**19CE2202 - DESIGN OF REINFORCED CONCRETE STRUCTURES**

**(Civil Engineering)**

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| **Course Category** | Professional Core | **Credits** | 3 |
| **Course Type** | Theory | **Lecture – Tutorial –Practical** | 2-1-0 |
| **Prerequisite** | Strength of Materials | **Sessional Evaluation**  | 40 |
| **Semester End Exam. Evaluation** | 60 |
| **Total Marks** | 100 |

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| **Course Objectives** | 1. To understand the basic principles of IS: 456-2000 in design of reinforced concrete elements.
2. To design the reinforced concrete beams and slabs subjected to flexure, shear, torsion and bond.
3. To design the reinforced concrete compression members under axial load and moment.
4. To design different types of isolated footings.
5. To understand the serviceability conditions of reinforced concrete flexural members.
6. To gain in-depth knowledge of staircases and able to design the dog-legged staircase.
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| **Course Outcomes** | CO1 | Understand the design principles of reinforced concrete members. |
| CO2 | Design singly and doubly reinforced rectangular and flanged beams for flexure, shear, torsion and bond. |
| CO3 | Carry out design and detailing of different types of slabs. |
| CO4 | Carry out design and detailing of columns for various loading conditions. |
| CO5 | Carry out design and detailing of different types of footings under axial load. |
| CO6 | Analyze reinforced concrete members for serviceability conditions. |
| **IMP: *At the end of the course work, complete analysis and design of a RC building must be explained using an appropriate software. This should be followed by an exercise.*** |
| **Course Content** | **UNIT – I****DESIGN PRINCIPLES:** Basic design principles – Stress Strain curves of concrete and steel – Characteristic strengths and loads – Partial safety factors – Stress block – Various limit states.**DESIGN FOR FLEXURE:** Limit state of collapse in flexure – Ultimate flexural strength – Balanced, under and over – Reinforced sections – Design of singly and doubly reinforced rectangular beams – Design of flanged beams.**UNIT – II****DESIGN FOR SHEAR, TORSION AND BOND**: Shear – Truss analogy – Design of beams for shear and torsion – Anchorage and development length.**UNIT – III****DESIGN OF SLABS AND BEAMS:**Design of one way and two way slabs- Design of continuous beams and slabs.**UNIT – IV****DESIGN OF COMPRESSION MEMBERS:** Columns – Reduction factors – Axially loaded, eccentrically loaded columns – Uni-axial moment – Biaxial moment (Biaxial moment for practice only and not for university examination).**UNIT – V****DESIGN OF FOUNDATIONS:** Types of footings– Design of isolated (Square, Rectangular and Circular) footings subjected to axial load.**UNIT – VI****DESIGN OF STAIR CASE:** Types of staircase – Specifications – Design of doglegged stair case.**LIMIT STATES OF SERVICEABILITY:** Deflection (short and long term) – Cracking. |
| **Textbooks****and Reference books** | **TEXTBOOKS:**1. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *RCC Designs (Reinforced Concrete structures)*, Laxmi Publications,10thedition, 2019.
2. N. Krishna Raju, R. N. Pranesh, [*Reinforced Concrete Design: IS: 456-2000 Principles and Practice*](http://www.newagepublishers.com/servlet/nagetbiblio?bno=000673),New Age International (P) Ltd. Publishers, 1stedition, 2018.
3. Unni Krishna Pillai,DevdasMenon,*Reinforced Concrete Design*, Tata McGraw-Hill Educational Private Ltd., 3rdedition, 2017.

**REFERENCE BOOKS**:1. S. N. Sinha, *Reinforced Concrete Design,* Tata McGraw-Hill Educational Private Ltd., 3rdedition, 2017.
2. Dr. Ramchandra,*Reinforced Concrete Structures (Limit State Design)*, Rajsons Publications Pvt. Ltd, 3rdedition, 2014.
3. S. R. Karve& V. L. Shah, *Limit State Theory and Design of Reinforced Concrete*, Structures Publications, 8thedition, 2014.
4. Plain and Reinforced Concrete – Code of practice (IS: 456-2000).
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**CO-PO Mapping:**3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|   | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **h** | **i** | **j** | **k** | **l** |
| **CO1** | 3 | 3 | 3 | 2 | 2 | - | - | 2 | - | - | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | 1 | 2 | - | - | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | 1 | 2 | - | - | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | 1 | 2 | - | - | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | 1 | 2 | - | - | 3 | 3 |
| **CO6** | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | - | - | 2 | 3 |