CE6183 CONCRETE STRUCTURES

Department of Civil and Urban Engineering
NYU Tandon School of Engineering
Course Outline
Spring 2017

Adjunct Professor J. Jong Lou, Ph.D., P.E.
Thursdays 6:00 - 8:30 PM; RH605

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Course Pre-requisites
Students must have completed CE2123 (Mechanics of Materials), CE3133 (Structural Analysis), CE3173 (Structural Design), CE4822 (Civil Engineering Design II: Structural Design), or CE6183 (Steel Structures). This course builds on these introductory courses, or structural design exposure at graduate level. Fundamental engineering design knowledge & experience, together with problem solving skills are considered essential for a successful completion of this course. Proficiency in computer software such as: STAAD-III, ETABS, SAP2000, PCA spSlab, PCA spColumn, MathCAD, AutoCAD, Microsoft Excel, and Microsoft Word Equation Editor is required.

Course Description
The course is critical for the design and analysis of Reinforced Concrete Structures. It integrates the theory & practice for the analysis & design of Reinforced Concrete Structures.

Course Objectives
Students are expected to understand:

- The materials: cement, aggregates, admixtures, concrete mix design, steel reinforcement, formwork, and cold-weather concreting, etc. Concrete-Steel Composite Action
- Flexural Analysis, Design of Concrete Beams; Shear Reinforcement; Bond; Development Length; Anchorage
- Serviceability: Deflection (Short-term and Long-term)
- Columns - Short Columns and Slender Columns; Sway and Non-sway frames; Beam-Column Interaction
- Analysis and Design of One-Way Slabs
- Analysis and Design of Two-Way Slabs
- Lateral Loads Analysis & Design - Wind and Earthquake Loads/Seismic Design
- Design of Reinforcement at Joints
- Introductory Prestressed Concrete (one session only)
- Recent Trends & Developments in Reinforced Concrete – High-Strength Concrete, Ultra-High Performance Concrete (UHPC), Geopolymer, and Carbon Fiber Reinforced Polymer (CFRP), Column Shortening due to Creep/Shrinkage - (Half session only)
Course Structure
The class will be comprised of 15 sessions of Lectures, one Workshop session on the design and analysis of Project Building - a 13-story concrete structure located in New York City, Miami, or Los Angeles and Three (3) exams.

Readings
The mandatory text for the course is:
References:
1. ACI 318-14, Building Code and Commentary, American Concrete Institute. (necessary)
3. Design of Concrete Buildings for Earthquake & Wind Forces, Ghosh, Domel, Portland Cement Association (PCA), latest edition. (Useful at advanced level)
4. ASCE 7-10 and/or New York City Building Code 2014

The governing code for concrete structures is ACI 318 by American Concrete Institute; therefore it is necessary to have this code for the class. However, some relevant code requirements are cited in the textbook and students may supplement the balance from Internet and/or through other means.

Even with a good understanding on course theory, it’s not guaranteed that you can solve real-life engineering problems. References No. 2 & 3 prepares you for a true hands-on approach to solutions. Furthermore, it is mandatory that students analyze and design a real-life 13-story concrete building combining theory, practice, Code compliance, constructability, and design economy under the guidance of the Instructor.

Course requirements
Class preparation and participation are important for this course and will be factored into your final grade. Students must read the required and/or assigned text and articles in advance and be prepared for class Question/Answer drills throughout each and every session. In addition to class participation, students shall take one in-class diagnostic mini-midterm exam, one full-fledged midterm exam, and one final exam. Design calculations and CAD-based drawings for the Project Building shall also be submitted no later than the final exam day.

1st Mini-midterm Exam (1 hour), February 16 (10% of final grade)
This will be a close-book exam with one formula/info sheet permitted. The purpose of the exam is diagnostic in nature. The course work is demanding in knowledge of structural engineering and design. Students with poor performance are advised to come out with a detailed study program to better prepare themselves for the course or, in certain cases, urged to withdraw.

Midterm Examination (2-hour), March 30 (25% of final grade)
This will be a timed, close-book examination which will cover all topics up to date. Two (2) formula info sheets are permitted during the exam.
Final Examination (2 ½ -hour), May 11 (35% of final grade)
This will be a timed, close-book examination with 3 info-sheets permitted.

Homework & Special Assignment - due one week after assigned (20% of final grade)
It is mandatory to do your homework on a timely basis. Homework must use Microsoft Word Equation Editor (or MathCAD; MATLAB), Excel, and AutoCAD. There’s no copying of other’s work and no lending of work to others. No late or missing homework is permitted. Students who are found copying others’ work or lending work to others for copying, and/or with late/missing submission of assigned work shall be regarded as academically delinquent if with a total combined three (3) offenses. **Hardcopy of each homework is due a week from it is assigned and shall be emailable. It is required for you to email your homework or assignment by Monday/Tuesday for professor’s preview and comment, therefore ensuring your approaches to the solutions of the assigned problems are in the right direction and therefore not wasting time.**

Building Project - Design and Analysis of a 13-story office building (10% of final grade)
The Project builds on the subjects discussed in the lectures, and the design runs parallel to each lecture topic. Students will submit results as special assignments/interim reports, which, after compilation, constitute the Final Project Design Package (commonly called in the industry as Construction Document). **Giving up on Project Building work is not acceptable, which will result in a penalty of -10%.**

Lecture Sessions

Jan 26   Introduction - Structural Engineering & Construction Materials; Concrete-Steel Composite Material
          • Nilson et al Chapters 1, 2 & 3; Professor Lou’s Notes

Feb 2    Concrete Mix Design, Rebar, and Formwork, etc.
          • Nilson et al Chapter 2

Feb 9    Ultimate Strength Design (USD) & Working Stress Design (WSD) – Intro only.
          Flexural Analysis – Concrete Beam Moments
          • Nilson et al Chapter 4

Feb 16   1st Mini-midterm Examination (one hour); Flexural Analysis (continued)
          • Nilson et al Chapter 4

Feb 23   Beam Design and Practice – Moment; Beam Shear
          • Nilson et al Chapter 5

Mar 02   Bond. Anchorage. Anchoring to Concrete. Rebar Development Length and its Applications. Serviceability (Deflections)
          • Nilson et al Chapter 6 & 7; Chapter 21
Mar 09 Serviceability (Deflections) – continued. Short Columns; Slender Columns: Beam-Column Interaction
   • Nilson et al Chapters 6 & 7; 9 & 10

Mar 16 Spring Recess (No Class)

Mar 23 Short Columns; Slender Columns: Beam-Column Interaction (continued)
   • Nilson et al Chapters 9 & 10

Mar 30 Midterm Examination (2 hours – close book with two formula sheets permitted)

Apr 06 No Class (re-scheduled to April 15)

Apr 13 Review of Mid-Term Exam results; Nonway vs. Sway Structures; Moment Magnifiers
   • Nilson et al Chapter 10

Apr 15 Saturday - 10 AM to 12:30 PM: Special Workshop on Project Building

Apr 20 Floor Systems - One-way and Two-way Slab Systems; Continuous Beams. Seismic/Wind Loads, LFRS (Lateral Force Resisting Systems), Floor Diaphragm
   • Nilson et al Chapters 12 & 13

Apr 27 Frame Analysis; Design of Reinforcement at Joints. Recent Trends & Developments in Reinforced Concrete
   • Nilson et al Chapter 20 & Reference No. 3; Chapter 18

May 04 Prestressed Concrete
   • Nilson et al Chapter 22

May 11 Final Exam (2-1/2 hours) and Project Design Package Due

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University’s Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.
NYU School of Engineering Policies and Procedures on Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School’s rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School’s Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person’s work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.

2. Fabrication: including but not limited to, falsifying experimental data and/or citations.

3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one’s own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.

4. Unauthorized collaboration: working together on work that was meant to be done individually.

5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.

6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.