MOHAMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN

Department of Civil Engineering

Name of the Subject	DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS	Name of the handling Faculty	Mrs S.Hemavathi
Subject Code	CE8501	Year / Sem	III / V
Acad Year	2021- 2022	Batch	2019-2023

Course Objective
To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

Course Outcome
At the end of the course, the students will able to,
1. Understand the various design methodologies for the design of RC elements.
2. Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
3. Design the various types of slabs and staircase by limit state method.
4. Design columns for axial, uniaxial and biaxial eccentric loadings.
5. Design of footing by limit state method.

		Lesson Plan					
Sl. No.	**Topic(s)**	**T / R*** **Book**	**Periods Required**	**Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)**	**Blooms Level (L1-L6)**	**CO**	**PO**
UNIT I - INTRODUCTION							
1	Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations	T1, T2	3	BB, PPT	L1	CO1	PO1
2	Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC	T1, T2	3	BB, PPT	L1	CO1	PO1-PO2
3	Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method	T1, T2	3	BB, PPT	L2	CO2	PO1-PO8
4	Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods	T1, T2	3	BB, PPT	L1	CO1	PO1, PO8
5	Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.	T1, T2	3	BB, PPT	L3	CO1	PO1-PO3
Suggested Activity: Assignment - Types of Load on Structure (Presentation)							
Evaluation method : PPT							
UNIT II - DESIGN OF BEAMS							
6	Analysis and design of singly reinforced rectangular and flanged beams	T1, T2	1	BB, PPT	L3	CO2	PO1-PO3, PO8
7	Analysis and design of doubly reinforced rectangular and flanged beams	T1, T2	2	BB, PPT	L3	CO2	PO1-PO3, PO8
8	Analysis and design of one way slabs subjected to uniformly distributed load for various boundary conditions.	T1, T2	2	BB, PPT	L3	CO2	PO1-PO3

9	Analysis and design of two way subjected to uniformly distributed load for various boundary conditions.	T1, T2	2	BB, PPT	L3	CO2	PO1-PO3
10	Analysis and design of continuous slabs subjected to uniformly distributed load for various boundary conditions.	T1, T2	2	BB, PPT	L3	CO2	PO1-PO3

Suggested Activity: General specification for flexure design of beams (Assignment)

Evaluation method: Paper Based

UNIT III - DESIGN OF SLABS AND STAIRCASE

11	Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams	T1, T2	3	BB, PPT	L2	CO3	PO1-PO2
12	Two way slab	T1, T2	3	BB, PPT	L3	CO3	PO3, PO8
13	Desingn of simply supported and continuous slabs using IS code coefficients	T1, T2	3	BB, PPT	L3	CO3	PO2-PO3
14	Types of Staircases	T1, T2	3	BB, PPT	L3	CO3	PO3, PO8
15	Design of dog-legged Staircase	T1, T2	3	BB, PPT	L3	CO3	PO2-PO3

Suggested Activity: Quiz

Evaluation method : MCQ

UNIT IV - DESIGN OF COLUMNS

15	Types of columns	T1, T2	1	BB, PPT	L1	CO4	PO1
16	Axially Loaded columns	T1, T2	2	BB, PPT	L3	CO4	PO2
17	Design of short Rectangula Square and circular columns	T1, T2	2	BB, PPT	L3	CO4	PO2
18	Design of Slender columns	T1, T2	2	BB, PPT	L3	CO4	PO3,PO8,
19	Design for Uniaxial and Biaxial bending using Column Curves	T1, T2	2	BB, PPT	L3	CO4	PO3, PO8

Suggested Activity: Tutorial -Failure of RC Columns

Evaluation method : BB

UNIT V - DESIGN OF FOOTINGS

20	Concepts of Proportioning footings and foundations based on soil properties	T1, T2	3	BB, PPT	L3	CO5	PO1-PO3, PO8
21	Design of wall footing	T1, T2	4	BB, PPT	L3	CO5	PO2-PO3
22	Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings	T1, T2	4	BB, PPT	L3	CO5	PO3
23	Design of Combined Rectangular footing for two columns only.	T1, T2	4	BB, PPT	L3	CO5	PO3

Suggested Activity: Quiz

Evaluation method: MCQ

Content Beyond the Syllabus Planned

| 1 | Pile footing |
| 2 | Strip footing |

	Text Books
1	Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
2	Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006
3	Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.

	Reference Books
1	Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
2	Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002
3	Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009
4	Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete",Laxmi Publication Pvt. Ltd., New Delhi, 2007
5	Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
6	IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
7	SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999
8	Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013

	Website / URL References
1	https://nptel.ac.in/courses/105/105/105105105/
2	http://www.ce.memphis.edu/4135/PDF/Notes/Chapter1-0%20.pdf

Blooms Level

Level 1 (L1) : Remembering	Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing			Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding			Level 5 (L5) : Evaluating				
Level 3 (L3) : Applying			Level 6 (L6) : Creating				

Mapping syllabus with Bloom's Taxonomy LOT and HOT

Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	METHODS OF DESIGN OF CONCRETE STRUCTURES	3	1	1				5	0	5
Unit 2	LIMIT STATE DESIGN FOR FLEXURE			5				5	0	5
Unit 3	LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION		2	2				4	0	4
Unit 4	LIMIT STATE DESIGN OF COLUMNS	1		4				5	0	5
Unit 5	LIMIT STATE DESIGN OF FOOTING			4				4	0	4
Total		4	3	16				23	0	23
Total Percentage		17.3913	13.043478	69.5652				100	0	100

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3					2					2	2
CO2	3	3	3					2					2	2
CO3	3	2	2					2					2	2
CO4	3	3	3					2					2	2
CO5	3	3	3					2					2	2
Avg	3	2.6	2.8					2					2	2

	Justification for CO-PO mapping
CO1	PO1 : Concept of Elastic method, ultimate load method and limit state method, PO2 : Design of slabs by working stress method PO3 : Analyse and design of beams by working stress method PO8 : Codal Standards for designing beams and slabs, PSO1 : Designing sustainable structural elements, PSO2 : Design cost effective structural components
CO2	PO1 : Concept of singly and doubly reinforced rectangular and flanged beams, PO2 : Design of singly and doubly reinforced rectangular and flanged beams, PO3 : Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions, PO8 :Design standards and specification for designing beam, PSO1 : Designing sustainable structural elements, PSO2 : Design cost effective structural components
CO3	PO1 : Knowledge in bond and Anchorage, PO2 : Problem in behaviour of RC beams in shear and torsion, PO3 : Design of RC members for combined bending shear and torsion, PO8 : Codal Standards for bond and anchorage, PSO1 : Designing sustainable structural elements, PSO2 : Design cost effective structural components
CO4	PO1 : Knowledge on Types of columns, PO2 : Problem of short Rectangular column, PO3 : Design of circular columns for axial, uniaxial and biaxial bending, PO8 : Codal Standards and Specifications for designing columns, PSO1 : Designing sustainable structural elements, PSO2 : Design cost effective structural components
CO5	PO1 : Knowledge in footing, PO2 : Design of rectangular pad and sloped footings, PO3 : Design of combined rectangular footing , PO8 : Codal Standards and Specifications for designing footings,PSO1 : Designing sustainable structural elements, PS02 : Design cost effective structural components

3	High level	2	Moderate level	1	Low level

Name & Sign of Faculty Incharge :	
Name & Sign of Subject Expert :	
Head of the Department :	

Format No :231