

**STATE UNIVERSITY OF NEW YORK  
COLLEGE OF TECHNOLOGY  
CANTON, NEW YORK**



**MASTER SYLLABUS**

**COURSE NUMBER – COURSE NAME  
CONS 216 – Soils in Construction**

**Created by: Adrienne C. Rygel**

**Updated by: Adrienne C. Rygel**

**Canino School of Engineering Technology !**

**Department: Civil and Construction Technology**

**Semester/Year: Fall 2018**

A. **TITLE:** Soils in Construction

B. **COURSE NUMBER:** CONS 216

C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

# Credit Hours: 4

# Lecture Hours: 3 per week

# Lab Hours: 3 per week

Other: per week

Course Length: 15 Weeks

D. **WRITING INTENSIVE COURSE:** Yes  No

E. **GER CATEGORY:** None:  Yes: GER  
*If course satisfies more than one:* GER

F. **SEMESTER(S) OFFERED:** Fall  Spring  Fall & Spring

G. **COURSE DESCRIPTION:**

Students learn about soil types, soil properties, soil classification, and basic soil property tests. Students learn how to conduct site and subsurface investigations. Introductory concepts of hydrogeology are introduced, students learn to measure and calculate hydraulic conductivity, and site dewatering techniques are discussed. Other site work related topics include: the compaction control process, slope stability and erosion control, excavation safety and support systems, and roadway subgrades materials and testing. Students learn about types of shallow foundations, deep foundations, and retaining structures and aspects of their construction as related to soil work. The laboratory component of the course explores soil testing methods and analytical problems related to lecture topics. Students learn and practice basic reporting styles used in industry. This is a writing intensive course.

H. **PRE-REQUISITES:** None  Yes  If yes, list below:

MATH 121 (College Algebra), MATH 123 (Pre-Calculus), or MATH 135 (Technical Math); and sophomore status; or permission of the instructor

**CO-REQUISITES:** None  Yes  If yes, list below:

**I. STUDENT LEARNING OUTCOMES: (see key below)**

By the end of this course, the student will be able to:

<b><u>Course Student Learning Outcome</u></b> <b><u>[SLO]</u></b>	<b><u>Program Student Learning Outcome</u></b> <b><u>[PSLO]</u></b>	<b><u>GER</u></b> <i>[If Applicable]</i>	<b><u>ISLO &amp; SUBSETS</u></b>	
a. Test a soil sample and analyze the data to determine the following soil index properties: grain size distribution, coefficient of uniformity, coefficient of curvature, moisture content, liquid limit, plastic limit, specific gravity.	2488: 1ab, 2a, 3a, 5b, 7bc, 11a 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Calculate the following soil properties based on mass-volume relationships: void ratio, porosity, degree of saturation, water content, wet unit weight and dry unit weight, wet unit mass and dry unit mass, and specific gravity.	2488: 1a, 2a, 6ab 517: 2, 5 162: 2, 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c. Classify a soil sample using the Unified Soil Classification System and the AASHTO Classification System.	2488: 1a, 3b 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d. Discuss and analyze results from field and lab tests used in subsurface investigations.	2488: 1a, 2bc, 3b, 6ab 517: 2, 4 162: 2, 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e. Determine the hydraulic conductivity of a soil sample using the constant head permeameter test; and discuss dewatering techniques for earthwork projects.	2488: 1a, 2ab, 3ab, 5b, 6ab, 7b, 11a 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

f. Conduct compaction control tests to determine the maximum dry unit weight and in place unit weight of a soil sample; and explain the compaction control process.	2488: 1a, 2ab, 3ab, 5b, 6ab, 7b, 11a 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
g. Discuss techniques for slope stability and erosion control.	2488: 1a, 2bc, 4ab, 6ab, 9a 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
h. Explain how soil is classified for excavation construction purposes.	2488: 1a 517: 5 162: 4		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
i. Compose an Engineering Research Report regarding a soil design or construction topic using appropriate syntax and grammar.	2488: 7bcd, 8b, 9ab, 10, 11abd 517: 1 162: 1		1-Comm Skills ISLO ISLO	W Subsets Subsets Subsets
j. Prepare and present an oral presentation regarding a soil design or construction topic with appropriate visual aids.	2488: 7acd, 8b, 9ab, 10, 11abd 517: 1 162: 1		1-Comm Skills ISLO ISLO	O Subsets Subsets Subsets

<b>KEY</b>	<b><u>Institutional Student Learning Outcomes [ISLO 1 – 5]</u></b>
<b>ISLO #</b>	<b>ISLO &amp; Subsets</b>
<b>1</b>	<b>Communication Skills</b> Oral [O], Written [W]
<b>2</b>	<b>Critical Thinking</b> <i>Critical Analysis [CA] , Inquiry &amp; Analysis [IA] , Problem Solving [PS]</i>
<b>3</b>	<b>Foundational Skills</b> <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
<b>4</b>	<b>Social Responsibility</b> <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
<b>5</b>	<b>Industry, Professional, Discipline Specific Knowledge and Skills</b>

\*Include program objectives if applicable. Please consult with Program Coordinator

J. **APPLIED LEARNING COMPONENT:** Yes  No

If YES, select one or more of the following categories:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Classroom/Lab | <input type="checkbox"/> Civic Engagement              |
| <input type="checkbox"/> Internship               | <input type="checkbox"/> Creative Works/Senior Project |
| <input type="checkbox"/> Clinical Placement       | <input type="checkbox"/> Research                      |
| <input type="checkbox"/> Practicum                | <input type="checkbox"/> Entrepreneurship              |
| <input type="checkbox"/> Service Learning         | (program, class, project)                              |
| <input type="checkbox"/> Community Service        |  |

K. **TEXTS:**

Liu, Cheng and Evett, Jack B. (2014). Soils and Foundations, 8th Edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Rygel, Adrienne. (2018). CONS 216 Soils and Foundations Laboratory Manual. SUNY Canton.

L. **REFERENCES:**

Bardet, Jean-Pierre (1997). Experimental Soil Mechanics. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Coduto, Conald P. (2000). Foundation Design, Principles and Practices, 2nd edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Coduto, Conald P. (1999). Geotechnical Engineering: Principles and Practice, 1st edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

McCarthy, David F. (2007). Essentials of Soil Mechanics and Foundations: Basic Geotechnics, 7th edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Slgado, Rodrigo (2008). The Engineering of Foundations. New York, New York: McGraw Hill.

Schroeder, W.L., Dickenson, Stephen, and Warrington, Don. C. (2004). Soils in Construction, 5th edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

M. **EQUIPMENT:** None  **Needed:** Standard oven, microwave oven, US standard sieve sets, Casagrande liquid limit devices, plastic limit devices, constant head permeability devices, Standard Proctor equipment, Modified Proctor equipment, sand cone equipment are provided by the department.

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- **Examinations,**
- **Homework assignments,**
- **In-class exercises,**
- **Quizzes**
- **Term Project: Paper and Presentation**

P. **DETAILED COURSE OUTLINE:**

## **I. Part 1: Soil Properties and Classification**

### **A. Introduction**

### **B. Origin of Soil Deposits**

- 1. The soil formation cycle -**
  - a) Weathering -**
  - b) Erosion -**
  - c) Transport and Deposition -**
- 2. Transport and deposition mechanisms -**
  - a) Alluvial (Water) -**
  - b) Aeolian (Wind) -**
  - c) Glaciers -**
  - d) Gravity -**

### **C. Soil Properties**

- 1. Grain Size Distribution -**
  - a) Coarse Grain -**
  - b) Fine Grain -**
- 2. Coarse Grained Soil Index Parameters**
  - a) Sieve Analysis**
  - b) Grading**
  - c) Coefficient of Curvature and Coefficient of Uniformity**
  - d) Effective grain size and median grain size**
- 3. Fine Grained Soil Index Parameters -**
  - a) Hydrometer Analysis -**
  - b) Liquid Limit -**
  - c) Plastic Limit -**
  - d) Shrinkage Limit -**

### **D. Soil Classification**

- 1. AASHTO Classification System**
- 2. Unified Soil Classification System**
- 3. Agricultural Classification System**
- 4. Geologists' Classification System**

### **E. Soil Particle Shape and Soil Structure**

### **F. Soil Mass/Volume Relationships**

## **II. Part 2: Subsurface Investigations**

### **A. Site Investigations**

- 1. Components**
- 2. Resources**

### **B. Subsurface Investigation Methods**

- 1. Auger and Core Boring**
- 2. Test Pits**
- 3. Standard Penetration Test**
- 4. Cone Penetrometer Test**
- 5. Vane Test**
- 6. Geophysical Tests**

**C. Basic Hydrogeology Concepts**

- 1. Aquifers**
- 2. Confining Layers**
- 3. Coefficient of Permeability**

**III. Part 3: Site Work and Construction**

**A. Methods for dewatering soil**

- 1. Vacuum trucks**
- 2. Trenches and Sump Pits**
- 3. Wells**
- 4. Caissons**
- 5. Cofferdam**
- 6. Seepage Barriers**
- 7. Electroosmosis**

**B. Soil Compaction**

- 1. Density and Soil Moisture**
- 2. Compaction Control Process**
- 3. Compaction Methods**
- 4. Testing**

**C. Slope Stability and Erosion Control**

- 1. Embankment Control Issues**
- 2. Methods of Slope Stability**
- 3. Methods of Erosion Control**
- 4. Pertinent Regulations**

**D. Excavations**

- 1. Excavation Safety and Regulations**
- 2. OSHA Soil Classification for Excavation Work**
- 3. Excavation Support Systems**

**E. Roadway Subgrades**

- 1. Materials**
- 2. Testing**
- 3. Subgrade Construction**

**F. Soil Work Associated with Foundations and Retaining Structures**

- 1. Types of Shallow Foundations**
- 2. Types and Construction of Deep Foundations**
- 3. Types and Construction of Retaining Structures**

**Q. LABORATORY OUTLINE: None  Yes**

- 1. Lab Report Writing and Finding Term Project References in the Library**
- 2. Sieve Analysis**
- 3. Hydrometer Analysis**
- 4. Water Content Determination and Mass-Volume Problems**
- 5. Specific Gravity of Solids and Atterberg Limits (Liquid Limit and Plastic Limit)**
- 6. Control Low Strength Material (CLSM)**



- 7. Constant Head Permeability**
- 8. Standard Proctor Compaction Test**
- 9. In Place Unit Weight by the Sand Cone Method**
- 10. Break CLSM Cylinders and Standard Proctor Test Group Poster Presentations**
- 11. Subsurface Investigation: Soil Boring/Test Pit Logging and Soil Classification**
- 12. Compaction Control Plan**
- 13. Student Term Project Presentations**
- 14. Student Term Project Presentations**