



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION

Programme	Civil Engineering	Semester	Fourth Semester
Course Code	20CE44P	Type of Course	Programme Core
Course Name	Design and Detailing RCC Structures	Contact Hours	8 hours/week 104 hours/semester
Teaching Scheme	L:T:P :: 3:1:4	Credits	6
CIE Marks	60	SEE Marks	40

1. Rationale: This course is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RCC Construction and fabrication. Students may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per IS: 456.

2. Course Outcomes/Skill Sets: At the end of the semester student will be able to,

CO-01	Identify the various structural RCC elements of a building for a given construction project. Explain the concept of Limit state design of Reinforced Cement Concrete (RCC).
CO-02	Explain the difference between the structural behaviour of different reinforced concrete structural elements through demonstration experiments and data analysis.
CO-03	Design, draft and detail different elements of reinforced concrete structural systems subjected to gravity, dead and live loads as per IS codes.
CO-04	Prepare bar bending schedules for different structural elements of buildings as per structural detailed drawing.
CO-05	Fabricate reinforcement for structural elements as per detailed drawing and Barbending schedule.

NOTE: Detailing and drafting shall be done in AUTOCAD.

Barbending Schedule and Material calculation shall be done in a spreadsheet.

Prototypes shall be created at the end of each week by each student

Tools used during fabrication of steel shall be taught and safety protocol shall be followed in site/field.

3. Course Content

We ek	CO	PO	Lecture (Performance Criteria)		Tutorial (Activity Criteria)	Practice
			3 hours/week			
1	1	1	1	Introduction: Concept of reinforced cement concrete structures, Different grades of concrete and steel used in RCC. Load and loading standards as per IS: 875.	1. Study different codal provisions	1 & 2 Demonstrate concept of density, Load and Loading standards for materials
			2	Design Based on Limit State Method: -Fundamentals of Limit State Method, types of limit state.		
			3	Introduction to stress block parameters, Assumptions in the theory of simple bending for RCC beams, Neutral Axis, Moment of resistance.		
2	1	1	1	Critical neutral axis, actual neutral axis. Concept of under reinforced, balanced and over-reinforced sections.	1. Study the Codal provisions for development Length of bars, Side face reinforcement, Nominal Cover to reinforcement.	1 & 2: Demonstrate Failure modes of RCC structural elements with Videos and Photos.
			2	Concept of balanced, under reinforced and over-reinforced sections.		
			3	Partial safety factors, Flexural strength, Shear Strength, Concept of Deflection and cracking, Design requirements.		
3	2, 3,4	2,3	1	Beams: Design Concept of Simply supported and cantilever singly reinforced Beams as per IS 456-2000.	1. Prepare Barbending schedule for singly reinforced simply supported	1 & 2: Detailing and Drafting of Singly Reinforced simply supported beam as per codal provisions.

			2 & 3	Analysis and design of Singly reinforced simply supported beam.	beam using spreadsheet.	
4	2, 3,4	2,3	1	Continuation	1. Prepare Bar bending schedule for singly reinforced cantilever beam using spreadsheet	1 & 2: Detailing and Drafting of Singly Reinforced cantilever beam as per codal provisions
			2 & 3	Analysis and design of singly reinforced cantilever beam		
5	2, 3,4	2,3	1	Beams: Design Concept of Doubly reinforced Simply supported and cantilever Beams as per IS 456-2000	1.Prepare Bar bending schedule for Doubly Reinforced simply supported beam 2.Prepare Bar bending schedule for Doubly Reinforced cantilever beam	1. Detailing and Drafting Doubly Reinforced simply supported beam as per codal provisions. 2. Detailing and Drafting of Doubly Reinforced cantilever beam, as per codal provisions.
			2	Analysis & Design of Doubly reinforced simply supported beam		
			3	Analysis & Design of Doubly reinforced cantilever beam		
6	2, 3,4	2,3	1	Design Concept of RCC One way slab.	1.Prepare Bar bending schedule for one way slab 2.Prepare a report on the design of economic section by optimization of materials.	1 & 2: Detailing and drafting of one-way slab as per codal provisions.
			2	Analysis of one-way slab.		
			3	Design of one-way slab.		
7	2, 3,4	2,3	1	Design concept of RCC two-way Slab	1.Prepare Bar bending schedule for two-way slab	1: Detailing and drafting of two-way slab as per codal provisions- Corners are not held down 2: Detailing and drafting of two-way slab as per codal provisions- Corners are held down
			2	(iii) Design of Two-way slab: a) Corners are not held down: All the Four edges discontinuous case only.		

			3	(iii) Design of Two-way slab: b) Corners are held down: All the Four edges discontinuous case only.		
8	2,3,4	2,3	1	Design Concept of One-way continuous slab (Two span only) using moment coefficient as per IS: 456.	1.Prepare Bar bending schedule for one-way continuous slab	1. Detailing and Drafting of one-way Continuous slab, as per codal provisions
			2	Design of Two-way continuous slab: All the Four edges continuous case only.	2.Prepare Bar bending schedule for two-way continuous slab	2. Detailing and Drafting of two-way Continuous slab as per codal provisions
			3			
9	2,3,4	2,3	1	Columns: Concept of long and short columns, Specifications for main and lateral reinforcement, interaction diagram in column design, Behaviour of RCC column under axial load.	1.Prepare Bar bending schedule for column (Square and rectangle)	Detailing and Drafting of Axially loaded short columns (square and rectangular as per IS specifications),
			2	Analysis and Design of Axially loaded column		Detailing and drafting of column subjected to uniaxial bending (square and rectangular as per IS specifications)
			3	Design of column subjected to uniaxial bending for reinforcement distributed equally on TWO sides only using SP-16 chart (Square and Rectangular).		
10	2,3,4	2,3	1	Design of Column Footings: Concept of column footing, Design criteria for square, rectangular isolated column footings,	1.Prepare Bar bending schedule for isolated column footing (Square and rectangular)	Detailing and drafting of isolated column footing (square and rectangular) as per IS specification
			2	Design of square, rectangular isolated column footings,		
			3	Continuation		
11	2,3,4	2,3	1	Design of Stairs: Introduction to stairs, Design of dog-legged stairs as per codal provisions.	1.Prepare Bar bending schedule for Stairs.	1.Detailing and Drafting of dog legged stair (with

						waist slab) as per codal provisions
			2	Single flight stairs-Waist slab		2.Detailing and Drafting of Folded/chain stair as per codal provisions.
			3	Design of Folded/Chain link stairs.		
12	2, 3,4	2,3	1	Design of Lintel with chejja: Introduction to lintel with chejja	1.Prepare Bar bending schedule for lintel with chejja	Detailing and drafting of lintel with chejja as per codal provisions
			2	Design of lintel with chejja		
			3	Continuation		
13	5	4	1	Field Practice on bar fabrication for Beam, slab, column, column footing, lintel with chejja and field/site visit		
			2			
			3			
Total in hours				39	13	52

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty

4. CIE and SEE Assessment Methodologies

Sl. No	Assessment	Test Week	Duration In minutes	Max marks	Conversion
1.	CIE-1 Written Test	5	80	30	Average of three tests 30
2.	CIE-2 Written Test	9	80	30	
3	CIE-3 Written Test	13	80	30	
4.	CIE-4 Skill Test-Practice	6	180	100	Average of two skill test reduced to 20
5	CIE-5 Skill Test-Practice	12	180	100	

6	CIE-6 Portfolio continuous evaluation of Tutorial sessions through Rubrics	1-13		10	10
Total CIE Marks					60
Semester End Examination (Practice)			180	100	40
Total Marks					100

5. Format for CIE written Test

Course Name	Design and Detailing RC Structures	Test	I/II/III	Sem	III/IV
Course Code	20CE44P	Duration	80 Min	Marks	30
Note: Answer any one full question from each section. Each full question carries 10 marks.					
Section	Assessment Questions		Cognitive Levels	Course Outcome	Marks
I	1				
	2				
II	3				
	4				
III	5				
	6				
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, Cognitive level and course outcomes.					

6. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
Average Marks= (8+6+2+2)/4=4.5							5

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

7. Reference:

Sl. No.	Description
1	Design of Reinforced Concrete Structures by S Ramamrutham& R Narayan
2	Reinforced Concrete Structures by B C Punmia
3	SP-16 Design aid for IS 456-2000, SP-23 Handbook on concrete mixes
4	BIS, IS 456 – 2000 Code of Practice for Plain & Reinforced Concrete

8. a. CIE Skill Test 1- Scheme of Evaluation

SL. No.	Particulars/Dimension	Marks
1	Portfolio evaluation for practice sessions -Performance criteria (Observations and report)	10
2	Simply supported/Cantilever -Singly/Doubly reinforced beam /One way slab. a. Design of given structural element as per codal provision-30 marks b. Detailing and drafting of designed structural Element-30 Marks c. Bar bending Schedule for given structural element using spreadsheet- 20 Marks	80
3	Viva-Voce	10
Total Marks		100

8. b. CIE Skill Test 2 - Scheme of Evaluation

SL. No.	Particulars/Dimension	Marks
1	Portfolio evaluation for practice sessions -Performance criteria (Observations and report)	10

2	Two-way slab/Column with Footing/Staircase a. Design of given structural element as per codal provision -30 marks b. Detailing and drafting of designed structural Element-30 Marks c. Bar bending Schedule for given structural element using spreadsheet - 20 Marks	80
3	Viva-Voce	10
Total Marks		100

8. c. SEE- Scheme of Evaluation

SL. No.	Particulars/Dimension	Marks
1	Simply supported/Cantilever -Singly/Doubly reinforced beam /One way slab/Two-way slab/Column with Footing/Staircase/Lintel with Chejja a. Detailing and drafting of structural Element as per the given design data and codal provision-30 Marks b. Bar bending Schedule for given structural element using spreadsheet - 20 Marks c. Fabrication of steel as per Detailing- 30 Marks	80
2	Viva-Voce	20
Total Marks		100

9. Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
1	Computer with AutoCAD software	8 GB RAM, 512GB HARD DRIVE, i5 and above 2.5 GHz PROCESSOR	1/ student
2	Bar Bending tools		1 set / batch