Marwadi University

Master of Technology

Structural Engineering

Advanced Concrete Design
01ST2101 (PCC)

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are:

- Impart the fundamental knowledge and skill pertaining to designing the Reinforced concrete special structures such as silos, flat slabs, grid floors, deep beams, liquid retaining and storage structures.
- Imbibe the design steps according to relevant Indian standard code of practice for design of the various structures.

Credit Earned: 4

Students learning outcomes:

After successful completion of the course, it is expected that student will be able to

1. Check and ensure the serviceability criteria for reinforced concrete structural elements.
2. Design various RC structural elements using Limit State method (LSM).
3. Design water retaining and storage structures using IS codal provisions.
4. Prepare structural detailing of various RC structural members as per IS Code provisions.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (I)	IA (M)	Viva (V)	Term Work (TW)	
04	00	00	04	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	**Introduction** **Basic Concept of Design** Materials Properties, Design Philosophy of Reinforced Concrete Design, Partial Safety Factors & Loads and Load Combinations.	**04**

	Serviceability Criteria for Design of RC Members Serviceability Limit States-Short & Long-Term Deflections due to Shrinkage and Creep; Serviceability Limit States of Cracking-Cracking Width Calculations.	
2	**Design of Column, Shear Wall, Deep Beams & Corbels** Design of Column with Biaxial Moments, Design of Slender Columns. Shear wall Design, using compression theory design for shear, torsional design. Introduction & IS Code Provisions for Design of Deep Beams, Procedure of Designing Deep Beams, Design as per IS 456, Checking for Local Failures, Detailing of Deep Beams. Design of Corbels.	**16**
3	**Design of Flat Slab, Grid Floors & Foundations** Analysis & Design of Flat Slab Using Direct Design Method Concept of Flat Slab & Behavior, IS Code Provisions for Design of Flat Slab, Distribution of Moments in Column & Middle Strips; Distribution of Moments & Shears from Flat Slabs to Columns, Design of Slabs using Direct Design Method & Check for Shear Failure, Detailing of Flat slab, Limitations of Direct Design Method. Analysis & Design of Grid Floors Concept & IS Code Provisions of Grid Floors, Different Techniques for Design of Grid Floors, Design of Grid Floor by IS code Method, Rankine Grashoff Method & Equivalent Plate Theory. Analysis & Design of Foundations Basics of Foundation Design, IS Code Provisions, Types & Suitability of Different Types of Foundations, Design of Eccentric Isolated Column Footing, Design of Combined Footing, Design of Strap & Strip Footing, Design of Raft Foundations, Design of Pile Cap.	**20**
4	**Design of Water Retaining & Storage Structures** Types of Water Retaining & Storage Structures, IS Code Provisions, Design of Intze Type Shaft Supported Water Tanks, Design of Storage Structures like Bunker & Silo.	**12**

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Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	20%	25%	25%	20%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:

Reference Book:

1. Krishna Raju N., Advanced Design of Concrete Structures –Tata Mc-Graw Hill, Delhi.
2. Sinha S. N., Reinforced Concrete Design –Tata Mc-Graw Hill, Delhi.
3. Jain A. K., Limit State Design of Reinforced Concrete –Nemchand & Bros., Roorkee.
4. Subramanian N., Design of Reinforced Concrete Structures-2013, Oxford University Press, New Delhi.
5. Varghese A. V., Advanced Reinforced Concrete, Prentice Hall of India.
6. Shah H. J., Reinforced concrete, Vol - I and II –Charotar Pub., Anand.
7. Shah and Karve, Design of Multi-storied Building (G+3) - Structure Pub., Pune.
8. Pillai S. U. and MenonD., Reinforced Concrete Design, Tata McGraw-Hill, 3rd Ed, 1999.
9. Park R. and PaulayT., Reinforced Concrete Structures, John Wiley & Sons, 1995.
10. Varghese P. C., Advanced Reinforced Concrete Design, Prentice Hall of India, New Delhi.
11. Hsu T. T. C. and Mo Y. L., Unified Theory of Concrete Structures, John Wiley & Sons, 2010.
12. IS Codes: IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16, SP:34.

Web Resources

Design of Reinforced Concrete Structures NPTEL Course (Video):

https://nptel.ac.in/courses/105/105/105105105/

Design of Concrete Structures NPTEL Course (Web):

https://nptel.ac.in/courses/105/105/105105104/

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