23CE3501: DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

(SYLLABUS)

Course Code	20CE3501	Year	III	Semester	I
Course Category	Professional Core	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	A. Engineering Mechanics B. Strength of Materials
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks:	100

Course Objectives:

The objective of this course is:

1. Familiarize Students with different types of design philosophies.
2. Equip student with concepts of design of flexural members.
3. Understand Concepts of shear, bond and torsion.
4. Familiarize students with different types of compressions members and Design, Understand different types of footings and their design.
5. Familiarize students with different types of slabs and waist slab staircase

Course Outcomes:

Course will enable the student to:

CO	Statement	Blooms level
CO 1	Understand the fundamental concepts and design philosophies of reinforced concrete structures.	L2
CO 2	Apply Limit State Design principles for flexural, shear, torsion, and serviceability requirements in beams and slabs.	L3
CO 3	Analyze and design reinforced concrete structural elements like beams, slabs, and columns using IS Code provisions.	L5
CO 4	Design structural elements to ensure safety, stability, and serviceability under different loading conditions.	L6
CO 5	Interpret and apply IS codal provisions to design isolated footings and structural elements subjected to combined actions.	L4

Course Articulation Matrix:

CO\PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	1	–-	–	2	–	–	–	2	2	2
CO2	2	3	3	2	-	–	3	–	–	–	2	3	3
CO3	3	3	3	2	-	–	3	–	–	–	2	3	3
CO4	2	3	3	2	-	–	3	–	–	–	2	3	3
CO5	2	3	3	2	-	–	3	–	–	–	2	3	2

Syllabus

Unit No	Content	Mapped COs
I	**Introduction:** Working stress method, Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly reinforced beams. **Limit State Design**: Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.	**CO1, CO4**
II	**Design for Flexure:** Limit state analysis and design of singly reinforced rectangular sections- effective depth- Moment of Resistance- Doubly reinforced rectangular beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- **Design of Flanged Sections (T)-** Effective width of flange –Behavior- Analysis and Design.	**CO1, CO2, CO3, CO4**
III	**Design for Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion for L Beam – Introduction to concept of bond, anchorage and development length, I.S. code provisions. **Limit state design for serviceability:** Introduction to Deflection, cracking and code provision.	**CO2, CO3, CO4**
IV	**Design of Compression members**: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending – I S Code provisions. **Footings:** Different types of footings – Design of isolated footings, square footings – Rectangular footings – circular footing - subjected to axial loads.	**CO3, CO4, CO5**
V	**Slabs:** Classification of slabs, design of one - way slabs, two - way slabs, IS Codal Provisions, design of waist-slab staircase.	**CO2, CO3, CO5**

NOTE: All the designs to be taught in Limit State Method. Drawing classes must be conducted every week and the Following plates should be prepared by the students.

- Reinforcement detailing of T-beams, L-beams.
- Reinforcement detailing of columns and isolated footings.
- Detailing of one-way, two-way slabs and waist-slab staircase.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weight-age for Part – A is 40% and Part- B is 60%.

Learning Resource(s)
Text Book(s)
1. 'Limit State Design' by A. K. Jain 2. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai &Devdas MenonTata Mc.Graw Hill, New Delhi.
Reference Book(s)
1. 'Design of concrete structures' by N. Krishna Raju. 2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons
IS Codes:
1. IS -456-2000 (Permitted to use in examination hall) 2. IS – 875 3. SP-16
Web Materials:
1. https://nptel.ac.in/courses/105105105