**20CE32E4 –ADVANCED REINFORCED CONCRETE DESIGN**

**(Civil Engineering)**

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| **Course Category**  | Professional Elective | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 3-0-0 |
| **Prerequisite** | Elemental design of Reinforced Concrete Structures  | **Sessional Evaluation**  | 40 |
| **Semester End Exam Evaluation** | 60 |
| **Total Marks** | 100 |

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| **Course Outcomes** | CO1 | Design combined rectangular footings, raft foundation and pile foundation. |
| CO2 | Design cantilever and counterfort retaining walls for different loadings. |
| CO3 | Design bunkers and silos |
| CO4 | Design liquid retaining structures resting on ground |
| CO5 | Designelevated liquid retaining structures. |
| CO6 | Analyze pre-stressedrectangular sections for losses and stresses. |
| **Course Content** | **UNIT – I****DESIGN OF FOUNDATIONS:** Design of combined rectangular footings– Design of raft foundation with continuous slab – Design of pile foundation.**UNIT – II****DESIGN OF RETAINING WALLS:** Design of cantilever retaining walls with horizontal backfill and sloping back fill – Design of counter fort retaining walls.**UNIT – III****BUNKERS AND SILOS:** Bunkers–Design of square bunkers– Design of circular Bunkers– Design of silos.**UNIT – IV****DESIGN OF WATER TANKS RESTING ON GROUND:** Review of working stress design method – joints in water tanks– IS code method of design of circular tank with flexible joint between floor and wall–Approximate design of circular tank with restrained base –Approximate design of rectangular water tanks resting on ground. **UNIT – V****DESIGN OF ELEVATED WATER TANKS:** Nature of stresses in spherical and conical domes – Design of RC domes – Design of Intze tanks.**UNIT – VI****PRESTRESSED CONCRETE:** Principles of prestressing – Materials used – Methods and Systems of prestressing– Analysis of rectangular sections for stresses – Losses of prestress. |
| **Textbooks****and****References** | **TEXTBOOKS:**1. Dr. B. C. Punmia, Ashok Kumar Jain &Arun Kumar Jain,  *RCC DESIGNS (Reinforced Concrete Structures),* Laxmi Publications, 11th edition, 2022.
2. S. Ramamrutham, *Design of Reinforced Concrete Structures*, DhanpatRai Publishing Company (P) Ltd., 1st edition, 2016.
3. N. Krishna Raju, *Pre-stressed Concrete*, McGraw Hill Education, 6thedition, 2018.

**REFERENCE BOOKS:**1. S. R. Karve & V. L. Shah., *Limit State Theory and Design of Reinforced Concrete*, Structures publications, 7th edition, 2015.
2. C.K Wang, C.G. and J.A. Pincheira, *Reinforced Concrete Design*, Oxford university press, 8th edition, 2017.
3. N. Subramanian, *Design of Reinforced Concrete Structures*, Oxford university press, Illustrated edition, 2013.
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**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 | 2 | - | 1 | 1 | - | 1 | - | - | 1 | 2 | - | 1 | - |
| **CO2** | 3 | 1 | 2 | - | 1 | 1 | - | 1 | - | - | 1 | 1 | - | 1 | - |
| **CO3** | 3 | 1 | 2 | - | 1 | 1 | - | 1 | - | - | 1 | 1 | - | 1 | - |
| **CO4** | 3 | 1 | 2 | - | 2 | 1 | - | 1 | - | - | 1 | 2 | - | 1 | - |
| **CO5** | 3 | 1 | 2 | - | 2 | 2 | - | 1 | - | - | 1 | 2 | - | 1 | - |
| **CO6** | 3 | 1 | 1 | - | 1 | 1 | - | 1 | - | - | 1 | 3 | - | 1 | 1 |