FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF

CIVIL ENGINEERING

Marwadi University Marwadi Chandarana Group NAAC A+

Design of Concrete Structures

01CI1701

Objective of the Course:

- Develop a comprehensive understanding of the different types of loads acting on structures and the corresponding calculation methods.
- Acquire proficiency in the analysis and design of various structural components of reinforced concrete structures for multistorey buildings in accordance with Indian Standard code provisions.
- Apply fundamental concepts and design principles of reinforced concrete to effectively design structures such as retaining walls and flat slabs, incorporating considerations for stability, load distribution, and durability.
- Utilize fundamental concepts and design philosophy to conduct comprehensive analysis and design of water retaining structures by relevant standards and guidelines.

Credit Earned: 04

Prerequisite: Structural Analysis, Elementary Design of Structures.

Student's learning outcomes:

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

1. Calculate various types of loads acting on reinforced concrete structures based on Indian Standard codes.
2. Apply Indian Standard code provisions to analyze various types of reinforced concrete structures.
3. Design different structural members of multi-storied reinforced concrete frames in compliance with Indian Standard codes.
4. Design water tank and retaining wall according to Indian Standard codes.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	01	00	04	50	30	20	25	25	150

Detailed Syllabus

Sr. No	Topic name	Hours
1	**Design of Multi-storey Buildings**	**14**
	1.1 Loads as per I.S., distribution & flow of loads, lateral load due to wind and seismic as per latest IS standards, load combinations, guidelines for the preparation of structural layout for the building, Structural Planning, Numbering and Nomenclature of members, Initial sizing of beams and columns, Wind load calculations.	4
	1.2 Loads, Design of Slabs, Design of Beams, Design of Columns, Design of Footing, Analysis, design & detailing of Multi-storeyed RC framed building for residential /commercial purposes including ductile detailing.	10
2	**Design of Retaining Wall**	**10**
	2.1 Types, behaviour and application of retaining wall, Earth pressure and Forces on retaining wall, Stability criteria for Retaining wall	2
	2.2 Design & detailing of cantilever & counterfort type retaining wall for various ground conditions.	8
3	**Design of Water Tank**	**12**
	3.1 Classification of the water tank and method of analysis, permissible stresses, IS code provisions.	4
	3.2 Design Philosophy and requirements, Joints in water tank, Analysis of water tank, Design of circular and rectangular under-ground water tanks using IS code method. Design of different types of water tanks.	8
4	**Design of Flat Slab**	**6**
	4.1 Terminology, IS Codal provisions, Analysis of Flat slab, Direct design method, Distribution of moments across the panel width, moment and shear transfer from slabs to columns, Shear in Flat Slabs, Check for one-way and two-way shears, Limitations of Direct design method.	4
	4.2 Equivalent Frame Method, Reinforcement detailing in a Flat Slab, Opening in Flat Slab.	2
	TOTAL	**42**

List of Tutorials

Sr. No	Topic name	Hours
1	Preparation of Structural Layout	1
2	Design of Slab	2
3	Design of Beam and Columns	2
4	Design of Staircase and Footing	1
5	Design of Retaining Wall	3
6	Design of Water Tanks	3
7	Design of Flat Slab	2

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 an effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	10%	25%	30%	20%	10%

Instructional Method and Pedagogy:

1 At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2 Lectures will be taken in class room with the use of multi-media presentations, white board– mix of both.
3 Attendance is compulsory in lectures and tutorial sessions which carries a 5% component of the overall evaluation.
4 About 10 to 15% of the topics/ sub-topics which is relatively simple is to be given to the students for self-learning and collaborative learning method. The assessment of Cos for the particular topics will be through classroom presentations.
5 Guide Students to undertake in micro-project/ physical model of the various elements.
6 Minimum two internal exams will be conducted and average of two will be considered as a part of continuous evaluation
7 Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
8 Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.

Recommended Study Material

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 Links

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/105/105105104/