CEE 614– Course Section 106: Course Title: Underground Construction

(3 credits)

Lectures Day(s) Thursday:6:00 pm – 8:50 pm
Faculty Memorial Hall, Room FMH 411

Instructor Alan Slaughter, P.E. Office Hours: Thursday: 4:15 to 5:30
Email: slaughte@njit.edu
Phone: 973 567 2726

Prerequisite: Undergraduate course in soil mechanics

Required Textbook

Introduction to Tunnel Construction; Second Edition
Authors David Chapman, Nicole Metje and Alfred
Publisher: CRC Press; Paperback, ISBN 13:978-1-4987-6624-1

Other Recommended Texts & Reading

Prerequisites: undergraduate course in soil mechanics

Course Description *(from NJIT's course catalog)*

Various aspects of underground construction, including rock and soft ground tunneling; open cut construction, underpinning; control of water; instrumentation; drilling and blasting rock; and estimating underground construction costs. Case studies and a possible field trip to and underground construction site may be included.

http://catalog.njit.edu/undergraduate/newark-college-engineering/civil-environmental/civil-engineering-bs/

Course Objectives (General)
By the end of this course, the student will be able to

Course Topic 1

Students will listen to the lectures and read the text in order to Identify the individual parts to an estimate and be able to understand and Identify the various items that make up an estimate.

Rock and soft ground

Course Topic 2:

During the semester the students will prepare a project estimate and schedule based on the project in the book. This included a prebid conference for the project during the semester. It all dramatizes the way a bid is actually done.

Course Topic 3

The students will identify, demonstrate, describe and organize schedules using CPM and bar chart compositions.

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations.

https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Communication: I maintain communications with my students by having office hours before class and after class if necessary. They can also contact me either by E-mail or canvas.

Lectures/Class: Attendance is checked early on in one of the first classes. If it appears that fewer students are showing up for some reason, attendance is taken again. The class is open communication and they ask questions as needed.

Handouts: Canvas is used to provide any handouts, electronically in its website.

Homework: Homework is provided on a weekly basis where possible. Students are expected to work individually and not in groups. The only change to this is the project where they my work in groups of two.

Homework Format: Homework is prepared in different formats depending on the assigned work. It may be a schedule, calculations, or writeups. They set their own format.

Late Homework: Late homework is accepted by email only. Generally 5 points are taken off which can be adjusted on the quality of work or the lateness of the work.

Homework Solutions: Homework can be provided only after all home work have been completed.

Exams: Exams are put on canvas. But given in class where I can proctor them. The studentsare allowed to use the book and notes in word excel and powerpoint.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework	15%
Midterm Exam	25%
Project	30%
Final Exam	30%

The minimum requirements for final letter grades are as follows:

A = 90%, B+ = 85.0%, B = 80%, C+ = 75%, C = 70%, D = 65%, F < 65%

Grades are based on the sum of the various numerical grades throughout the semester

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In

cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Instructor Commitment: You can expect the instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

Course Schedule: Include a table with a preliminary schedule including estimated exam dates, course topics, project dates, etc.

Course Outline

Week No. /Date	Topics	Chapter Reading
1/ Jan. 23	Introduction – History Types of tunnels	Chapt. 1
2/ Jan. 30	Geotech & Site Investigation HW 1	Chapt. 2, 7
3/ Feb. 6	Shafts HW 2	Chapt. 3
4/ Feb. 13	Gnd. Improvement and lining sys. Cut and Cover HW 3	Chapt. 4 Chapt. 5.8
5/ Feb. 20	Rock Excavation – Blasting HW 4	Chapt. 5.6
6/ Feb. 27	Tunnel Inspections and Rehabilitation HW 5	
7/ Mar. 6	**Midterm Examination**	
8/ Mar. 13	Rock Tunnel – TBM HW 6	Chapt. 5.5

Spring Vacation March 16th thru March 22nd

9/ Apr. 3 Earth Tunneling Chapt. 5.2, 5.3
Shield Tunneling Methods HW 7 5.4

10 Apr.10 Tunnel Construction Techniques HW 8 Chapt. 5.1, 5.7

11/ Apr. 17 Immersed Tube Tunnels HW 9 Chapt. 5.9, 5.10,
Microtunneling 5.11, 5.12

12/ Apr. 24 Tunnel Linings HW 10

13/ May 1 Safety Chapt. 6

15/ May 8 **Final Examination**

Course Objectives Matrix – Course No. CE 410 – Section Number 101

Strategies and Actions	Course Student Learning Outcomes	ABET Student Outcomes (a-k)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: For each course topic, list the measureable learning outcomes for that topic.				
Input a strategy and action	Input student learning outcome	1, 5, 7	1	Input assessment methods/metrics
Course Objective 2: For each course topic, list the measureable learning outcomes for that topic.				
Input a strategy and action	Input student learning outcome	1, 3, 5, 6	1	Input assessment methods/metrics
Course Objective 3: For each course topic, list the measureable learning outcomes for that topic.				
Input a strategy and action	Input student learning outcome	1, 2, 4, 6,	1, 2	Input assessment methods/metrics

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 scholarships among our faculty and students
• to promote service to the engineering profession and society

Program Educational Objectives
Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

- **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
- **Professional Growth:** Alumni will advance their technical and interpersonal 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 academia, business, and law through further education.
- **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.

Student Outcomes

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

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

Updated 1/6/2025