



Professor Frank L. Golon Ph.D., P.E.

Spring 2024

## CE 210-004: CONSTRUCTION MATERIALS & PROCEDURES

### Class Hours

**Tues & Thurs 8:30 AM- 9:50 AM** COLT 416 (First Day of Classes Tues. January 16, 2024)

Office Hours by appointment (Colton 261) at (973) 491-6900 or [fg4@njit.edu](mailto:fg4@njit.edu)

### REQUIRED TEXT

Halpin, Daniel W. and Senior, Bolivar A., Construction Management, 5<sup>th</sup> Edition Wiley, and ISBN: 9781119256809. This textbook is referred to as DH in the lecture readings and other references below.

### OTHER REFERENCE

International Building Code (IBC 2018 & 2021) and some of its supplements  
ASCE report card US Infrastructure & DOT codes Bridge & Roads & WSJ Articles  
*Construction Methods and Management* by S.W., Nunnally, 6<sup>th</sup> edition  
Other files are assigned electronically as supplemental readings and will be e-mailed to class participants. These are denoted in course outline as Efiles.

**Prerequisites:** ENGL 101

### 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.

COURSE OUTLINE (Subject to updating throughout semester)

Week	Dates	Textbook/Reading	Assignment (*)	Topics
1	16 & 18 Jan	DH Chapters 1,2 AIA Docs e-mailed or hand-out	Questions 2.1, 2.5 DH	Overview of Construction Industry; Development Cycle for Projects
2	23 & 25 Jan	DH Chapters 3, 4	Assignment #1 Questions 3.4, 3.11(ref to AIA Doc & canvas)	Development Cycle for Projects (cont.), Contracts
3	30 Jan & 1 Feb	DH Chapters 5, 6	Assignment #2 4.13 and handout or canvas	Legal Aspects of Organizations; Impact of Taxes-Field Trip (1)
4	6 & 8 Feb	Chapter 6(cont.), & 14	Case: So St & Penn Ave Urban Renewal LLC Assignment #3 Handout	Depreciation of Assets Project PILOT
5	13 & 15 Feb	DH Chapters 14	Proforma Problem & FV PV Time Value Money Assignment #4	Mathematics of Money
6	20 & 22 Feb	DH Chapters 11, 12 & AIA Document G702	Future and Present Values; Annuities & sinking funds, Bonds	Present and Future Values; Proforma
7	27 & 29 Feb	DH Chapter 13 ASCE Report card	Problem Project Funding	Case Study NY Ave
8	5 & 7 Mar	DH Chapter 7 canvas Nunnally book chapters	Assignment # 5 Problem 7.3, MS project WBS Model Hand out	Project Planning & Scheduling CPM Hand- out
9	12 & 14 Mar	No Class Spring Break	No Class Spring Break	No Class Spring Break
10	19 & 21 Mar	Fast track case study South Street Urban Renewal-CPM	MS schedule & presentation with problems-CPM	Practical Case Studies- Newark & Elizabeth Projects
11	26 & 28 Mar	Nunnally canvas OSHA 1926	Structural bridges & building Materials	Construction Materials
12	2 & 4 April	Handout, Nunnally Codes	Structural bridges & building Materials	Construction Materials <a href="#">Project Report due</a>
13	9 & 11 April	Handout, Nunnally IBC Codes	Structural building Materials testing	Construction Materials
14	16 & 18 April	Handout, Nunnally IBC Codes	Structural building Materials - Trusses	Construction Materials
15	23 & 25 April	Handout, Nunnally IBC Codes Simpson	Structural building Materials - Trusses	Construction Materials
16	30 April- May 2	Final Class Reading day review for final	Final Class Reading day review for final	Final Class Final covers entire semester

**Reading day 1 & 2 May 1 & 2 - Final Exam: May 3 - 9 - TBD**

\* OSHA & Ethics will be covered each week specific to the topics

Assignment sheet will be handed out in class and/or found in canvas with due dates

\*Actual Assignments may differ from list and can be changed by Instructor during Semester.

The overall term grade will be based on the following elements:

Paper/Project Case Study: 17.5%  
Class Quizzes 1-3 or Mid-term: 10% - to be determined during semester  
Homework: 20%  
Class Participation/attendance: 10%  
Test: 17.5% - to be determined during semester  
Final: 25%

### **Field Trip Reports**

Each student will submit one (1) report, on **self-conducted** field trips according to the following schedule:

1. Project Administration: In this first part, you will establish a construction project of your choice, or a section of the class field trip project:
  - a- The project background, scope, budget, staging and key milestones.
  - b- Understanding of the contract and project delivery system, relationships between parties, progress measurement/payment, change-order management.
  - c- Description of the Construction Methods and Materials, and an engineering evaluation of a key project component (e.g. foundation design, etc.)
  - d- A Preliminary Work Breakdown Structure.  
**Project Planning, including:**
    - e- A detailed Work Breakdown Structure for all building systems and work elements or a building code evaluation used on site.
    - f- An MS Project CPM Schedule integrated with a cost estimate to enable cost/schedule integration.Reports are due April 4<sup>th</sup> - must hand-in classroom

### **Outline and Content Elements for Each (Part of) the 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 in. bond paper submitted in class. 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 is at least 5 pages.

NJIT Honor Code: the NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students.

## **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 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:** 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

This program is accredited by the Engineering Accreditation Commission of ABET, <http://abet.org>.

## Outcomes Course Matrix – CE 210-Construction Materials & Procedures

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
<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.

Revised 02/20/2024