

GUJARAT TECHNOLOGICAL UNIVERSITY
BRANCH NAME: B.ARCH.
SUBJECT CODE: 2X45003
SUBJECT NAME: STRUCTURE - III
2nd Year, 4th SEMESTER

Type of course: B.Arch.

Prerequisite: Structure – I, & II

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

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	1	0	3	50	50	0	0	100

Content:

Sr. No.	Topics	Teaching Hrs.	Weightage %
1	Moment Distribution Method: Analysis of two span continuous beams and Single non sway Portal frame.	03	10
2	Introduction to RCC Design: Concept of RCC, Assumptions and Characteristics of RCC, Limit state of collapse & Serviceability: Safety factors for Material & Loading, Limit State of Flexure: Stress-Strain characteristics of Concrete & Reinforcing steel, Limit State of Shear and Torsion: Combined Flexure & Torsion, Bond & Anchorage, Development length, Lap length.	04	15
3	Design of Beams: Theory and Concept of different type of sections: Under reinforced, Over reinforced & Balance section, Neutral Axis depth, Moment of Resistance for singly reinforced and doubly reinforced beam. Design of singly and doubly reinforced beams.	05	20
4	Design of Slab: Types of Slab, loading transfer behaviors, Design of Simply supported One-Way and Two-Way Slab, Design of One way and Two-Way continuous slab.	05	20
5	Design of Column: Definition, Classifications of column, Assumptions, Design of Short columns considering only axial load.	03	10
6	Design of Footing: Definition, Types of footings based on structural requirements, Design of Isolated footing Considering only Axial load.	03	10
7	Design of Staircase: Introduction, Concepts of different types of staircases based on structural	03	10

	behaviors, Calculation of trade and riser, Design of waist slab type staircase.		
8	Earthquake Basics: Interior of Earth, plate tectonics, faults, consequences of earthquake, Basic parameters of earthquake, magnitude & intensity, scales, Seismic zones of India, damages caused during past earthquakes (worldwide).	02	05

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	30	20	10	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books/ Indian Standards:

1. Junarkar S. B. & Shah H. J.; Charotar publishing house.
2. Wang C. K; Tata McGraw Hill book Company.
3. Shah & Karve; Limit State Theory & Design of Reinforced Concrete; Structure Pub., Pune
4. Dr. H. J. Shah; Reinforced concrete Vol-I; Charotar Pub. Anand.
5. IS: 456 - Code of practice for plain and reinforced concrete.
6. IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards.
7. IS: 1893 - Criteria for earthquake resistant design of structures.
8. IS: 13920 -Code of Practice for ductile detailing of RC structure subjected to seismic force.
9. EQ Tips; IIT Kanpur & BM &TPC New Delhi.

Course Outcome:

Sr.No	CO Statement	Marks % Weightage
Upon completion of this course, the students should be able to:		
1	Analyse continuous beam and non-sway single bay single story frames using Moment Distribution Method.	10
2	Select various design philosophies to plan, to draw structural layout and to understand analytical approach to be used in the design of structural elements.	10
3	Evaluate the loading conditions and to calculate loads as per IS Specifications.	15
4	Identify IS code provisions for the design of basic structural members.	30
5	Propose design of basic structural elements like slab, beams, columns, staircase and foundation etc. using concrete as materials.	35

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). The students have to draw at least five structural components (RCC) with proper details in sketch book/A3 size sheet.

List of Tutorials:

1. Prepare model showing reinforcement detail of singly reinforced, doubly reinforced simply supported and continuous beams.

2. Prepare model showing reinforcement detail of one way and two-way slabs with various end conditions.
3. Prepare model for detailing of beam column junction and column-footing junction.
4. Prepare model for detailing of Stair case.