

## DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

### CE 210-102 Construction Materials & Procedures

Spring 2024  
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**Text:** Halpin, Daniel W. and Senior, Bolivar A., Construction Management, 5th Edition Wiley, ISBN: 9781119256809

Prerequisite: HUM 101. Introduction to construction management organization, contracts, construction safety, engineering economics, and engineering ethics. Studies current practices of heavy construction including soil and rock excavation productivity, and building construction materials and procedures. Field trips to construction sites provide opportunities to directly view many of the practices.

**COURSE DESCRIPTION AND OBJECTIVES:** This course is a general comprehensive course on construction management and engineering in the Civil and Environmental Engineering Department at NJIT. It provides a broad understanding of the construction environment, the engineering and construction project management process and development process, with particular emphasis on planning, scheduling and cost management, which are key pillars of successful construction management. Also, the various tools and techniques and their interactions in the cost-effective development of constructed facilities, will be covered with practical illustrations and complemented by hands-on exercises and case studies.

**LEARNING OUTCOMES** This course covers the environment, planning and management issues related to the modern approach of construction management. Using the cases and background materials, and methodologies covered, you should be able to: - Analyze the feasibility of a construction project within resource constraints. - Understand the basic structure of the construction industry, its environment, its various sectors and its overall relationship to the US and global economy. - Devise the best organizational structure capable of carrying out the project. - Understand engineering economic principles and apply the concepts of life-cycle management of a constructed project from the owner's perspective (feasibility, financing, rate of return, contract management, quality control). - Define the role of the general contractor, and understand the perspective of the GC as a business (estimating, bidding, project financing, cash flow management, materials and operations management). - Understand the components of modern Professional Construction Management, and its relationships to other project participants as a form of project delivery.

*“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](mailto:dos@njit.edu)”

## COURSE OUTLINE

Day	Topics	Reading Assignment	Homework
1/18	Development Cycle, Construction Organizational Structures	2, 3	2.1, 2.5, 2.7, 2.8, 2.10, 3.2, 3.3
1/25	Overview of Construction Industry, Contracts: Legal Structures	1, 4, 5	4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.4
2/1	Engineering Economics & Time Value of Money	11	11.1, 11.3, 11.4, 11.5, 11.7, 11.13, 11.14
2/8	Engineering Economics & Time Value of Money: Project Cash Value	12, 13	12.1, 12.3(do not calculate ROR)
2/15	Construction Planning	7	7.3 (a) and 7.4
2/22	Construction Scheduling	8	8.1, 8.2, 8.6
2/29	Material Management	19	19.1, 19.2, 19.3
3/7	<b>MIDTERM EXAM / Field Report #1 Due</b>	-	-
3/21	Material Management continued	19	19.1, 19.2, 19.3
3/28	Special Scheduling Applications, PERT	9	9.1, 9.2
4/4	Equipment Ownership and Productivity	14, 15	14.3, 14.5, 15.1, 15.2, 15.5
4/11	Construction Cost Estimating and Control, Safety, Engineering Ethics	17, 20, Handout	17.1, 17.2, 17.3,
4/18	Construction Labor	16	16.1, 16.2, 16.3
4/25	Cost Control, Review / <b>Field Report #2 Due</b>	18	-
5/9	<b>FINAL EXAMINATION</b>		

**Course Delivery:** Face to face in the classroom in CKB 120

**Exams:** Exams will be completed on **CANVAS**.

**Assignments:** Selected homework problems will be assigned each week and submitted on **CANVAS**. Each student will be required to submit two reports on construction field visits.

Field Report #1 due: March 7, 2024

Field Report #2 due: April 25, 2024

**Basis of Grading:** Homework = 20%, Reports = 20%, Midterm Exam = 25%, Final = 25%,  
Class Attendance & Participation = 10%

The final grade will be based upon the following percentages:

A =	90 to 100%
B+ =	85 to 89%
B =	80 to 84%
C+ =	75 to 79%
C =	71 to 74%
D =	68 to 70%
F =	below 68%

### **Field Trip Reports**

Each student will submit two (2) reports on self-conducted field trips.

#### **Outline for Field Trip Reports:**

1. *Introduction:* Identify the project, its location and the type of construction. Give the dates of your visitation. Identify the Owner, Contractor, and Architect-Engineer
2. *Field Investigation:* Describe the project in detail based on your field visitation. Report on the present stage of construction. Report on the labor, equipment, and materials on the job. Report on production rates. Report any discussions with personnel (see note below).
3. *Engineering Evaluation:* Present your own evaluation of the equipment, materials, and procedures being used on the project based on your knowledge from CE 210. Suggest alternatives that might improve job progress and efficiency. Discuss any environmental and safety aspects of the project.
4. *Appendix:* (If any) Present applicable codes, manufacturer's literature, news articles, web links, etc.
5. *Figures and Photographs:* These or sketches are strongly recommended. Refer to all figures and photos in the body of the report.

**Note:** Make certain that you do not disrupt the ongoing construction activities during your visit. Always check first with the person-in-charge, usually the project superintendent, upon your arrival. Be courteous and remember, construction managers are busy people.

**Report Format and Grading:** The report should be word processed on 8.5 x 11 on bond paper. Correct grammar and spelling are required. Grading will be based on (1) Technical content, (2) Communication effectiveness including organization, grammar, spelling, clarity, and neatness. Suggested length of the text portion of the report (Sections 1 in, 2, and 3 above) is 4 pages.

### **Miscellaneous Notes:**

You are to show all calculations. If you need multiple sheets they need to be numbered and stapled. Sloppy, untidy, frizzled edges or dog-eared submissions will not be accepted. All written assignments shall be typed (or neat hand writing).

Collaborating, sharing, and/or copying for homework is NOT allowed. Credit will not be given to individuals who either asked or allowed such behaviors. The NJIT honor code will be upheld and any violation will be brought to the immediate attention to the Dean of Students.

[http://studentsenate.njit.edu/wpcontent/uploads/2010/03/University\\_Code\\_on\\_Academic\\_Integrity.pdf](http://studentsenate.njit.edu/wpcontent/uploads/2010/03/University_Code_on_Academic_Integrity.pdf)

Late assignments will NOT be accepted. Homework received after the due date will NOT be graded and a ZERO will be counted for that assignment.

**\*\*\*ANY ASSIGNMENT THAT IS COPIED WILL RECEIVE A ZERO AND THOSE STUDENTS INVOLVED WILL BE SUBJECT TO DISCIPLINARY ACTION IN ACCORDANCE WITH THE NJIT HONOR CODE\*\*\***

All assignments are to be submitted in class on paper, unless otherwise requested, on the due date. Email is only to be used if you will be absent from class with the understanding that permission was granted and shall not be the primary form of submission.

Students are responsible for submitting all homework, projects, assignments, etc. on the due date (during class time). Students who miss assignments due to attendance must contact the Dean of Students to be excused for absences. Students who miss class with no valid excuse (as determined by the Dean of Students) will not be given any accommodations to complete work.

There will be no makeup exams.

**Outcomes Course Matrix – CE 210 Construction Materials & Procedures**

<b>Strategies, Actions and Assignments</b>	<b>ABET Student Outcomes (1-7)</b>	<b>Program Educational Objectives</b>	<b>Assessment Measures</b>
<b>Student Learning Outcome 1: Explain terms used to describe construction materials, methods and procedures used in heavy building construction management and construction management and organization.</b>			
Introduce the United States system of delivery of engineering and construction services	4	1, 2, 3	Homework, quizzes and exams
Introduce equipment labor and methods used in heavy and building construction	7	1	Homework, quizzes and exams
<b>Student Learning Outcome 2: Apply the process of job site planning, scheduling and construction productivity estimating.</b>			
Introduce critical path method scheduling	1, 2	1	Homework, quizzes and exams
Introduce methods used to calculate and estimate excavation equipment productivity	1, 2	1	Homework, quizzes and exams
<b>Student Learning Outcome 3: Discuss construction contracts in the context of the United States legal system.</b>			
Introduce the United States legal system and contracts	4	1, 3	Homework, quizzes and exams
Present the NCEES model rules of professional conduct	4	1, 3	Homework, quizzes and exams
Introduce the role of OSHA and construction site safety	4	1, 2, 3	Homework, quizzes and exams
<b>Student Learning Outcome 4: Observe and report on construction project site visits.</b>			
Visit construction sites and observe the project status and operations at the site.	3	1, 2	Field reports.
Introduce engineering economics and its role in selection of alternatives.	7	1, 2	Homework, quizzes and exams.

## 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 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

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