CE 443: Foundation Design Section: 102 - Spring 2024
6:00 pm – 8:50 pm - Thursday January 18, 2024 - May 9, 2024
Faculty Memorial Hall 213

NJIT CIVIL AND ENVIRONMENTAL ENGINEERING

Course Description:

CE 443. Foundation Design. 3 credits, 3 contact hours (3;0;0).

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.

Instructors:

Matthew Riegel, PE, D GE
Office - 261 Tuesday, 3pm to 6pm and Thursday 9pm – 10pm (following class) and by appointment

Holtisa Jovani, PE

e-mail: mdriegel@hntb.com 973-632-7541 (Cell)
Outside office hours please contact me via e-mail or cell phone.

Text:

Principles of Foundation Engineering 9th Ed. Das and Nagaratnam, 2019 Cengage Learning
ISBN: 978-337-70502-8

Syllabus Information:

The dates and topics of the syllabus are subject to change; however, students will be consulted with and must agree to any modifications or deviations from the syllabus throughout the course of the semester.

Week	Date	Topic
1	1-18	- Review –Shear Strength and Consolidation; Geotechnical Investigations
2	1-25	- Shear Strength and Bearing Capacity Theory
3	2-1	- Application of Bearing Capacity Theory
4	2-8	- Bearing Stresses and Elastic Settlement
5	2-15	- Consolidation Settlement
6	2-22	- Design of Shallow Foundations
7	2-29	- Exam 1 followed by Introduction to Deep Foundations
8	3-7	- Pile Foundations- Types and Installations
	3-14	- Spring Break – NO CLASS
9	3-21	- Pile Capacity and Settlements
10	3-28	- Design/Construction of Pile Groups
11	4-4	- Exam 2 followed by Design/Construction of Drilled Shafts
12	4-11	- Introduction to Lateral Earth Pressure
13	4-18	- Lateral Earth Pressure and Retaining Wall Design
14	4-25	- Design of Retaining Walls
	5-2	- Reading day – NO CLASS
15	5-9	- Exam 3

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General course information:

Students will be provided insights into the following foundation design topics –

- Soil strength, consolidation, and site investigation
- Selection of foundation types and basis for design
- Foundation loading
- Permissible settlements (service state) of shallow and deep foundations
- Stability (strength state) of shallow and deep foundations
- Slope stability
- Computations of earth pressure and design of retaining walls.

Grading Scale:

Your overall grade will be based on the following:
20% Quizzes
10% Written Homework Assignments
70% 3 Exams

The final grade will be as follows:

A:	90 to 100%
B+:	86 to 89%
B:	80 to 85%
C+:	74 to 79%
C:	70 to 73%
D:	60 to 69%
F:	Below 59%

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Attendance Policy:

Attendance and class participation are mandatory. If you are unable to attend the instructor should be informed prior to the class. It is your responsibility to obtain the materials presented and submit homework as assigned on the date due. It is suggested you contact a fellow student to provide you with the materials missed.

Assignment Policy:

All assignments will be collected on the due date prescribed; if you are absent, it is your responsibility to submit the assignment on that date. Late homework will not be accepted. All work to be submitted at the start of class via electronic uploads.

- Mobile Phones must be turned off during class.
- Electronic versions of homework must be a SCANNED PDF file with the file titled as follows:
  - **LAST NAME Assignment No X.PDF**
- Please keep a copy of all your work until you received a final grade.
- Please save a copy of your homework before submitting it to the instructor.
- All work should be done in a professional manner.
- Homework is due at the beginning of class. Late homework will not be accepted.
- The instructor may photocopy and save your assignments and tests, as part of the effort necessary to renew accreditation of our educational programs. The copies, which will be accessible only to faculty, administration, and external reviewers, will be destroyed afterwards.
- No make-up examination will be administered, unless approved by the Dean
- Switch off cell phones during quizzes and examinations.
- No recording devices shall be used during class or examinations. Take notes.

Quizzes

- **A quiz will be given at the beginning of most classes** based on each material covered in the previous class from 6:00-6:20 PM. There will be two 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.
- All examinations open book, open notes.

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HOMEWORK:

All homework assignments shall be submitted with a short Memorandum, generally of one to two (maximum) pages of text with accompanying figures, tables, drawings, calculations, etc. The memorandum should be typed (hand written submittals will not be accepted; however, handwritten calculations are acceptable). 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.
10. All sources cited

Also include any list of symbols, figures or tables that you think are appropriate but do not obscure the important results with excessive computer output or calculation worksheets.

All calculations are to be included, all work shown and presented on engineering graph paper, handwritten calculations must be neat.

Withdrawals:
In order to ensure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline will not be permitted unless extenuating circumstances (e.g., major family emergency or substantial medical difficulty) are documented. The course Professors and the Dean of Students are the principal points of contact for students considering withdrawals.

NJIT University Policy on Academic Integrity:

The NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students. The Honor Code can be found at (https://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf).

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Outcomes Course Matrix – CE 443 –

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Student Learning Outcome 1: Identify the properties of soils and the basic principles of soil mechanics and develop the ability to apply these principles to solving problems in civil engineering.			
Introduce index properties of soils and subsurface conditions	1	1	Homework, quizzes and exams.
Explore subsurface methods of investigation in design.	1	1, 2	Homework, quizzes, and problem solving in class
Discuss professional design practice.	2, 7	1, 2	Class discussions and problem solving. Quizzes and exams.
Student Learning Outcome 2: Apply principles of soil mechanics and foundation design to size spread footing foundations			
Introduce basic concepts strength and service limit state design of spread footing foundations as it relates to bearing capacity and settlement	1	1	Homework, quizzes and exams.
Apply these principles to problem solving.	1, 2	1	Homework, quizzes, and problem solving in class
Discuss application of these principles to engineering problems.	2	1	Class discussions and problem solving. Quizzes and exams.
Student Learning Outcome 3: Apply principles of soil mechanics and foundation design to size deep foundation elements			
Introduce basic concepts strength and service limit state design of deep foundations as it relates to bearing capacity and settlement	1	1	Homework, quizzes, and exams.
Discuss analytical methods to solve different types of settlement problems.	2	1	Homework, quizzes, and problem solving in class.
Discuss professional design practice.	2, 4	1, 2	Class discussions, problem analyses, and problem solving.

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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 safe, practical, resilient, 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 technical and interpersonal skills through professional growth and development activities such a 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:

   a. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
   b. 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
   c. an ability to communicate effectively with a range of audiences
   d. 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
   e. 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
   f. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
   g. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies