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Fall 2019

# CE 495-103: Senior Design II (Structural)

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**CE 495 Senior Design II (Structural) Section: 103 Fall 2019**

**Text:** Reinforced Concrete Design of Tall Buildings, 1<sup>st</sup> Edition, by Bungale S. Taranath (ISBN: 9781439804803)

**Instructor:** Simon Shim, P.E., E-mail: [shim@njit.edu](mailto:shim@njit.edu) or [sshim@axisd.com](mailto:sshim@axisd.com) (Office Hour: 4:00 ~ 5:00 PM Tuesday by appointment)

**Location:** ECEC 100

Prerequisites: [CE 333](#), [CE 432](#), [CE 443](#) and [CE 494](#). Provides students with the type of design experience they would receive if engaged in civil and environmental engineering design practice. Course will focus on one or more of these design areas: structural, geotechnical, transportation and planning, and sanitary and environmental engineering.

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Week	Topic	Homework to be Assigned
1.	Introduction of course work and team project	
2.	Understand Design Project team and Communication Design Process and scope of work. Reference: Deliverables: Project drawing package, Specifications.	Handout 1

3.	Overview of structural engineering workflow for existing building and New Building.	Handout 2
4.	Site Visit: Subject to Change Construction Site visit (TBD) – Location and Time	Site Visit Report
5.	Structural Design Criteria: Dead Load, Live Load, Wind Load, and Seismic Load, etc	Handout 3
6.	Gravity floor framing System and Design I Finite Element Modelling and Analysis Column Load Takedown with Tributary Area Method	Handout 4A
7.	Gravity floor framing System and Design II Finite Element Modelling and Analysis and Design Beam and Slab and Column Design	Handout 4B
8.	Lateral load resisting system I Finite element Modelling and Analysis	Handout 5A
9.	Lateral load resisting system II Finite element Modelling, Analysis, and design	Handout 5B
10.	Foundation system Finite element Modelling, Analysis, Design	Handout 6
11.	Walkthrough production of floor framing plan and foundation drawing, Lateral framing plan drawing	Handout 7
12.	Typical details: Concrete, Steel, Masonry References: ACI530 Building Code Requirements for Masonry Structure	Handout 8
13.	Final Team Presentations, and Final portfolio and Report. (Invite two critic engineers) Team Project presentation and Report	Presentation 20 minutes/each
14.	Closing remarks and comments: Display presentation to the public New Technologies: Rhino, Grasshopper (Plug-in), Integration tool, Introduction digital fabrication on complex form structure. Q/A for career path	

**Grading:** Grading will be judged from the final term project presentation and report.

**Outcomes Course Matrix – CE 495 Civil Engineering Design II  
(Structural focused)**

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
<b>Student Learning Outcome 1: Understand, Analyze, and design an engineering project (building foundation, etc.)</b>			
Present an area specific civil and environmental engineering practice design problem.	1, 2, 7	1, 2	Final project report and periodic progress reports.
Discuss specific code, performance, cost, time, quality and safety objectives.	2, 4	1, 2	Final project report and periodic progress reports.
Work individually and within multi-disciplinary design teams.	3, 5	1, 2	Final project report, periodic progress reports, oral presentation.

**CEE Mission, Program Educational Objectives and Student Outcomes** The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of

- public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
  4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
  5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
  6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
  7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

**Class Notes:**

Goal: This class will provide seniors with the overview of structural engineering design practice they would be engaged in structural design firm. The primary design topics will be covered upon a 40-story residential building design by walking through structural system design step by step.

Students will gather existing high-rise building structural information from various sources and discuss during the class to get familiar to various structural systems including floor framing system, lateral load resisting system, and foundation system.

The sequences of the class topics may vary based on class progress. Site visit date and timing is subject to weather. Individuals in group may receive different grades based on attendance, class participation and presentation.

Revised: 8/23/19