

Branch Name:	CIVIL ENGINEERING
Program Code:	ET106
Course Title:	Design of Reinforced Concrete Structure
Course Code:	2ET1060601T
Pre-requisite Course:	Mechanics of Solids, Structural Analysis-I,II

Course Objective:

CO-1: This subject is applications of structural engineering principles to design basic structural elements using of reinforced concrete as materials.

CO-2: This subject is specifically aim to develop understanding of various design philosophy, Indian Codal provisions, design basis used in design of basic elements of framed structures and its detailing requirement.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	3	1	-	4	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction: Objectives, Properties of Reinforced Concrete and Structural Steel, Loads & load combinations, Methods of Analysis, Codes & specifications, Design Philosophies - Working stress Method, Ultimate Load Method, Limit State Method, Plastic Method.	03	10
2	Limit state design of RC elements: (A) Philosophy of Limit state design: Limit state of collapse & serviceability, partial safety factors for material & loading. Limit State of Flexure: Stress-strain characteristics of concrete & reinforcing steel, Type of section-under reinforced, over reinforced & balance section, Neutral Axis depth, Moment of Resistance for singly reinforced, doubly reinforced and flanged sections. Limit State of Shear and Torsion, combined flexure & torsion, Bond & Anchorage, Development length, splicing	03	10
3	(B) Design of Beams: Simply supported, cantilever and continuous beams	10	20

4	(C) Design of Slab: One way, two way simply supported and continuous slabs	10	20
5	(D) Design of Column: Classifications, Assumptions, Design of Short Columns under axial load.	10	20
6	(E) Design of Foundations: Design of isolated footing under axial load and uni-axial bending, combined footing	06	20

Term-Work:

The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial (minimum 30 problems). Practical examinations shall consist of oral based on term work and above course. The students have to draw at least five structural components (RCC) with proper details in sketch book/A3 size sheet.

Course Outcome:

After learning the course, the students should be able to:

1. Understand various design philosophy to be used in the design of structural elements.
2. Design basic structural elements like slab, beams, columns and foundation etc. using concrete as materials
3. Design basic structural elements slab, beams, columns and foundation etc. using limit state approach.

Reference Books :

1. Shah & Karve; Limit State Theory & Design of Reinforced Concrete; Structure Pub., Pune. 2017.
2. Dr. H.J. Shah; Reinforced concrete Vol-I; Charotar Pub. Anand. 2017.
3. A.K.Jain; Design of Concrete Structures, Nemchand Publication. 2012.
4. IS: 456 - Code of practice for plain and reinforced concrete
5. IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards
6. IS: 1893 - Criteria for earthquake resistant design of structures
7. IS: 13920 -Code of Practice for ductile detailing of RC structure subjected to seismic force.

E-Resources (If any):

<http://www.nptel.iitm.ac.in/>

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand various design philosophy to be used in the design of structural elements.	L-1, L-2
CLO2	Design basic structural elements like slab, beams, columns and foundation etc.using concrete as materials.	L-4, L-5
CLO3	Design basic structural elements slab, beams, columns and foundation etc. using limit state approach.	L-4, L-5

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with Pos & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M	M						M				M	M		M
CLO2	M	M	H	M	M	M					H	M	M	M	M
CLO3	M	M	H	M	M	M					H	M	M	M	M

H:High, M:Medium, L:Low