015.
2. Gurnham,C.F., Principles of Industrial Waste Treatment, John Wiley, New York,2012.
3. Varshney, R.S., Industrial Waste Disposal and Treatment,, Nem Chand & Bros., 2017.
4. Jayarami Reddi.P, Text Book of Industrial Waste Disposal and Treatment, Lakshmi Publications, 2017.
5. Bear J., " Industrial Waste Disposal ", McGraw-Hill, New York, 2012

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2. https://nptel.ac.in/courses/105/105/105105178/
3. https://nptel.ac.in/content/105/107/105106056/

COs/POs/PSOs Mapping

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

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

U19CEE84 DESIGN OF INDUSTRIAL STRUCTURES

L	T	P	C	Hours
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand about the planning and layout of buildings and its components.
- Have information about the functional requirements of industries.
- Perceive the design concepts of steel storage structures.
- Be acquainted with the design concepts of concrete storage structures.
- Familiarize the general principles of prefabrication and the functional requirements for precast concrete units

Course Outcomes

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

CO1 - Describe the general requirements for industries like cement, chemical and steel plants. **(K2)**
CO2 - Relate the functional requirements such as lighting, ventilation and fire safety of industries **(K2)**
CO3 - Design the steel storage structures like bunkers and silos **(K5)**
CO4 - Design the concrete storage structures like bunkers and silos **(K5)**
CO5 - Illuminate the functional requirements of Pre cast concrete units **(K2)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I PLANNING (9 Hrs)

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS (9 Hrs)

Lighting – Ventilation – Acoustics – Fire safety – Guidelines from factories act

UNIT III DESIGN OF INDUSTRIAL STEEL STRUCTURES (9 Hrs)

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos.

UNIT IV DESIGN OF INDUSTRIAL RCC STRUCTURES (9 Hrs)

Silos and bunkers – Chimneys (Using C programming) – Principles of folded plates and shell roofs.

UNIT V PREFABRICATION (9 Hrs)

Principles of prefabrication and erection – Prestressed precast roof trusses- Functional requirements for Precast concrete units- Introduction to design of industrial mezzanine building

Text Books

1. Mohamed A. El-Reedy, “Construction Management and Design of Industrial Concrete and Steel Structures”, CRC Press, 2010
2. Varghese.P.C., " Limit State Design of Reinforced Concrete", Prentice Hall of India Eastern Economy Editions, 2 nd Edition, 2003.
3. Bhavikatti.S.S., “Design of Steel Structures", J.K. International Publishing House Pvt.Ltd., 2009.

Reference Books

1. Henn W. "Buildings for Industry", Vol.I and II, London Hill Books, 2017
2. SP32-1986, Handbook on Functional Requirements of Industrial buildings, Bureau of Indian Standards, 1990
3. Structural Engineering Research Centre, Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Madras, 1982
4. Koncz.J., "Manual of Precast Construction", Vol.I and II, Bauverlay GMBH, 1971.

5. Ashoke Kumar Dasgupta, “Design of Industrial Structures Reinforced Cement Concrete and Steel”, CRC Press, 2021
6. IS: 9178-PART-I: Indian code of practice criteria for design of steel bins for storage of bulk materials, PART-II: General requirements and assessment of loads, PART-III: Design criteria and Bins designed for mass flow and funnel flow
7. IS:5503(PART- I)-1969: Indian Code of practice for silos for grain storage
8. IS 4995-1 (1974): Criteria for design of reinforced concrete bins for storage of granular and powdery materials, Part 1: General requirements and assessment of bin loads

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2. https://nptel.ac.in/courses/105/105/105105162/
3. https://nptel.ac.in/courses/105/105/105105105/

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

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

U19CEE85 **COASTAL AND OFFSHORE STRUCTURES**

L	T	P	C	Hours
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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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	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3

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

U19CEE86	PAVEMENT ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the various stresses in the pavement
- Gain knowledge about the design of flexible pavement
- Familiar with the design of flexible pavement
- Understand the basic distresses in the pavement
- Gain knowledge on basic elements of soil stabilization

Course Outcomes

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

CO1- Design the stresses and deflection of the pavement **(K3)**
CO2 - Design the flexible pavement **(K4)**
CO3 - Design the rigid pavement **(K4)**
CO4 - Understand the pavement evaluation methods **(K3)**
CO5 - Understand the various soil stabilization techniques **(K3)**

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

UNIT I PAVEMENT AND STRESS DISTRIBUTION (9 Hrs)

Introduction – Pavement as layered structure – Pavement types (rigid and flexible) - Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS (9 Hrs)

Flexible pavement design - Factors influencing design of flexible pavement - Empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads

UNIT III DESIGN OF RIGID PAVEMENTS (9 Hrs)

Cement concrete pavements - Factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE (9 Hrs)

Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index - Pavement maintenance

UNIT V Stabilization of Pavements (9 Hrs)

Stabilization for highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geosynthetics in roads

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. Kadiyali L R, “Highway Engineering”, Khanna Book Publishing Co Pvt Ltd, 2019.
3. Thom Nicholas, “Principles of Pavement Engineering”. ICE Publishing, 2008

Reference Books

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017
3. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
4. Yoder, E.J. and Witchak M.W. “Principles of Pavement Design”, John Wiley 2011
5. Huang, “Pavement Analysis and Design”, Pearson Education, 2008.

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1. https://nptel.ac.in/courses/105101087/
2. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-28.pdf
3. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-29.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
CO1	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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

U19CEE87 REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Learn various distress and damages to concrete structures
- Assess the durability of concrete due to various non-destructive testing
- Suggest the suitable materials and techniques for repair
- Implement various rehabilitation and retrofitting techniques
- Select suitable demolition techniques for structures

Course Outcomes

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

CO1 - Gain knowledge of maintenance and various assessment techniques **(K2)**
CO2 - Understand the methods of non-destructive testing systems **(K2)**
CO3 - Understand the types and properties of repair material **(K2)**
CO4 - Understand the corrosion and damaged structures **(K2)**
CO5 - Gain knowledge of strengthening of structures **(K3)**

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

UNIT I MAINTENANCE AND REPAIR (9 Hrs)

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II DAMAGE DIAGNOSIS AND ASSESSMENT (9 Hrs)

Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement.

UNIT III REPAIR TECHNIQUES (9 Hrs)

Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.

UNIT IV CORROSION OF STEEL IN CONCRETE (9 Hrs)

Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)

UNIT V STRENGTHENING OF CONCRETE STRUCTURES (9 Hrs)

Introduction – Plate bonding method - RC Jacketing of column and beams with reinforced concrete – FRP methods – Strengthening of RC members in flexure, shear, confinement using FRP

Text Books

1. Poonam I. Modi and Chirag N. Patel, “Repair and Rehabilitation of concrete structures”, PHI Learning Pvt. Ltd., 2015
2. P.C.Varghese, “Maintenance, Repair & Rehabilitation & Minor Works of Buildings”, PHI Learning Pvt. Ltd., 2014

3. Riadh Al-Mahaidi, Robin Kalfat, “Rehabilitation of Concrete Structures with Fiber-Reinforced Polymer”, Matthew Deans, 2018

Reference Books

1. R.T.L. Allen, S.C. Edwards, and J.D.N. Shaw, “The Repair of Concrete Structures”, Blackie Academic & Professional, 2005
2. Walter F. Silva-Araya. Oladis T. De Rincon and Luis Pumarada O’Neill, “Repair and Rehabiliation of Reinforced Concrete Structures”, ASCE Publications, 1997.
3. Anibal Costa, Joao Miranda Guedes, Humberto Varum, “Structural Rehabilitation of Old buildings”, Springer, 2014
4. V.M. Malhotra,”Repair, Rehabiliation and Maintenance of Concrete Structures, and innovations in design and construction”, American Concrete Institute, 2000
5. Thomas Dyer, “Concrete Durability”, CRC Press, 2014

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2. https://onlinelibrary.wiley.com/doi/abs/10.1002/pse.140
3. https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470015902.a0021403.pub2

COs/POs/PSOs Mapping

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

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

U19CEE88 ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge on the various environmental protection laws and acts in India
- Decide appropriate technologies to quantify the impact.
- Gain knowledge on the various mitigation measures for air, water and land quality
- Understand about the steps in performing socio economic impact assessment
- Gain knowledge about the impacts of economic profile of the community

Course Outcomes

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

CO 1-Understand the concept of Environmental protection laws-**(K2)**
CO 2-Understand about EIA methodologies-**(K2)**
CO 3-Analyze the various mitigation measures- **(K4)**
CO 4-Understand the concept of socio economic impact assessment –**(K2)**
CO 5-Assess the concept about economic profile of the community**-(K3)**

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

UNIT I LAWS AND ACTS (9 Hrs)

Historical perspective of environmental protection laws and acts in India - Definition of EI, EIA, EIS - Industrial policy statement of the Government of India. Legal and Regulatory aspects in India - Types and Limitations of EIA - Minimum National Standards – Bureau of Indian Standards – WHO standards.

UNIT II METHODOLOGIES (9 Hrs)

EIA methodologies – Appropriate Methodologies, Quantification, - Cost benefit analysis - Risk assessment, Test Model format - Preliminary assessment

UNIT III AIR QUALITY IMPACT (9 Hrs)

Background - Typical considerations and factors, air quality impact of industry, transport systems, mitigation methods. Water quality impact: Water quality criteria and standards, Field Surveys waterquality- impacts by developmental projects –Land and soil quality impacts- Soil fertility and remediation. Noise impact: Noise and sound, the effects of noise on people, noise scales and rating methods, estimating transportation noise impact.

UNIT IV ENERGY IMPACT (9 Hrs)

Energy impact considerations, data sources, energy conservation data, EIA of hydro, thermal and nuclear power plants, Vegetation and Wild life impact: Biological concepts and terms, impact on flora and fauna, mitigating measures, alternatives - Types, steps in performing socio economic impact assessment, analysis of public services and facilities, impacts, social impacts

UNIT V SUMMARIZATION OF ENVIRONMENTAL IMPACTS (9 Hrs)

Environmental Management plan, Public involvement - impacts of economic profile of the community, Exchange of information - comparison of alternatives-Training

Text Books

1. Trivedi.P.R, Trivedi, P.R, Environmental Impact Assessment, APH Publishing, 2011.
2. S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye “Environmental Impact Assessment” 2010
3. Larry Canter “Environmental Impact Assessment” McGraw Hill publications.1995
4. Rau Whooten “Environmental Impact Analysis Handbook” McGraw Hill publications. 1980
5. R K Jain “Environmental Impact Analysis – A Decision Making Tool”

Reference Books

1. Canter, L.W (1996) Environmental Impact Assessment, Mc Graw Hill.
2. Petts, J (1999) Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, London.
3. Kuala Lampur(1983) “Environmental assessment of development projects”, United Nations Asia and Pacific Development Centre.
4. John, G. Rau and David C. Wooten (1980), Environmental Impact Analysis Hand Book, McGraw Hill Book Co.
5. Judith Petts “Handbook of Environment Impact Assessment” McGraw Hill publications.

Web References

1. http://environmentclearance.nic.in
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ge22/
3. http://www.gpcet.ac.in/wp-content/uploads/2017/03/

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	2	3	3	3	3	3	3	3	3	3	3	2	2	3
CO2	3	3	2	3	3	3	3	3	3	2	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	2	3	3	2	3	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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

U19CEE89 PRE- STRESSED CONCRETE STRUCTURES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the need for pre-stressing in a structure.
- Explain the methods, types and advantages of pre-stressing to the students..
- Aware of Design of compression and Tension Members
- Understand about methods and analysis of Composite Beams and Continuous Beams.
- Describe the principles of pre tensioned and post tensioned concrete bridge decks.

Course Outcomes

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

CO 1 - Understand the behaviour of pre-stressed concrete members and able to analyze the pre-stressed Concrete beams. **(K2)**

CO 2 - Design the pre-stressed concrete members for flexure and shear as per the relevant design code (IS 1343). **(K3)**

CO 3 - Design compression and tension members**(K3)**

CO 4 - Analyze and design of composite beams and continuous beams. **(K4)**

CO 5 - Choose the right pre-stressed bridge type suitable for construction process**(K5)**

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

UNIT I INTRODUCTION (9 Hrs)

Basic concepts – Advantages and disadvantages - Materials of pre-stressing - Loss in pre-stress - Analysis of sections – Stress concept – Strength concept – Load balancing concept -Deflection of Pre-stressed Concrete members – Beam Deflection (Using C Programming)

UNIT II DESIGN OF SHEAR AND FLEXURAL MEMBERS (9 Hrs)

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams - Design for shear based on I.S. 1343 Code.

UNIT III DESIGN OF COMPRESSION AND TENSION MEMBERS (9 Hrs)

Design of compression members and tension members. Circular pre-stressing - Water tanks - Pipes - Analysis and design - IS Codal provisions.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS (9 Hrs)

Composite beams - Analysis and design. Partial pre-stressing - non-pre-stressed reinforcements. Analysis of Continuous beams - Cable layout - Linear transformation - Concordant cables.

UNIT V PRE-STRESSED CONCRETE BRIDGES (9 Hrs)

General aspects - Pretension pre-stressed bridge decks - Post tensioned pre-stressed bridge decks - Advantages over R.C. bridges

Text Books

1. Krishna Raju N., Pre-stressed concrete, Tata McGraw Hill Company, New Delhi 2012
2. Lin T.Y. and Ned.H.Burns, "Design of pre-stressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013
3. Dr. Y.R.M. Rao, J. P. Annie, P. Easwari, Pre-stressed Concrete Analysis and Design, G S Enterprises,

2017.

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1. Ramaswamy G.S., Modern pre-stressed concrete design, Arnold Heinimen, New Delhi, 2012
2. David A.Sheppard, William R. and Philips, Plant Cast precast and pre-stressed concrete - A design guide, McGraw Hill, New Delhi 2011.
3. Praveen Nagaraja, Pre-stressed Concrete Design, Kindersley India, 2013
4. Dayaratnam.P., "Pre-stressed Concrete Structures", Oxford and IBH, 2013
5. IS1343:1980, Code of Practice for Pre-stressed Concrete, Bureau of Indian Standards, New Delhi, 2012

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1. https://nptel.ac.in/courses/105/106/105106118/
2. https://www.youtube.com/watch?v=PZi50Miapc8
3. https://nptel.ac.in/courses/105/106/105106117

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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

Annexure VII

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

Annexure VIII

DEPARTMENT OF CIVIL ENGINEERING

DETAILS OF EXAMINERS FOR QUESTION PAPER SETTER AND EVALUATORS

Sl. No	Name of the Examiner	Specialization	Year of Experience	Designation, Department and Institution in which currently working	Contact number and mail id
1.	Dr.S.Prakash Chandar	Construction Engineering and Management	11	Assistant Professor, Senior Grade Department of Civil Engineering, SRM Institute of Science and Technology, Chennai	9962042224 prakashs@srmist.edu.in
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17.	Dr. P.T. Ravichandran	Geotechnical Engineering	27	Professor SRM Institute of Science and Technology, Chennai	9840798450 ptrsrm6@gmail.com
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34.	Dr. S.Kandasamy	Concrete Technology	7	Assistant Professor , Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Avadi, Chennai	8190965230 skandasamyisha@gmail.com,
35.	Dr. P.Subashree	Structural Engineering	12.5	Assistant Professor , Hindusthan College of Engineering and Technology, Coimbatore	6379559740 subasri03@gmail.com
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