B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

18CV53	Course Code	DESIGN OF RC STRUCTURAL ELEMENTS	Course Title	V	Semester
4	Credits	3 – 1 – 0 - 4	L – T – P-TL*	50 Hours	Teaching Period
100 Marks	Total	60 Marks	SEE*	40 Marks	CIE*
*NOTE: L – Lecture; **T** – Tutorial; **P** – Practical; **TL** – Total; **CIE** – Continuous Internal Evaluation; **SEE** – Semester End Examination					

Course Learning Objectives:	Teaching Hours
This course will enable students to; 1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading. 2. Follow a procedural knowledge in designing various structural RC elements. 3. Impart the culture of following the codes for strength, serviceability and durability as an ethics. 4. Provide knowledge in analysis and design of RC elements for the success in competitive examinations.	
Module-1 **Introduction to Limit State Design and Serviceability**: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.	**10Hours**
Module-2 **Limit State Analysis of Beams**: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear.	**10Hours**

Module-3 **Limit State Design of Beams**: Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456.	**10Hours**
Module-4 **Limit State Design of Slabs and Stairs:** Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.	**10Hours**
Module-5 **Limit State Deign of Columns and Footings**: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment.	**10Hours**

Course outcomes:

After a successful completion of the course, the student will be able to:

- understand the design philosophy and principles
- solve engineering problems of RC elements subjected to flexure, shear and torsion
- demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns   and footings
- owns professional and ethical responsibility

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 20 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- The designs are as per IS-456 and SP (16) relevant charts to be provided in the question paper

Textbooks:

1. Unnikrishnan Pillai and Devdas Menon, " Reinforced Concrete Design" , McGraw Hill, New Delhi
2. Subramanian, " Design of Concrete Structures" , Oxford university Press
3. H J Shah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)" , Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publisher s
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons,   Inc.