



FIRST SEMESTER 2016-2017

Course Handout Part-II

Date: 02/08/2016

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CE G613

Course Title : ADVANCED CONCRETE STRUCTURES

Instructor-in-charge : G. MUTHUKUMAR

1 (a): Scope of the Course:

The concrete structures are quite common in India for both low-rise and high rise buildings due to the strong performance in the last many decades even during strong wind & earthquake ground motion. The concrete structures are used in most of the infrastructure applications such as construction of buildings, bridges, roads, airport structures, stadiums, water tanks, chimneys, storage bins, nuclear reactors etc., The codal provisions are continuously changing with changing times due to technological advancements and our improved understanding of the behavioral characteristics of concrete. Though concrete structures are design are not anything new, but certain aspects of design and construction still needs further research and understanding. The beam-column joint is hardly 50 years old and was totally unexplored before 1970s. Today, it was observed that beam-column failure is one of the most important reasons for the failure of RC framed structures. On the other hand, RC structures are only framed form, but different structural configurations evolve over the years to accommodate the tall buildings with safety and economy. The present course aims to highlight the design and construction aspects of wide range of structures, ranging from traditional RC framed structures to tall buildings to certain specialized structures such as chimneys and water tanks. The emphasis will be more on the performance of structure under earthquake loading conditions. The codal provisions will be discussed for the better understanding.

1(b): Objectives of the course:

- To understand the concrete structures and its applications [**Module - I**]
- To study different structural configurations for the concrete structures [**Module-II**]
- To understand and design few important components of RC framed structures including beam-column joints [**Module-III**]
- To understand the concept of shear wall frame structures [**Module IV**]
- To understand the behavioral and design aspects of shell structures and folded plates [**Module V**]
- To understand the ductile behavioral aspects of structures under earthquake [**Module VI**]
- To understand the design and detailing aspects of water tanks and chimneys [**Module VII**]
- To understand the design aspects of RCC poles and pipes [**Module VIII**]
- To discuss the case studies of different RC structures and its failures[**Module IX**]
- To discuss the various advancements in concrete structures and the research scope [**Module X**]





2. Text Book:

T1. P.C. Varghese, "Advanced Reinforced Concrete Design", second edition, PHI Learning Pvt. Ltd., New Delhi.

3. Reference Books:

- R1: S. U. Pillai and D. Menon, "Reinforced Concrete Design", Third Edition, Tata McGraw Hill.
- R2: H.J. Shah, "Reinforced concrete Vol. II (Advanced Reinforced Concrete)", Seventh edition, Charotar Publishing House Pvt. Ltd., Anand.
- R3: B.S. Taranath, "Reinforced Concrete Design of Tall Buildings", Special Indian Edition, CRC Press, New York.
- R2: IS 456, IS 875, IS 1893, IS 3370, IS 6533, IS 13920.
- R3: S. N. Manohar, "Tall chimneys: Design and construction", Tata McGraw Hill.
- R4: Raju, N.K., "Advanced RCC Design", CBS Publishers and distributors, New Delhi.
- R5: Gambhir, M.L., "Design of Reinforced Concrete Structures", PHI Learning Pvt. Ltd., New Delhi.

4. Course Plan

Mod. No.	Learning Objective	Topics to be covered	No. of Lectures
1	Concrete structures and its application	Advantages of concrete structures over steel structures; History; Characteristics; Present state-of-the art	2
2	Structural configurations	RC framed structures; Shear wall-Frame structures, Tubular structures (Framed tube, Braced frame tube, tube-in-tube structures).	5
3	RC framed structures	Design aspects of framed structures; Design of beam-column joints; Design of deep beams;	5
4	Shear wall-frame structures	Behavior of shear wall frame interaction; Analysis of shear-wall frame structures; Design aspects of shear wall with and without boundary elements	5
5	Shell structures and folded plates	General classification of shells; Design aspects of Shell roofs; Hyperbolic cooling towers; Spherical domes; folded plates;	5
6	Concept of ductility & dynamic ground motion	Earthquake Resistant Design; Earthquake ground motion; Concept of storey drift; Accidental eccentricity; Ductile design considerations; Strength hierarchy; Strong column weak beam philosophy; Special confining reinforcement;	5
7	Water tanks and chimneys	Seismic analysis and design aspects of over head water tank (Rectangular and Intze type) (IS: 3370-2009); Design aspects of chimney subjected to lateral loads;	4
8	RCC Poles and Pipes	Specifications for overhead power and telecommunication lines; RCC Pipes; Concrete pipe design; Special considerations; Buoyancy forces; Pipe-soil structural interaction;	3
9	RC structures and its failures	Failure modes of RC structures; Poor construction practices; Stability of RC structures; Common design errors; Unavoidable complexities in construction.	4
10	Advancements in concrete structures;	Introduction to Performance Based design; New structural configurations; Impact of Structural design software;	3
		Total	40





5. Evaluation Scheme:

Component	Duration	Weight	Date & Time	Remarks
Mid Test	90 min	25%	<TEST_1>	CB
Take-home Assignments		10%	Will be announced every month	OB
Term paper presentation		10%	Will be announced every month	OB
End Semester Project		20%		OB
Comprehensive Examination	3 hrs	35%	<TEST_C>	OB

6. Mid Semester Grading [Mid Sem + Assignments +Term Paper] = [25+10+5 = 40]

7. Chamber Consultation Hour: Thursday 5 pm - 6 pm

8. Reading assignments will be given as and when necessary. Timely submissions of assignments is expected; For every project, frequent reports are needed (2 reports are expected). Take-home assignments need to be taken seriously. Three such assignments will be given and will be completed before mid-sem. There will be two term-paper presentations of 10 minutes each (on recent topic to be chosen by the candidate).

9. Notices: Notices and communication will be sent through your BITS mail only.

Instructor-in-charge

