Fall 2019

CE 443-003: Foundation Design

Ivan L. Guzman

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CE 443 Foundation Design  Fall 2019
Section:003

Instructor: Ivan L. Guzman, PhD, MBA, PE
Class Hours: Tuesday, 10 am – 12:50 pm - Room CKB 124
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Phone: (718) 260-5689
Office Hours: By Appointment

ISBN: 978-133778

Prerequisites: CE 341, CE 341A. Site investigation, selection of foundation types and basis for design, allowable loads, and permissible settlements of shallow and deep foundations. Computations of earth pressure and design of retaining walls.

Objectives: Students will be provided insights into the following foundation design topics - site investigation, selection of foundation types and basis for design, allowable loads, and permissible settlements of shallow and deep foundations, and computations of earth pressure and design of retaining walls.

STATEMENT ON ACADEMIC INTEGRITY

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tr>
<td>1</td>
<td>Review – Shear Strength; Geotechnical Investigations</td>
</tr>
<tr>
<td>2 &amp; 3</td>
<td>Bearing Capacity</td>
</tr>
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<td>4</td>
<td>Bearing Stresses and Elastic Settlement</td>
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<td>5</td>
<td>Total Settlement</td>
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<tr>
<td>6</td>
<td>Design of Shallow Foundations based on site investigation and given structural loads and Midterm Review</td>
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<td>7</td>
<td>Midterm Examination</td>
</tr>
<tr>
<td>8</td>
<td>Pile Foundations - Types and Installations</td>
</tr>
<tr>
<td>9</td>
<td>Pile Capacity</td>
</tr>
<tr>
<td>10</td>
<td>Design of Pile Groups</td>
</tr>
<tr>
<td>11</td>
<td>Design of Drilled Shafts</td>
</tr>
<tr>
<td>12 &amp; 13</td>
<td>Lateral Earth Pressure and Retaining Wall Design, and Highlight of Slope Stability Analysis</td>
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<tr>
<td>14</td>
<td>Review (if time allows)</td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
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</table>

Your overall grade will be based on the following:
20% - Weekly quizzes, 10% - Homework, 35% - Midterm, 35% - Final

Grading structure:
100 – 90: A  
89 – 86: B+  
85 – 80: B  
79 – 74: C+  
73 – 70 : C  
69 – 60: D  
59 – 0 : F

**Attendance:** Attendance and class participation are mandatory. It is your responsibility to obtain the materials presented and submit homework as assigned on the due date. It is suggested you contact your group to obtain the materials you missed or send homework to a group member BEFORE it is due.

**Quizzes:** Will be given at the beginning of class based on material covered in the previous class or reading assignment from 10:00-10:10 AM. The quizzes will consist of one or two of these questions: the first will be conceptual to evaluate theory of the material covered in the previous week; the second will practical to apply theory and test comprehension. A missed quiz (due to absence or tardiness to class) will be assigned a grade of zero. A minimum passing grade of 70% for quizzes will be required to pass the course. Absence from 4 or more quizzes will result in a failing grade for the course.

**Homework:** Written assignments are to be submitted in class on paper ON OR BEFORE the due date. Electronic submission will not be accepted. Late homework on the due date will incur a 50% deduction, after the due date a 100% deduction will apply. All homework assignments shall be submitted with accompanying figures, tables, drawings, calculations, etc. Save a copy of your work before submitting it, since it may not be possible to return the corrected homework back in time for you to study for examinations. Please keep a copy of all your work until you have received a final grade. Homework must be done on 8 ½” × 11” engineering calculation paper, in a manner consistent with professional engineering calculation in practice. The following information shall be included:

1. Your name  
2. Date  
3. Course Title and Number  
4. Person to whom it is being submitted.  
5. A brief statement of the assignment purpose (what was requested, who authorized it and what you did).  
6. Reference to any drawings, figures, charts etc. – identify and important information that they contain.  
7. Description of what information was obtained and used to solve the problem.  
8. Important results clearly identified.  
9. Appropriate conclusions and recommendations, if required.  
10. All sources cited  
11. If you assume soil property value you need provide a justification and cite your source.

**Additional requirements and notices:**
A. Students should read the chapter/slides related to the topic that will be covered in the class before the class
B. All examinations will be open book, open notes. Bring a hardcopy of your textbook, no electronic versions will be allowed.
C. Students will be informed of any modifications from the syllabus during the semester.
D. Communication from the instructor will be sent only to your NJIT e-mail address.
E. All email to the Professor must include CE 443 – [Email Subject] in the subject line.
F. Always bring your text book, a calculator and writing paper to class.
G. Only NCEES approved calculators can be used during examinations (no cellphones): Casio: All fx-115 and fx-991 models, Hewlett Packard: The HP 33s and HP 35s models, Texas Instruments: All TI-30X and TI-36X models
H. All material handed out, posted or discussed in class will be part of course material and students will be responsible for studying them in addition to the appropriate sections of the text book.
I. Professional presentation will be part of all grading.
J. No make-up examinations will be administered.
K. Switch off laptops and cell phones during class, and examinations.
L. No recording nor photographic devices shall be used during class or examinations.

### Course Objective Matrix – CE 443 Foundation Design

<table>
<thead>
<tr>
<th>Strategies, Actions, Assignments</th>
<th>Assessment Measures</th>
<th>ABET Student Outcomes (1-7)</th>
<th>Program Educational Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Learning Outcome 1</strong>: Apply subsurface exploration techniques and laboratory tests in design of foundations and retaining walls.</td>
<td>Develop a site report based on field and laboratory data</td>
<td>Technical report assessment rubric</td>
<td>1, 3, 6</td>
</tr>
<tr>
<td>Students will learn and apply analytical methods incorporating soil mechanics concepts in design of shallow and deep foundations.</td>
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<td>Homework, quizzes and examinations.</td>
<td>1, 2</td>
</tr>
<tr>
<td>Students will learn the relationship between empirical methods, theoretical concepts and design requirements in codes.</td>
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<td>Homework, quizzes and examinations.</td>
<td>2, 4</td>
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<tr>
<td>Students will visualize, formulate, analyze and design foundations.</td>
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<td>Class/group discussions, homework, quizzes, and examinations.</td>
<td>1, 2, 5</td>
</tr>
<tr>
<td><strong>Student Learning Outcome 2</strong>: Apply the principles of soil mechanics to design of shallow and deep foundations including bearing capacity and settlement calculations</td>
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<tr>
<td><strong>Student Learning Outcome 3</strong>: Compute the lateral earth pressure, select size of retaining walls to ensure safety against external forces and moments as well as excessive settlements.</td>
<td>Students will learn and use engineering mechanics and soil mechanics concepts in design of retaining walls.</td>
<td>Homework, quizzes and examinations.</td>
<td>1, 2</td>
</tr>
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<td>2, 4</td>
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<td>concepts and design requirements in codes.</td>
<td>Students visualize, formulate, analyze and retaining walls.</td>
<td>Class/group discussion, homework, quizzes, and examinations.</td>
<td>1, 2, 5</td>
</tr>
</tbody>
</table>
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

Revised: 2/13/18