Professor Frank L. Golon Ph.D., P.E. Spring 2018

CE 210-004: CONSTRUCTION MATERIALS & PROCEDURES

Class Hours

Wed & Fri 1:00 PM- 2:25 PM KUPF 117 (First Day of Classes Wed. January 17, 2018)

Office (Colton 261) at (973) 491-6900 or fg4@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

International Building Code (IBC 2015) and some of it supplements

Construction Methods and Management by S.W., Nunnally, 6th 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: *HSS 101, CIS 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	17 & 19 Jan	DH Chapters 1,2 AIA Docs e-mailed or hand-out	Questions 2.1, 2.5	Overview of Construction Industry; Development Cycle for Projects
2	24 & 26 Jan	DH Chapters 3, 4	Questions 3.1,3.11, 4.1, 4.11, 4.12	Development Cycle for Projects (cont.), Contracts
3	31 & 2 Jan-Feb	DH Chapters 5, 6	Questions 5.5, problem chapter 6 & e-mailed information	Legal Aspects of Organizations; Impact of Taxes-Field Trip (1)
4	7 & 9 Feb	Chapter 6(cont.), & 14	Case: So St & Penn Ave Urban Renewal LLC	Depreciation of Assets Project PILOT
5	14 & 16 Feb	DH Chapter 11	Proforma Problem & FV PV Time Value Money	Quiz1/Mathematics of Money
6	21 & 23 Feb	DH Chapters 11, 12 & AIA Document G702	Future and Present Values; Annuities & sinking funds, Bonds	Present and Future Values; Proforma
7	28 Feb & 2 Mar	DH Chapter 13	Problem Project Funding	Case Study NY Ave
8	7 & 9 Mar	DH Chapter 7 E-mail Nunnally book chapters	Problem 7.3, MS project WBS Model	Project Planning
9	14 & 16 Mar	Spring Break	Spring Break	Spring Break
10	21 & 23 Mar	Nunnally (cont.)	Problem 8.2, MS Project	Mid-Term/ scheduling
11	28 & 30 Mar	Fast track case study South Street Urban Renewal	MS schedule & presentation with problems	Practical Case Studies-Newark & Elizabeth Projects
12	4 & 6 April	Nunnally E-mail 1926	OSHA & Structural Materials	Construction Materials
13	11& 13 April	Handout, Nunnally IBC Codes	OSHA Structural building materials	Construction Materials and Properties; Building Systems
14	18 & 20 April	Handout, Nunnally IBC Codes	Structural building materials	Construction Materials
15	25 & 27 April	Handout, Nunnally IBC Codes	Structural building materials	Construction Materials
16	4 & 10 May	Finals week	Finals week	Finals week

Final Exam Period begins: May 4.

*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 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 February 28 hand in at class.
2. Project Planning, including:
   a- A detailed Work Breakdown Structure for all building systems and work elements
   b- An MS Project CPM Schedule integrated with a cost estimate to enable cost/schedule integration.
   Part 2 is due April 25 hand in at class

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.

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: Recent 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: Recent alumni will advance their skills through professional growth and development activities such as graduate study in engineering, professional registration, and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Recent alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, and humanitarian endeavors.

Our student outcomes are what students are expected to know and be able to do by the time of their graduation:

(a) an ability to apply knowledge of math, science, and engineering
(b) an ability to design and conduct experiments, as well as interpret data
(c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of ethical and professional responsibility

(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use techniques, skills and modern engineering tools necessary for engineering practice

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Course Objectives Matrix – CE 210 Construction Materials and Procedures

Strategies and Actions	Student Learning Objectives	Student Outcomes (a-k)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: Develop an understanding of terms used to describe construction materials, methods and procedures used in heavy building construction, and construction management and organization.				
Introduce the United States system of delivery of engineering and construction services.	Students will become familiar with owner, engineer, contractor organization and project responsibilities.	f	1, 2, 3	Homework, quizzes, and exams.
Introduce equipment, labor and methods used in heavy and building construction.	Students will become familiar with equipment, labor and methods used on construction projects.	k	1	Homework, quizzes, and exams.
Introduce technology and standards used for basic construction materials.	Students will learn about the basic of construction materials.	a, e	1	Homework, quizzes, and exams.
Course Objective 2: Learn the process of job site planning, scheduling and construction productivity estimating.				
Introduce critical path method scheduling.	Students will learn the basics of critical path methods scheduling and job site planning.	a, e	1	Homework, quizzes, and exams.
Introduce methods used to calculate and estimate excavation equipment productivity.	Students will learn the basics of estimating excavation equipment productivity.	a, e	1	Homework, quizzes and exams.
Course Objective 3: Introduce construction contracts in the context of the United States legal system.				
Introduce the United States legal system and contracts.	Students will become familiar with the United States legal system and contracts.	f	1, 2, 3	Homework, quizzes, and exams.
Present the NCEES model rules of professional conduct.	Students will learn the rules of engineering ethics.	f	1, 2, 3	Homework, quizzes, and exams.

Introduce the role of OSHA and construction site safety.	Students will be aware of the role of OSHA and site safety on construction projects.	f	1, 2, 3	Homework, quizzes, and exams.
Course Objective 4: Observe and report on construction project site visits.				
Visit construction sites and observe the project status and operations at the site.	Students will learn how to write a construction site visit report which covers methods, materials, labor, equipment, safety, and environmental concerns.	g, h, j	1, 2	Field reports.
Introduce engineering economics and its role in selection of alternatives.	Students will learn the basics of engineering economics.	k	1, 2	Homework, quizzes and exams.