CE 642 – 851 Foundation Design
Fall 2024

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:

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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	9-5	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	9-12	Geotechnical Desk Studies, Subsurface Investigations and Site Characterization. *Quiz No – 1* Read Chapter 4 Assignment – Relevant examples to be posted under separate cover.
3	9-19	Performance Requirements of Foundations *Quiz No – 2* Read Chapter 5 Assignment – Relevant examples to be posted under separate cover.
4	9-26	Bearing Capacity of Shallow Foundations Read Chapters 6 and 7 Assignment – Relevant examples to be posted under separate cover.
5	10-3	Settlement of Shallow Foundations *Quiz No – 3* Read Chapter 8 Assignment – Relevant examples to be posted under separate cover.

6	10-10	Shallow Foundations Geotechnical and Structural Design Read Chapters 9, 10 and 11 Assignment – Relevant examples to be posted under separate cover.
7	10-17	Introduction to Deep Foundations *Quiz No – 4* Read Chapter 12 Assignment – Relevant examples to be posted under separate cover. Lectures 1 - 5
8	10-24	Midterm Exam
9	10-31	Pile Load Transfer, Limit States and Axial Load Testing Read Chapter 13 and 14 Assignment – Relevant examples to be posted under separate cover.
10	11-7	Axial Capacity of Driven Piles – Static Analysis Read Chapter 15 Assignment – Relevant examples to be posted under separate cover.
11	11-14	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	11-26	Laterally Loaded Piles *Quiz No 6* Read Chapter 22 Assignment – Relevant examples to be posted under separate cover.
	11-28	Lecture not posted, Thanksgiving Holiday
14	12-5	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 48 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.

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

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Fall 2024

NJIT CIVIL AND ENVIRONMENTAL ENGINEERING

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

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://www.njit.edu/dos/sites/njit.edu.dos/files/NJIT%20University%20Policy%20on%20Academic%20Integrity_0.pdf

University Policy on Academic Integrity

Section 1. Purpose

New Jersey Institute of Technology is an institution dedicated to the pursuit of knowledge through teaching and research. The university expects that its graduates will assume positions of leadership within their professions and communities. Within this context, the university strives to develop and maintain a high level of ethics and honesty among all members of its community. Imperative to this goal is the commitment to truth and academic integrity.

This commitment is confirmed in this NJIT University policy on Academic Integrity. The essential quality of this Policy is that each student shall demonstrate honesty and integrity in the completion of all assignments and in the participation of the learning process. Adherence to the University policy on Academic Integrity promotes the level of integrity required within the university and professional communities and assures students that their work is being judged fairly with the work of others. This Policy defines those behaviors which violate the principles of academic integrity, describes a range of appropriate sanctions for offenses, and identifies a method for promoting the principle of academic integrity on campus.

Section 2. Definitions

Terms defined in the Student Code of Conduct also apply to the University Policy on Academic Integrity

Academic Dishonesty

The list below contains some general parameters that define academic dishonesty. While the definitions include examples, the examples themselves cannot be listed exhaustively. Therefore, the list of examples is not all inclusive.

Cheating/Copying

Cheating/Copying is defined as: Intentionally using, providing or attempting to use or provide unauthorized assistance, materials, information or study aids in any academic exercise, or preventing, or attempting to prevent, another from using authorized assistance and/or materials. Examples include the following:

- Copying or attempting to copy answers from or looking at another student's exam or a student'.
- Copying or attempting to copy from others during an exam or on an assignment
- Using or possessing any material not expressly permitted during an exam, such as notes, books, sticky notes, prohibited calculators.

- Using electronic devices such as smartphones, smartwatches, digital cameras, PDA's, data storage devices, computers, internet, or other electronic devices unless expressly permitted.
- Having someone else take an exam for you or asking someone for answers to a test/exam.
- Possessing tests, notes, materials, or property belonging to or generating from faculty, staff, and students without permission.
- Memorizing codes, formulas or programs from an external source that are not permitted by the professor and submitting them as your own work
- Submission of purchased term papers or projects done by others. Intentionally or knowingly helping or attempting to help another person commit an act of academic dishonesty.
- Taking an exam for someone else.
- Offering answers or information related to tests, exams, or assignments without prior instructor knowledge.
- Intentionally or knowingly helping or attempting to help another person commit an act of academic dishonesty.

Contract Cheating

Contract Cheating is defined as: The utilization of a third party or source to complete academic work (labs, exam papers, quizzes, homework assignments, sketches, graphic design etc) or facilitating the use of third party's services, for which a student another then submits said academic work for credit. Examples include the following:

- Unauthorized selling of a student's papers, study materials or exams, or the professors or university's teaching materials or exams.
- Paying someone to copy their answers whether it is an in-class exam, homework, project, assignment, etc.
- Utilizing or accessing an online resource or account service (Chegg, StackOverflow, Discourse, etc), whether such resource/service is free or requires payment for use or access, where the professor's or university's materials are uploaded without authorization.
- Take an exam for someone or have someone take an exam for you.
- Asking someone (a friend, family member, partner, classmate, etc) to complete any portion or all of an assignment or paper for you

Fabrication or Falsification

Fabrication/Falsification is defined as: Intentional and unauthorized falsification, alteration, reporting or invention of any information or citation in any academic exercise. Examples include the following:

- Artificially creating data when it should be collected from an actual experiment
- Unauthorized alteration or falsification of data, documents, codes, images, music, art or other work.

- Unauthorized omission of data, information, or results in documents, reports and presentations.
- Hiding data, results, or information using inappropriate scales, magnification and representation in charts, graphs and other forms of representation.
- Unauthorized impersonation of another person to complete an academic activity.
- Unauthorized use of another individual's computer login ID and password
- Citing nonexistent or irrelevant works.
- Making up citations on a bibliography or works cited page.
- Skewing data in accord with what you think results should be.
- Changing answers after an exam has been returned.
- Having one student sign in for another student to indicate that they were present when in actuality they were absent.

Plagiarism

Plagiarism is defined as: Using or attempting to use written, oral, or graphic work which was authored or prepared by another and submitting it as one's own without appropriate citation or credit. Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise. It is also a combination of stealing and lying about it afterwards.
Self-Plagiarism: Unauthorized reuse of previously published or submitted work for a class.

Examples include the following:

- Copying from a source without quotations or appropriate documentation.
- Copying from any source and altering a word or phrase to avoid exact quotation.
- Cloning someone else's ideas without attribution.
- Having someone else write a paper for you.
- Patchworking/changing key words and phrases but retaining the essential content of source.
- Utilizing an image for a paper or project without attribution.
- Recycling and submitting previously submitted work from one class to another for credit without citation or permission.

Unauthorized Collaboration/Collusion

Unauthorized Collaboration is defined as: Working with others (friend, parent, classmate, etc) on assignments, examinations, or projects that will be submitted for a grade *without specific permission from the instructor*. This applies to in-class or take-home tests, papers, labs, or homework assignments.
Collusion is defined as: When more than one student contributes to a piece of work that is submitted as the work of an individual. Individual assessment work should be entirely the work of the student submitting that work. Working together with other students on a piece of work that

will be submitted for individual assessment is not permitted and can result in an accusation of academic misconduct for all the students involved.

Examples include the following:

- Sharing work or answers with another student without the permission of the professor.
- Working together with another student on a take home exam, final exam or project without the instructor approval.
- Submitting homework identical to that of another student.
- Sharing code with another student for example in Computer Science and submitting work while logged into site for the course as the other student.
- Submitting programs or codes that were too similar to those of another student to have been accomplished without unauthorized collaboration on the assignments.

Section 3.Reporting, Investigation, and Adjudication Process

1. Faculty members will refer any allegations of Academic Dishonesty to the Office of the Dean of Students. If at any time, a student makes a charge of a violation of the Academic Integrity Policy concerning another student to an instructor, that instructor is obligated to report the matter to the Dean of Students without delay. If the maximum sanction for the alleged offense is below suspension, the Dean of Students reserves the right to appoint the Faculty member as the Investigator and/or Hearing Officer
2. Faculty members who observe any cheating will confiscate all materials used in the alleged violation.
3. The Dean of Students or their designee will investigate the matter to determine whether a violation is likely to have occurred. While the initial report/allegation may be verbal, a signed written statement is required for adjudication.
4. If a student refutes the academic integrity allegation, the Dean of Students or designee will initiate the adjudication procedures. A hearing will proceed as outlined in the Student Code of Conduct.
5. Students who are accused of academic dishonesty will have the option to resolve the matter through an Administrative Hearing or a Hearing Board. *In some cases an Informal Meeting with the professor may be an option but it is dependent upon the professor's availability or willingness to meet considering the preponderance of evidence.

Section 4. Course Failure: XF Sanction System

1. A student who fails a course due to an egregious act of academic misconduct for a first time offense or for a second case due to academic integrity violations will be assigned a grade of "XF" in that course and placed on probation for a period to be determined by the sanctioning authority. The "XF" will be treated in the same way as an "F" for the purposes of Grade Point Average, course repeatability, and determination of academic standing.

2. The student may petition the Office of the Dean of Students to remove the "X" portion of the grade once the probationary period has passed and the following conditions are satisfied.
    a. Successful completion of the Academic Integrity Workshop Series.
    b. Twelve months have passed since the grade of "XF" was imposed
    c. The student has not been found responsible for another act of academic dishonesty or similar offense.
3. The student will be assigned to the Academic Integrity Workshop series for the semester following the adjudication of the academic integrity allegation. A student will be permitted two attempts to successfully complete the Academic Integrity Series. If a student fails to successfully complete the Academic Integrity Series, the "X" will remain permanently.
4. Notation on the student's transcript shall read, "Failure due to Academic Dishonesty."
5. Students with the "XF" designation will be prohibited from officially representing the university, holding office in a student organization or representative body, and may be relieved from student employment at NJIT
6. Students receiving more than one "XF" grade may be expelled from the university.

Section 5. Violation Levels and Sanctions

Academic Integrity violations are categorized into four levels and are presented with a list of behaviors and examples. This list is for illustory purposes only and is not exhaustive by any means. The **Sanctions** listed here are examples only and the Office of the Dean of Students maintains discretion when deciding on the most appropriate sanction when a student is found responsible for violating this policy. Sanctions for a given violation may be imposed differently on those with more or less experience as students. Thus, violations of academic integrity by graduate students may be penalized more severely than the same violations by inexperienced undergraduate students.

Level 1. These are violations which may result in the failure of the specific work submitted. These violations of academic integrity may occur because of ignorance or inexperience in understanding the academic integrity principles and policies on the part of the individual(s) committing the violation and involve a minor part of the credit awarded in the course. Examples include:

a. Copying one answer or minor homework assignment(s) and submitting the same for credit.
b. Failure to properly acknowledge or document references on submitted work which represents a minor part of the credits to be awarded in the course.
c. Impeding student access to reference material, i.e. keeping referenced material. Giving or receiving unfair aid in the completion of an assignment.
d. Engaging in unauthorized collaboration/collusion.

Possible Sanction/s:

- Failure in the specific work submitted such as a zero and educational sanctions

- Official warning
- Reflection paper
- Grade reduction
- Academic Integrity modules

Level 2. These are violations where the action/s likely did not occur because of ignorance or Inexperience and thus carry a more punitive response/measure. It could result in failure of the course and mandatory attendance to the Academic Integrity Workshop Series.
Examples may include but are not limited to:

a. Cheating on an examination (not premeditated), including but not limited to utilizing/accessing online sources such as Chegg, Stackoverflow, Discourse or Google during an exam.
b. Altering any work after it had been graded, and re-submitting it for further credit.
c. Copying laboratory projects; falsely reporting, or tampering with laboratory data.
d. Failing to acknowledge that the work submitted for credit is the work of a collaboration.
e. Giving or receiving unfair aid in completion assignment.
f. Permitting another student to copy work during an examination.
g. Signing in or clicking in for another student for class attendance.
h. Submission of the same work for more than one course without the permission of the instructor(s) or prior authorization. Using material prohibited from the examination, e.g. calculator when prohibited by Instructor.
i. Providing their assignments, paper exam or quiz to another student.

Possible Sanction/s:

- Failure in the course
- Probation or suspension for one semester
- Reflection paper
- Official warning
- Second offense XF notation
- Other sanctions as deemed necessary for the specific incidence.

Level 3. These are serious violations for which sanctions may result in a suspension for one or two semesters from the university. Student organizations may face temporary suspension from university. These violations of academic integrity generally, but don't necessarily has to entail advanced planning or involve significant part of credit awarded in the course (normally one quarter to less than one-third).Examples may include, but are not limited to:

a. Premeditated cheating on an examination.
b. Plagiarizing extensively in part, written, oral or graphic work which was authored or prepared by another.
c. Permitting one's work to be submitted by another student for his/her/their credit.
d. Giving or receiving unfair aid in the completion of an assignment.

e. Splitting up independent assignments with others and copying either in part or whole from each other.
f. Providing another student with academic materials (e.g. homework or quizzes, lab reports, outlines etc) when permission was explicitly prohibited by the professor in the class syllabus.

Possible Sanction/s:

- Failing grade,
- grade reduction,
- XF notation,
- Suspension (semester/year),
- Probation
- Educational sanction as deemed necessary.

Level 4. These are the most serious and flagrant violations for which the sanction may result in expulsion from the university. Student organizations engaged in a violation(s) may face revocation of official recognition from the university. These violations of academic integrity generally, but don't necessarily have to, entail advanced planning, may include conspiring with others or involve a substantial part of credit awarded in the course (normally one third or more).Examples may include, but are not limited to:

a. Any repeated violation after the student has been placed on suspension or received more than one XF.
b. Premeditated, conspiratorial cheating on any examination.
c. Taking an examination for another student or vice versa.
d. Replacing the name on a paper or an assignment and submitting it as one's own work.
e. Unauthorized obtaining or transmitting of examination material before examination.
f. Plagiarizing, in full or significant/substantial part written, oral or graphic work which was authored or prepared by another.
g. Forging documentation such as medical, work or government related.
h. Contract cheating.
i. Repeat violations.

Possible Maximum Sanction/s:

- Suspension for 1 or more years
- Failure of course with XF notation that grade cannot be replaced by retaking class
- Permanent expulsion
- Denial of degree
- Bar readmission
- Revocation of degree and withdrawal of diploma