NYU Tandon School of Engineering
Civil and Urban Engineering Department
Course Outline – CE-UY 3173– Structural Design
Spring 2017
Roula Maloof
Alfonso Whu
Tuesday and Thursday  2:00 pm – 3:50 pm  Room TBA

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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.


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

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

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

Grade Basis:  Attendance (5%), Homework10%, Quizzes 15%, Midterm 30%, Final 40%.

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. Threaded Rods and Bars
      vii. Tension Member in Roof Trusses.
  4. Compression Members
      i. Residual Stresses
      ii. Elastic and Inelastic Buckling
      iii. Local Buckling
      iv. Design of Column
      v. Double Angle Compression Member.
      vi. 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.

4- Columns: Combined axial load and bending
   i. Strength of short concentrically loaded columns.
   ii. Strength of eccentrically loaded columns.
   iii. P-M diagrams.
   iv. Introduction to slender columns

5- Footing
   i. Design consideration for isolated footing.
   ii. Design considerations for combined footing.
   iii. Design considerations for footing under a wall.

6- Design of two-way slabs
   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-conduct/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.