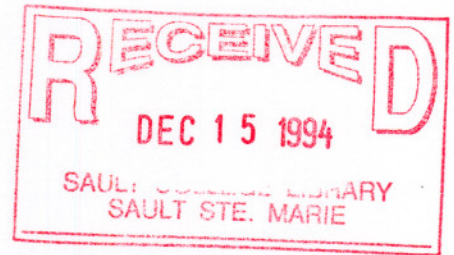


SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE



COURSE TITLE: Soil Mechanics  
CODE NO.: ARC 217  
PROGRAM: Civil Engineering Technology  
SEMESTER: III  
AUTHOR: S. Ienco  
DATE: August 1994

*M. Ienco Aug 24/94*

NEW: \_\_\_\_\_ REVISION: X

APPROVED: *S. Ienco*  
DEAN

94-08-24  
DATE

Soil Mechanics

ARC 217

COURSE NAME

CODE NO.

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Total Credit Hours 64  
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Prerequisite (s) ARC 133  
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**I. PHILOSOPHY/GOALS:**

This is an introductory soil mechanics course. Topics covered will include: rock/soil origins, review of soil identification and classification system, site investigation, laboratory testing, movement of water through soil, engineering properties of soils and stress distribution in soils.

**II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):**

Upon successful completion of this course the student will:

1. Describe the process that occurs during the formation of igneous, sedimentary and metamorphic rocks and classify several rocks from each group.
2. Describe the main types of natural soil deposits, their formation and their characteristics.
3. Solve applied problems in soil mechanics.
4. Classify soils using the Unified Classification System.
5. Relate the soil classification to its potential for engineering uses or problems.
6. Research, schedule and execute a procedure for performing a field investigation.
7. Perform standard laboratory tests for the following: specific gravity of soils, mass-volume measurements, sieve analysis, hydrometer analysis, Atterberg limits test, constant head permeability test, falling head permeability test, compaction and California bearing ratio.



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**II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):**

8. Describe the manner in which water moves through soils such as permeability and capillary action and the effects that water movement has on drainage and frost heave.
9. Describe various methods that may be employed in dewatering a construction site.
10. Apply Mohr's circle for solving stress at a point problems.

**III. TOPICS TO BE COVERED:**

1. Rock/soil origins.
2. Mass-volume relationship.
3. Soil types.
4. Classification systems.
5. Laboratory testing of soils - Classification.
6. Site investigation.
7. Compaction.
8. Movement of water through soils.
9. Stress distribution in soils.

**IV. LEARNING ACTIVITIES/REQUIRED RESOURCES**

1. Rock/soil Origins

**Learning Activities**

- . Outline the geological and weathering processes that resulted in rock formations and soil deposits.
- . Describe the characteristics of common soil deposits in Ontario.
- . Preview and answer questions on a video of the rock cycle.

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IV. LEARNING ACTIVITIES/REQUIRED RESOURCES (continued)

1. Rock/soil Origins

Learning Activities

- . Review soil and geological maps and plans and describe probable site conditions at a site.

Resources:

- . Chapter 1 - text, overheads, slides, film and Northern Ontario Geology Terrain Study 91 maps.

2. Mass-Volume Relationships

**Learning Activities:**

- . Calculate mass-volume relationships for given units of soil.
- . Perform a laboratory that illustrates the mass-volume relationship.

**Resources:**

- . Chapter 2 - text, handout.

3. Soil Types

**Learning Activities:**

- . Identify the major soil types of gravel, sand, silt and clay.
- . Differentiate between different types of clays.
- . describe and give examples of the interrelationship between clay and water.

Resources

- . Chapter 3 - text.



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IV. LEARNING ACTIVITIES/REQUIRED RESOURCES (continued)

4. Classification System

Learning Activities

- . Describe and explain the method and purpose of classification systems.
- . State the soil properties which identify a soil type and identify soils using the Unified Classification System.
- . Relate the classification grouping of a soil to its properties and potential engineering uses or problems.

Resources

- . Chapter 4 - text, handouts.

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5. Laboratory Testing of Soils - Classification

Learning Activities

- . Conduct laboratory tests of soils such as moisture content determinations, Atterburg Limits testing, sieve analysis, and hydrometer analysis.

Resources:

- Chapter 4 - text, handouts.

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6. Site Investigation

Learning Activities

- . Describe what information should be sought in a preliminary reconnaissance including: recognition of landforms, material classification, local information reports from other agencies and photographs.
- . Outline the equipment and techniques used in soil sampling and testing in the field.



IV. **LEARNING ACTIVITIES/REQUIRED RESOURCES** (continued)

6. Site Investigation

- . Describe methods used to identify location of water table.
- . Prepare site plans showing borehole locations, document borehole logs and draw profiles from given data.

Resources:

- . Chapter 11 - text, handouts, film strips, photos and reports from other agencies.

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7. Compaction

Learning activities:

- . Conduct and evaluate a standard density test on a soil sample.
- . Outline methods used to compact soils and to evaluate degree of compaction on projects.
- . Outline and describe methods used for soil stabilization.
- . Solve compaction problems.

Resources:

- . Chapter 11 - text, handouts.

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8. Movement of Water Through Soil

Learning Activities:

- . Describe the process of water movement through soil particles.
- . Outline and illustrate the types of water found in soils.
- . Explain the mechanics of capillarity.
- . Solve permeability problems using Darcy's law of flow.
- . Conduct laboratory test on constant head and falling head permeability.
- . Construct simple flow nets for various soil- water conditions.

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**IV. LEARNING ACTIVITIES/REQUIRED RESOURCES (continued)**

8. Movement of Water Through Soil

Learning Activities:

- . Explain and illustrate dewatering systems for construction sites.
- . Explain the mechanics of frost heave.

Resources:

- . Chapter 5 & 6 - text

9. Stress Distribution In Soils

Learning Activities:

- . Solve soil problems using Mohr's circle.

Resources:

- . Chapter 7 - text.

**V. METHOD OF EVALUATION**

A final grade will be derived from the results of field testing, laboratory testing, tutorials and three tests weighed as follows:

Field testing	10%
Laboratory testing and/or tutorials	20%
Two term tests each worth 20%	40%
Final test	30%
TOTAL	<u>100%</u>



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V. METHOD OF EVALUATION (continued)

The grading system used will be as follows:

A+	90% - 100%
A	80% - 89%
B	70% - 79%
C	55% - 69%
R	Repeat

- 1) Minimum acceptable grade for this course is 55%.
- 2) Each laboratory or tutorial assignment will carry equal weight, and is due in my office no later than one week after it has been assigned.
- 3) If at the end of the semester your overall average of the combined laboratories, tutorials field project and three tests is below 55%, then it will be up to the instructor whether you receive an R, repeat, or a rewrite. The criteria employed for arriving at that decision is class attendance, class participation and overall grade, which should be a least 45%.
- 4) In case a rewrite is granted, it will be permitted only once it will cover the entire course outline and will limit the maximum obtainable grade for the course to 60%.
- 5) **Testing Absence:**

If a student is unable to write a test on the date assigned, the following procedure is required:

- a. The student shall provide the Professor with advance notice preferably in writing of their need to miss a test.
- b. The student may be required to document the absence at the discretion of the professor.
- c. All decisions regarding whether tests shall be re-scheduled will be at the discretion of the Professor.
- d. The student is responsible to make arrangements, immediately upon return to the College with his/her course Professor related to make-up of the missed test prior to the next scheduled class for the course in question.



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**V. METHOD OF EVALUATION (continued)**

- e. In the event of an emergency on the day of the test, the student may require documentation to support the absence and must telephone the College to identify the absence. The college has a 24 hour electronic voice mail system (759-2554).

Failure to comply with these guidelines may result in a zero grade being recorded for the missed test.

**VI. REQUIRED STUDENT RESOURCES (including textbooks and workbooks)**

Essentials of Soil Mechanics And Foundations  
Latest Edition  
David F. McCarthy  
Prentice Hall

**VII. SPECIAL NOTES**

Students with special needs (eg. physical limitations, visual impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of the students.