

Asian Institute of Technology
School of Engineering and Technology

Advanced Concrete Structures

Course Objective: The objective of this course is to provide the state-of-the-art information about various procedures for the design of individual structural components. The real purpose of structural analysis is to produce useful information for design decision-making. This course attempts to address this by providing practical guidelines and covering code-based design of individual structural elements

Learning Outcomes:

- Ability to apply systematic principles of reinforced concrete design in accordance with standards and codes of practice.
- Ability to design and detail the reinforced concrete structural components that satisfy the strength, serviceability, ductility and durability requirements for gravity and lateral loads.

Prerequisite: None

Course Outline:

- I Material and section behavior
 - 1. Defining cross-sections
 - 2. Structural materials and behavior
 - 3. Cross-sections properties
 - 4. Strength and stiffness
 - 5. Stress and strain relationships
 - 6. Cross-section response
 - 7. Ductility of cross-sections and members

- II Introduction to strut and tie models
 - 1. Background concepts
 - 2. Truss analogy for concrete members
 - 3. Deep members
 - 4. Application of strut and tie model
 - 5. How to construct truss models
 - 6. ACI approach to strut and tie models

- III Design of gravity load resisting components
 - 1. Design of slab systems
 - 2. Design of beam and columns
 - 3. Design of transfer systems

- IV Design of lateral load resisting components
 - 1. Design of shear wall
 - 2. Design of BRB and Outriggers

- V Design of composite members
1. Design of composite slab systems
 2. Design of composite column
- VI Detailing of reinforcement for different systems (OMRF, IMRF and SMRF)
1. General approach
 2. Special moment resisting frames (SMRF)
 3. Beams in SMRF
 4. Columns in SMRF
 5. Beam-column joints in SMRF
 6. Detailing of wall

Learning Resources:

Textbooks:

- Lecture notes will be provided by the instructor.
- Anwar, N., & Najam, F. A. (2016). Structural Cross Sections: Analysis and Design. Butterworth-Heinemann

Reference Books:

1. James K. Wight (2016): Reinforced concrete: Mechanics and design, 7th edition, Prentice Hall.
2. E.G. Nawy (2009): Reinforced concrete: A Fundamental Approach, 6th edition, Prentice Hall International.
3. Arthur H. Nilson, David Darwin, Charles W. Dolan (2005): Design of Concrete Structures, 13th Edition.
4. Bungale S. Taranath (2010): Reinforced Concrete Design of Tall Buildings, Taylor and Francis Group, LLC.

Journals and Magazines:

- Journal of Structural Engineering, ASCE.
- ACI Structural Journal, ACI

Instructor:

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