Spring 2019

CE 210-004: Construction Materials & Procedures

Fadi Karaa

Dr. F. Karaa Spring 2019

CE 210-004: CONSTRUCTION MATERIALS & PROCEDURES

Class Hours

Tue Thu 11:30 AM- 12:50 PM FMH 319 (First Day of Classes January 22, 2019)

Office Hours (Colton 274)

Thu 4:00 PM- 5:30 PM and Wed 4:30 PM- 6:00 PM or by e-mail or appointment
at (973) 642-4198 or karaa@njit.edu

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

OTHER REFERENCE

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: *HUM 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	22, 24 Jan	DH Chapter 1,2	As posted in Moodle	History and Basic Concepts of Construction; Bid Package Development
2	29, 31 Jan	DH Ch. 2 (ctd.), 3, 4	As posted in Moodle	Development Cycle for Projects (ctd.), Contracts
3	5, 7 Feb	DH Ch 5, 6		Alternative Project Delivery Systems/ Legal Aspects/ Taxes
4	12, 14 Feb	Chapter 6(ctd), E-File	As posted in Moodle	Impact of Taxes/Depreciation of Assets- Project Organization Structures
5	19, 21 Feb	DH Ch 7; DH Ch 8	MS project WBS Model	Project Planning WBS); Project Scheduling (1)
6	26, 28 Feb	DH Ch 8 (ctd.);	Problem 8.2, Bonus Assignment figure 8.26 MS Project generalized relationships	Quiz 1/ Project Scheduling (2);
7	5, 7 Mar	DH Ch 10	Resource Leveling and Time-Cost Trade-Off problems	Resource-Related and Linear Scheduling; Computer applications
8	12, 14 Mar	DH Ch 9	PERT Problem	Construction Materials (Part I)/ PERT Advanced Scheduling
	17-24 Mar	SPRING RECESS		
9	26, 28 Mar	DH Ch 11	Future and Present Values; Lifecycle costing	Mid-Term/ Present and Future Values; Lifecycle Costing;
10	2, 4 Apr	DH Ch13	Problem Project Funding	Project Funding
11	9, 11 Apr	DH Ch 13 (ctd.)		Project Funding Case
11	16, 18 Apr	Handout, Dh Ch. 19;	TBA	Construction Materials and Properties (Part 2); Building Systems**
12	23, 25 Apr	Engineering Ethics Handouts and Case	Ethics Assignment I	Engineering Code of Ethics – Knowledge and Case
13	30 Apr, 2 May	DH Ch 17, Ch 15	Problem: Equipment Balance Planning	Overview of Cost Estimating;

			Ethics Case	Productivity Based Estimating ; Equipment Productivity – Heavy Construction
14	7, 9 May	Study Period		
15	10- 16 May	Finals		

Final Exam Period: May 10-16.

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

GRADING:

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

Paper/Project Case Study: 17.5%
Quiz 1: 10%
Homework: 20%
Class Participation/attendance: 10%
Mid-Term: 17.5%
Final: 25%

Field Trip Reports

Each student will submit two (2) reports, which can be 2 Parts of the same project on self-conducted field trips according to the following schedule:

1. Project Administration: In this first part, you will establish for 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.
   Part 1 is due March 5 at 5PM.
2. Project Planning, including:
   a- A detailed Work Breakdown Structure for all building systems and work elements
   b- A MS Project CPM Schedule integrated with a cost estimate to enable cost/schedule integration.
   Part 2 is due April 30 at 5PM.

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 and electronic file submitted on Moodle. 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 each of the 2 Parts of the report is at least 4 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.

Outcomes Course Matrix – CE 210-004 -Construction Materials & Procedures

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
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.			
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
Student Learning Outcome 2: Apply the process of job site planning, scheduling and construction productivity estimating.			
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
Student Learning Outcome 3: Discuss construction contracts in the context of the United Sates legal system.			
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
Student Learning Outcome 4: Observe and report on construction project site visits.			
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 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

Spring 2019 Academic calendar

January	22	Tuesday	First Day of Classes
January	26	Saturday	Saturday Classes Begin
January	28	Monday	Last Day to Add/Drop a Class
January	28	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	29	Tuesday	W Grades Posted for Course Withdrawals
February	4	Monday	Last Day for 90% Refund, Full or Partial Withdrawal - no refund for partial withdrawal after this date
February	18	Monday	Last Day for 50% Refund, Full Withdrawal
March	11	Monday	Last Day for 25% Refund, Full Withdrawal
March	17	Sunday	Spring Recess Begins - No Classes

			Scheduled - University Open
March	24	Sunday	Spring Recess Ends
April	8	Monday	Last Day to Withdraw
April	19	Friday	Good Friday - No Classes Scheduled - University Closed
May	7	Tuesday	Friday Classes Meet
May	7	Tuesday	Last Day of Classes
May	8	Wednesday	Reading Day 1
May	9	Thursday	Reading Day 2
May	10	Friday	Final Exams Begin
May	16	Thursday	Final Exams End
May	18	Saturday	Final Grades Due
TBA			Commencement