



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

COURSE OUTLINE

COURSE TITLE: Soil Mechanics & Highway Engineering

CODE NO.: ARC 217

PROGRAM: Civil Engineering Technology

SEMESTER: III

AUTHOR: S. Ienco

DATE: August 1992 *me Aug/92*

NEW: _____ REVISION: _____ x

APPROVED: *L.P. Crozuth* *92-08-24*
CHAIRPERSON DATE

Soil Mechanics & Highway Engineering

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Total Credit Hours 64

Prerequisite (s) ARC 133

I. PHILOSOPHY/GOALS:

This course is intended to expand on the basic soil mechanics knowledge acquired in construction materials, and introduce the student to new topics, which include: rock/soil origins, review of soil identification and classification system, site investigation, laboratory testing, movement of water through soil, engineering properties of soils, pavement materials and stress distribution in soils.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

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

Soil Mechanics & Highway Engineering

ARC 217

COURSE NAME

CODE NO.

II. STUDENT PERFORMANCE OBJECTIVES (Continued):

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. Determine the stress distribution in soils for point loading and uniform loading.
11. Describe and explain the major components of a pavement structure and the effects of soil conditions on both rigid and flexible pavements.

III. TOPICS TO BE COVERED:

1. Rock/soil origins.
2. Site investigation.
3. Laboratory testing of soils.
4. Movement of water through soils.
5. Engineering properties of soil.
6. Stress distribution in soils.
7. Pavement materials and design.

IV. TOPIC DESCRIPTION

TOPIC NO.	TOPIC DESCRIPTION	REFERENCE
1.	<u>Rocks/Soils Origins</u> <ul style="list-style-type: none">- Introduction- Classification of Rocks- The Cycle of Rock Weathering and Soil Formation- Deposited and Transported Soils	Chapter 1, 2 & Hand- outs

Soil Mechanics & Highway Engineering

ARC 217

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IV. TOPIC DESCRIPTION

TOPIC NO.	TOPIC DESCRIPTION	REFERENCE
2.	<u>Site Investigation</u> <ul style="list-style-type: none">- Main Types of Soil Deposits- Geological Soil Maps- Interpretation of Aerial Photographs- Recognition of Landforms- Visual Procedure for Classifying Soils- Methods and Equipment for Subsurface Investigation- Frequency, Depth and Size of Field Samples- Typical Logs For Sample Recovery- Recovery of Undisturbed Soil Samples- Recovery of Disturbed Soil Samples- Measurement of Ground Water Table- Method and Equipment for In-Situ Testing	Chapter 2, 2 & Hand- outs
3.	<u>Laboratory Testing of Soils</u> <ul style="list-style-type: none">- Moisture Content Determination- Atterberg Limits Test- Sieve and Hydrometer Analysis- Compaction Test- Field Density Using The Sand Cone Method- Field Density Using The Rubber-Balloon Method- Percolation Test- Unconfined Compression Test- California Bearing Ratio Test- Permeability Test For Fine-grained Soils- Permeability Test For Coarse-grained Soils- Unconfined Compression Test	Chapter 1, 2, 3 & 6

Soil Mechanics & Highway Engineering

ARC 217

COURSE NAME

CODE NO.

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TOPIC NO.	TOPIC DESCRIPTION	REFERENCE
4.	<u>Movement of Water Through Soil</u> <ul style="list-style-type: none">- Permeability of Soils- Darcy's Law of Flow- Capillary Tension In Soils- Drainage- Frost Heave- Flow Nets and Seepage	Chapter 1 & Purchased notes
5.	<u>Stress Distribution In Soils</u> <ul style="list-style-type: none">- Vertical Pressure Below a Concentrated Load- Westergaard Equation- Boussinesg Equation- Vertical Pressure Below a Uniform Load	Purchased notes
6.	<u>Pavement Materials and Design</u> <ul style="list-style-type: none">- Components of a Pavement Structure- Types of Pavements- Subgrade Construction- Earthwork Operations- Geotextiles	Chapter 5

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	100%

Soil Mechanics & Highway Engineering

ARC 217

COURSE NAME

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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%.

VI. REQUIRED STUDENT RESOURCES (including textbooks and workbooks)

HIGHWAY MATERIALS SOILS AND CONCRETES

Latest Edition
Atkins
Reston

SOILS AND FOUNDATIONS

Latest Edition
Cheng Liu & Jack B. Evett
Prentice Hall
Chapter 5 & 6. Can be purchased at the bookstore

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.