

CE-4350

Reinforced Concrete and Steel Design

Fall 2004

Instructor: Professor Haluk Aktan

Office Hours: Mon., Wed. 3:00 P.M. – 5:00 P.M.

TA: Alia Mohammad, 1305 Engineering – Structures Lab, 313-577-3785, ap4492@wayne.edu.

Office Hours: Mon. 5:00 P.M. – 7:00 P.M., Wed. 6:00 P.M. – 7:00 P.M. (Or by appointment).

Class Hours: Mon., Wed. 12:50 P.M. – 2:30 P.M., 201 Manoogian

Text Books:

1. Arthur H. Nilson, David Darwin, and Charles W. Dolan. Design of Concrete Structures, 13th Edition, Mc.Graw Hill, Inc.
2. Building Code Requirements for Structural Concrete and Commentary, ACI 318-01
3. Charles G. Salmon and John E. Johnson 4th Edition, Steel Structures, Harper Collins
4. LRFD-Design Specification of Steel Construction, AISC free downloads
<http://www.aisc.org/>

Concrete Design:

1. Introduction:

Concrete
Loads, Serviceability, Safety
Design Basis, ACI code
Fundamental Assumptions
Behavior of RC Member under Axial Load

2. Materials and Properties:

Stress-Strain Relationship
Tensile Strength
Modulus of Elasticity
Creep and Shrinkage
Steel Reinforcement

3. Analyses and Design of Beams

RC beam Behavior
Beams Reinforced on Tension Side
Beams Reinforced on Tension and Compression Side
T Beams

4. Shear, Torsion and Diagonal Tension in Beams
 - Diagonal Tension
 - RC Beams without Shear Reinforcement
 - RC Beams with Web Reinforcement
 - ACI Code Provisions
 - Axial Force Effects

5. Bond and Anchorage
 - Fundamentals
 - Development Length for Ultimate Strength
 - ACI Code for Tension Reinforcement
 - Anchorage by Hooks
 - Development Length in Compression
 - Bundled Bars
 - Cutoff, Bend Point, Splices, Design Example

6. Cracking and Deflections of Beams
 - Cracking in Flexural Members
 - ACI Code for Crack Control
 - Deflection Control
 - Deflection under Sustained Loads
 - Deflections due to Shrinkage and Temperature Changes
 - Moment vs. Curvature

7. Short Columns
 - Axial Compression
 - Ties and Spirals
 - Compression Plus Bending
 - Interaction Diagrams
 - ACI Code
 - Computer Analysis
 - Bar Splicing

Steel Design:

1. Introduction (chapter 1,2)
Specifications and Building Codes
Structural steel and properties
Stress-strain Behavior
2. Tension Members (chapter 3)
Nominal strength
Net area, Effective net area, Tearing at bolt holes
LRFD-Tension Members
3. Compression Members, Columns (chapter 6)
Euler buckling, column strength
Inelastic buckling, residual stresses
SSRC strength design, LRFD strength design
LRFD design of rolled shapes
4. Beam Design (chapter 7)
Simple bending of symmetrical shapes
Behavior of laterally supported beams
LRFD, Laterally supported beams
Shear
Deflection
5. Connections (chapter 4,5)
Fasteners
LRFD of fasteners
Eccentric shear, combined shear and tension
Types of welds and welding symbols
Effective net weld area and strength
LRFD of welds
Welds in axial tension, eccentric shear

Exam Schedule:

Midterm I October 13, 2003

Midterm II November 17, 2003

Final December 16, 2003 1:20pm – 3:50pm

Grading:

Midterms: 50%

Final: 30%

Homework: 10%

Project 10%

Total: %100

Rules:

- Textbook Chapters noted are Required Reading
- Attendance is Mandatory
- Absolutely no late homework
- Absolutely no Makeup Exam except for medical reasons verified by WSU Health Center Physicians
- Refer to course web site on Pipeline for additional information