Fall 2023

CE 642-851:Foundation Engineering

Matthew Riegel

CE 642 – 851 Foundation Design
Fall 2023

NJIT
CIVIL AND ENVIRONMENTAL ENGINEERING

Course Description

The course material presents foundation design using methods presented in course text as well as current ASD and LRFD codified design methodologies for both strength and service limit state conditions. Topics covered include uncertainty/risk mitigation in assessment of subsurface conditions and foundation analysis. Standard methods of subsurface investigation and site characterization. Spread footing applicability and design, bearing capacity and settlement. Geotechnical and structural foundation sizing methodologies. Deep foundation design of driven piles and drilled shafts. Specialty foundation systems.

Instructor:

Matthew Riegel, PE, D GE
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973-632-7541 (cell)
Office – TIER 261 Tuesday, 3pm to 6pm and Thursday 6pm – 10pm (remote) and by appointment

Text:

Foundation Design Principles and Practices 3rd ed; Coduto, Kitch, Yeung, Pearson, 2016. ISBN 0-13-341189-3

COURSE SCHEDULE:

Although there is no "schedule" for an on-line course we will release the course materials on a weekly basis on Thursday evening at 6PM.

Lecture	Posted	Topic/Assignment
1	9-7	Course Introduction; Uncertainty and Risk in Foundation Design; Soil Mechanics Review. Read – Chapters 1 – 3 Assignment – Relevant examples to be posted under separate cover.
2	9-14	Geotechnical Desk Studies, Subsurface Investigations and Site Characterization. *Quiz No – 1* Read Chapter 4 Assignment – Relevant examples to be posted under separate cover.
3	9-21	Performance Requirements of Foundations *Quiz No – 2* Read Chapter 5 Assignment – Relevant examples to be posted under separate cover.
4	9-28	Bearing Capacity of Shallow Foundations Read Chapters 6 and 7 Assignment – Relevant examples to be posted under separate cover.
5	10-5	Settlement of Shallow Foundations *Quiz No – 3* Read Chapter 8 Assignment – Relevant examples to be posted under separate cover.

6	10-12	Shallow Foundations Geotechnical and Structural Design Read Chapters 9, 10 and 11 Assignment – Relevant examples to be posted under separate cover.
7	10-19	Introduction to Deep Foundations *Quiz No – 4* Read Chapter 12 Assignment – Relevant examples to be posted under separate cover. Lectures 1 - 5
8	10-20	Midterm Exam
9	11-2	Pile Load Transfer, Limit States and Axial Load Testing Read Chapter 13 and 14 Assignment – Relevant examples to be posted under separate cover.
10	11-9	Axial Capacity of Driven Piles – Static Analysis Read Chapter 15 Assignment – Relevant examples to be posted under separate cover.
11	11-16	Axial Capacity of Drilled Shafts – Static Analysis *Quiz No 5* Read Chapter 16 Assignment – Relevant examples to be posted under separate cover.
12	11-21	Pile Group Settlement and Structural Design Read Chapters 20 and 21 Assignment – Relevant examples to be posted under separate cover.
13	11-30	Laterally Loaded Piles *Quiz No 6* Read Chapter 22 Assignment – Relevant examples to be posted under separate cover.
14	12-7	Specialty Deep Foundations Read Chapter 17 and 18
15	12-21	Final Exam

Grading Policy:

Your overall grade will be based on the following:
10% Quizzes
20% Homework Assignments
35% Midterm Grade
35% Final Grade

Grading Scale:

A:	100-90
B+:	89-85
B:	84-80
C+:	79-75
C:	74-70
D:	69-60
F:	Below 60

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Attendance Policy:

Given this is an on-line internet-based course there are no true attendance requirements. I will maintain "class time" from 6pm to 9pm on the evening that the lectures are uploaded as noted on the schedule shown above. We will use this time to maintain an open forum where I will be available to answer questions and interact in real-time. In addition I require that any academic questions be posted on a Canvas Forum associated with that lecture. Please allow 24 hours for me to respond if questions are posted during times other than "class time", after which I suggest you reach out to me via e- mail or cell phone. Lectures will be posted at 6PM every Thursday night as indicated in the schedule above. You will need a PDF scanner or a quality digital camera to upload your completed quizzes within the allotted time limit. All files MUST be submitted in PDF format. The midterm and the final exams will be administered remotely.

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).

Assignment Policy:

1. Electronic versions of homework must be a SCANNED PDF file with the file titled as follows:
2. "LAST NAME"_Assignment No X.PDF
3. Please keep a copy of all your work until you have received a final grade.
4. Please save a copy of your homework before submitting it to the instructor, since it may not be always possible for the instructor to return the corrected homework back in time for you to study for quizzes and examinations.
5. All work must be neat, concise, assumptions stated, references cited, units provided, conclusions apparent and presented in a professional manner.
6. Homework is due at the time and date noted. Late homework will not be accepted.
7. 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.
8. No make-up examination will be administered, unless approved by the Dean of Students

All examinations open book, open notes.

Quizzes

A quiz will be given at the beginning as noted above based on the material covered in the previous class

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.

Outcomes Course Matrix – CE 642

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 principles of soil mechanics as it relates to probability and develop the ability to apply these principles to solving problems in geotechnical engineering.			
Introduce development of engineering 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 from a geotechnical perspective using LRFD codified methodologies			
Explore current standard of practice for the concepts of 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			
Explore current standard of practice for the concepts of 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, 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:

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