**20CE3101- ELEMENTAL DEISGN OF RC 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 Outcomes** | CO1 | Understand the design principles of reinforced concrete members and design singly reinforced, doubly reinforced and flanged beams for flexure. |
| CO2 | Design RC beams for shear, torsion and bond. |
| CO3 | Carry out design and detailing of different types of slabs and continuous beams. |
| CO4 | Carry out design and detailing of stair case and columns for various loading conditions. |
| CO5 | Carry out design and detailing of different types of isolated footings under axial load and Analyze reinforced concrete members for serviceability conditions. |
| CO6 | Analyze slabs using yield line theory. |
| **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.**DESIGN OF STAIRCASE:** Types of staircase – Specifications – Design of doglegged stair case.**UNIT – V****DESIGN OF FOUNDATIONS:** Types of footings– Design of isolated (Square, Rectangular and Circular) footings subjected to axial load.**LIMIT STATES OF SERVICEABILITY:** Deflection (short and long term) – Cracking.**UNIT – VI****YIELD LINE THEORY:**Introduction – Behavior of slab up to failure – Assumptions – Guidelines for predicting yield line pattern – Yield criterion – Methods of analysis and basic principles – Virtual work – Equilibrium method – Corner levers – Circular slabs. |
| **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 and 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.
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IMP: *At the end of the course work, complete analysis and design of a RC building must be explained to the students using appropriate software. This should be followed by an exercise.*

**CO-PO Mapping:**3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|   | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | 1 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | - | 1 |
| **CO2** | 3 | 1 | 3 | 2 | 2 | 2 | - | 1 | - | - | - | 2 | 2 | - | 1 |
| **CO3** | 3 | 2 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | 3 | 2 | - | 1 |
| **CO4** | 3 | 1 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | 3 | 2 | - | 1 |
| **CO5** | 3 | 1 | 3 | 1 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | - | 1 |
| **CO6** | 3 | 1 | 2 | 1 | 1 | 2 | - | 3 | - | - | - | 2 | 1 | - | 1 |