

2014 Fall Semester
CT5203: Behavior of reinforced concrete members

INSTRUCTOR

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COURSE OBJECTIVE

Advanced understanding of behavior and analysis of reinforced concrete structural members and systems.

COURSE SCHEDULE

Wednesday: 13:30-16:20

TEXTBOOK

Lecture notes will be distributed in class.

REFERENCES

1. ACI Committee 318. (2008). *Building code requirements for structural concrete (ACI 318-05) and commentary (ACI 318R-08)*. American Concrete Institute.
2. Priestley, M. J. N., and Paulay, T. (1992). *Seismic Design of Reinforced Concrete and Masonry Buildings*. John Wiley & Sons, Inc.
3. Wight, J. K., and MacGregor, J. G. (2008). *Reinforced concrete: mechanics and design*. 5th edition, Prentice Hall.

GRADING

Homework: 20%
Midterm exam : 40%
Final exam: 40%

COURSE CONTENT

Table of Contents

1. DESIGN APPROACHES
 - 1.1 Working Stress Design (WSD)
 - 1.2 Strength Design (SD or LRFD in steel design)
 - 1.3 Capacity Design
 - 1.4 Plastic Design
 - 1.5 Recent Development of Design Philosophy
2. MATERIALS
 - 2.1 Proportion of Concrete
 - 2.2 Mechanical Behavior of Unconfined Concrete
 - 2.3 Mechanical Behavior of Confined Concrete
 - 2.4 Reinforcing Steel

- 2.5 Tension Stiffening
- 3. BENDING AND AXIAL LOAD
 - 3.1 Pure Bending/Flexure
 - 3.1.1 Fundamentals
 - 3.1.2 Moment-Curvature Analysis-Hand Calculation
 - 3.1.3 Effects of Major Section Design Parameters on Strength and Ductility
 - 3.1.4 Moment-Curvature Analysis- by In-House Computer Programs
 - 3.1.5 Moment-Curvature Analysis- by Commercial Software
 - 3.1.6 Member Flexural Force-Displacement Relationship
 - 3.2 Combined Bending and Axial Load
 - 3.2.1 Introduction
 - 3.2.2 Pure Axial Compressive Load
 - 3.2.3 P-M Interaction Diagram
 - 3.3 Biaxially Loaded Columns
- 4. SHEAR
 - 4.1 Fundamentals
 - 4.2 Behavior of Beams without Web Reinforcement
 - 4.3 Behavior of Beams with Web Reinforcement
 - 4.4 Equilibrium Truss Model for Beam Shear
 - 4.5 ACI 318 Shear-Failure Limit States
 - 4.6 Selected Shear Strength Models
- 5. BOND TRANSFER
 - 5.1 Mechanism of Bond Transfer
 - 5.2 Bond Stress
 - 5.3 Strain Penetration and Bond-Slip Modeling
 - 5.4 Development Length
 - 5.5 Splices of Reinforcement
 - 5.6 Concrete Breakout Strength of Anchor in Tension
- 6. STRUT AND TIE MODELS
 - 6.1 Introduction
 - 6.2 Struts, Ties and Nodal Zones
 - 6.3 ACI Code Provisions
 - 6.4 Selecting a Strut-and-Tie Model
 - 6.5 Deep Beams
 - 6.6 Shear Friction
 - 6.7 Brackets and Corbels
- 7. Special moment frames
 - 7.1 Introduction
 - 7.2 Principles for design of special moment frames
 - 7.3 Materials
 - 7.4 Beams
 - 7.5 Columns
 - 7.6 Beam-column joints