Course Outline – CE-UY 3173– Structural Design
Spring 2018
Roula Maloof
Alfonso Whu
Tuesday and Thursday   2:00 pm – 3:50 pm   RGSH_207

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Course Pre-requisite:    CE-UY 3133 Structural Analysis

Course Description:  A thorough treatment of structural design principles and techniques. Topic in both steel and reinforced concrete are treated, including: design of reinforced concrete beams, columns, slabs and footings; design of steel tension, compression and flexural members, beam-columns, design of bolted connections.

Textbooks:  

Reinforced Concrete Mechanics and design by James K. Wight, Pearson; Seventh Edition

Reference:  
Manual of Steel Construction; American Institute of Steel Construction, Fifteen Edition

ACI 318 -14”Building Code Requirements for Structural Concrete and Commentary”, American Concrete Institute.

Grade Basis: Attendance 5%, Homework 15%, Quizzes 15%, Midterm 30%, Final 35%.

Course Objectives:

1- To establish an understanding of the behavior of the steel and reinforced concrete structures.
2- To provide students with a clear and thorough presentation of the methods and regulations used in current design practice.
3- Students should develop the skill to combine analysis and design processes.
4- Students should develop the skill to design efficient structures, safely and economically.
TOPICS:
I - Steel Structures:

1. Introduction and Concepts in Structural Design
   i. Classification, idealization and load distribution.
   ii. Load & Resistance Factor Design (LRFD).

2. Beams
   i. Bending Stresses and Plastic moment.
   ii. Laterally supported beams
   iii. Lateral Torsional Buckling (LTB)
   iv. Flexural, shear strength
   v. Biaxial Bending
   vi. Beam Bearing Plates.

3. Tension Members
   i. Nominal Strength: Yielding, Fracture
   ii. Effective Net areas
   iii. Staggered Holes
   iv. Block Shear Failures.
   v. Design of Tension Members
   vi. Tension Member in Roof Trusses.

4. Compression Members
   i. Residual Stresses
   ii. Elastic and Inelastic Buckling
   iii. Local Buckling
   iv. Design of Columns
   v. Design of Column Base Plate

5. Beam-Column
   i. Combined Bending and Axial Load.
   ii. Moment Amplification.
   iii. Braced and Un-braced frames.
   iv. Design of Beam-Column

6. Simple Connections
   a. Bolted Connection
      i. Introduction: Type and sizes of Bolts
      ii. Slip-Critical and Bearing Type connections

7. Eccentric Connections
   a. Bolted Connection
      i. Shear Only
      ii. Shear Plus Tension

8. Introduction to Welded Connections
   a. Concentric Connections
   b. Eccentric Connections
II – Reinforced Concrete:

1. Introduction to reinforced concrete design: Materials properties, ACI Load factors, Design strength.

2. Flexure in Beams
   i. Analysis of singly reinforced rectangular beams.
   ii. Analysis of doubly reinforced sections.
   iii. Analysis of T-beams and L-beams.
   iv. Continuous beam and One-way slab.

3. Shear and Diagonal Tension in Beams.
   i. Shear stresses in concrete beams.
   ii. Behavior of beams without shear reinforcement.
   iii. Shear and diagonal tension in beams.
   iv. Design of vertical stirrups.

   i. Strength of short concentrically loaded columns.
   ii. Strength of eccentrically loaded columns.
   iii. P-M diagrams.
   iv. Introduction to slender columns.

5. Footings.
   i. Design considerations for isolated footing.
   ii. Design considerations for combined footing.
   iii. Design considerations for footing under a wall.

   i. Direct Design method.

Specific Requirements:
- A minimum of 25% unweighted average of exams is required.
- A minimum of 40% score for passing.
- A minimum of 50% on homework grade for passing.
- Late home works are not accepted without a valid reason.
- Neatness and presentation in home works will be taken into account.
- Solution of homework will be posted.
- Missing a quiz will result in a zero grade.
- More than 25% absences will lead to a failing grade “F”.
- Cheating or any academic dishonesty will be penalized. Refer to the SOE Code of Conduct “engineering.nyu.edu/academics/code-of-condut/academic-misconduct”

ABET Competencies:
   e. An ability to identify, formulate, and solve engineering problems.
   i. Recognition of the need for, an ability to engage in life-long learning.
   j. Knowledge of contemporary issues.