Department of Civil and Environmental Engineering
Course Description and Outline

CE 414 – Engineered Construction Fall 2017
Thursday, 2:30-5:25 pm Dr. John Schuring

Prerequisites: CE 210, CE 332, CE 341

Course Objective:
Design, erection, and maintenance of temporary structures and procedures used to construct an engineering project. Business practices, codes, design philosophies, construction methods, hardware, inspection, safety, and cost as they pertain to engineered construction projects..

Course Texts:
The principal texts are:
A: Ratay, R.T., *Temporary Structures in Construction*, 3rd Edition, McGraw Hill, 2012.
In addition, the reference texts listed below are recommended for further study.
Reference Texts:
B: OSHA Regulations 29 CFR, Part 1926, Safety and Health Regulations for Construction.
C: ASCE/SEI Standards 37-02, *Design Loads on Structures During Construction*, American Society of Civil Engineers, 2002.
D: Johnston, D.W. *Formwork for Concrete*, 8th Edition, SP-4(14), American Concrete Institute, 2014.
E: Souder, C., *Temporary Structure Design*, Wiley, 2014.

Course Format: Most classes will be a lecture format supplemented with interpretative exercises. Homework problems and designs will be assigned throughout the course. Two exams will be given including a midterm and a final.

***Honor Code:** Students are advised that the NJIT Honor Code will be upheld in this course, and any violations will be brought to the immediate attention of the Dean of Students.

Course Grading Basis: Assignments/Quizzes = 45%; Midterm Exam = 25%; Final Exam: 25%; Class Participation = 5%.

Instructor Contact: Colton Hall, Room 225; Ph: 973-596-5849; Fax: 973-596-5790; schuring@njit.edu. Office hours: Mon. 4:00-5:00, Thurs. 11:00-1:00; other hours by appointment.

Course Syllabus: *Please see next page.* Students will be consulted on any substantial changes to the course syllabus. Changes will be announced in advance.

COURSE OUTLINE – CE 414

Week	Date	Topics	Reading (Text A: Ratay)
1	Sept. 7	Introduction to Engineered Construction; Construction Loads; Example Construction Failures	Ch. 1, 3, 23
2	Sept. 14	Overview of Codes, Standards, and Regulations; Competent Person Rules; Most Cited OSHA Violations; Ladders and Scaffolding	Ch. 2, 4, 5, 14; OSHA Subpart L, M, X
3	Sept. 21	Confined Spaces; Pressure of Fresh Concrete	
4	Sept. 28	Design of Concrete Formwork	Ch. 16
5	Oct. 5	Design of Concrete Formwork (cont.)	Ch. 16
6	Oct. 12	Shoring and Reshoring; Formwork Bracing and Guying	Ch. 15, 17
7	Oct. 19	Temporary Bridges	TBA
8	Oct. 26	**Midterm Exam**	
9	Nov. 2	Excavation Safety	Ch. 7; OSHA Subpart P
10	Nov. 9	Cranes and Lifting; Introduction to Earth Pressures	Ch. 7, 20
11	Nov. 16	Earth Retaining Structures; Cofferdams	Ch. 6, 7
12	Nov. 21	Special Earth Structures: Slurry Walls, Diaphragms	Ch. 7, 8
13	Nov. 30	Underpinning and Protection of Site	Ch. 11, 21
14	Dec. 6	Ground Improvement Methods	TBA
15	Dec. 15-21	**Final Exam Period**	

Department of Civil and Environmental Engineering
CE 414 – Engineered Construction

Description:
Design of temporary structures used to construct engineering projects. These include temporary retaining walls, shoring, scaffolding, decking, lifting beams and formwork. Design philosophy, codes, standards, and safety practices as they pertain to engineered construction are emphasized.

Prerequisites: CE 210 - Construction Materials and Procedures
CE 332 - Structural Analysis
CE 341 - Soil Mechanics

Textbook(s)/Materials Required:
Ratay, R.T. Handbook of Temporary Structures in Construction, McGraw Hill, 2nd Edition,1996

Course Objectives:

1. Understand the rational method of engineering design as it applies to temporary structures.
2. Learn how to analyze and design temporary structures
3. Become familiar with codes, standards and safety practices pertaining to engineered construction.

Topics:

Rational Design, Loads, Material Properties
Horizontal and Vertical Form Design
Specialty Formwork, Shoring, Scaffolding
OSHA Requirements and Tolerances
Design of Braced Excavations
Trenching Design and Safety
Roadway Decking Design
Underpinning

Schedule: Lecture/Recitation- 1-1/2 hour class, twice a week
Laboratory- none

Professional Component: Engineering Topics (Design)

Program Objectives Addressed: 1, 2, 3

Prepared By: Prof. Slaughter **Date:** 10/01/06

CEE Mission, Program Objectives and Program 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 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 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, civic organizations, and humanitarian endeavors.

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

(a) ability to apply knowledge of math, science, and engineering
(b) ability to design and conduct experiments, as well as interpret data
(c) 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 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) ability to use techniques, skills and modern engineering tools necessary for engineering practice

Revised 8/28/13

Course Objectives Matrix – CE 414 Engineered Construction

Strategies and Actions	Student Learning Outcomes	Outcomes (a-k)	Prog. Object.	Assessment Methods/Metrics
Course Objective 1: Have students understand the rational method of engineering design as it applies to temporary structures.				
Teach the rational design method as it applies to temporary construction structures.	Students will learn how to apply the rational design methods for temporary structures.	a, c,	1	Homework, quizzes, exams and design projects.
Course Objective 2: Have students learn how to analyze and design temporary structures.				
Emphasize the allowable stress design philosophy used for temporary structures.	Students will learn design concepts and understand safety factors.	a, c	1, 2	Homework, quizzes, and exams.
Incorporate and use	Students will learn to apply	a, c, e	1	Homework,

strength structural analysis.	their knowledge of strength materials and analysis.			quizzes, exams, and design projects.
Formulate the guidelines of analysis and design of temporary structures (formwork, shoring, bracing etc.).	Students will learn how to analyze and design a safe and serviceable temporary structure.	a, c, e	1	Homework, quizzes, exams, and design projects.
Course Objective 3: Have students become familiar with codes, standards and safety practices pertaining to engineered construction.				
Teach the use of the National Design Specifications for wood.	Students will learn how to design wood structural members as per the National Design Specifications.	c, i	1, 2	Homework, quizzes, exams, and design projects.
Introduce OSHA, ANSI, ACI, and BOCA requirements for design and use of temporary structures.	Students will learn the basics of standards used for the design and use of temporary structures.	e, i, k	1, 2, 3	Homework, quizzes, exams, and design projects.
Have students present oral and written report on a specialized topic dealing with engineered construction.	Students will research a topic and make an oral presentation to the class.	g, i, j	1, 2	Term reports and oral presentations.