SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: CONSTRUCTION MATERIALS

Code No.: ARC 133-3

Program: CIVIL/ARCHITECTURAL TECHNICIAN

Semester: II

Date: JANUARY, 1990

Author: S. IENCO

New: _____ **Revision:** ____X____

APPROVED: _____ 98/02/02
Chairperson **Date**

CALENDAR DESCRIPTION

CONSTRUCTION MATERIALS	ARC 133-3
COURSE NAME	COURSE NUMBER

PHILOSOPHY/GOALS:

The student will be introduced to various construction materials such as soil, wood, steel and concrete. Understanding of the physical and engineering properties of these materials will be accomplished through lecture and in the laboratory experimentation. In addition the student will design, construct and test, to ultimate failure, a wooden truss.

METHOD OF ASSESSMENT:

Laboratory work	40%
Project	15%
Mid Semester Exam	20%
Final Examination	25%
	100%

GRADING:

A+	90 - 100
A	80 - 89
B	70 - 79
C	55 - 69
R	Repeat
X	A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete the requirements of the course.

1. Minimum acceptable grade is 60%

2. Each laboratory will carry equal weight. Late submissions will be penalized with a loss of 20% for the first day late and an additional 10% for each subsequent late day.

3. If at the end of the semester your overall average of the combined laboratory work, project and examinations is below 55% then it will be up to the instructor whether you receive an "R" grade or a rewrite. The criteria employed for arriving at that decision is class attendance, class participation and overall score.

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4. If a rewrite is granted, it will cover the entire course work and the maximum overall obtainable grade on the rewrite is a "C".

TEXTBOOK(S):

Highway Materials, Soils and Concretes
Harold N. Atkins
Reston, Virginia, 1983

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TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1	18	**Soils** - types - mass-volume relationships - grain size - plasticity - compaction
2	18	**Wood** - species - structure - sawing - classification - physical and mechanical properties - plywoods - glue laminated products
3	6	**Structural Steel** - properties - manufacture - uses - ultimate strength
4	18	**Portland Cement and Concretes** - history - aggregates - water/cement ratio - mix design - batching - placing - additives - curing and testing

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LABORATORY EXERCISES

TOPIC NO.	TOPIC DESCRIPTION
1	**General** a) mass volume relationships
2	**Soils** a) Sieve analysis b) Atterburg limits test c) Compaction test d) Specific gravity of soils e) Unified soil classification system
3	**Steel** a) Tensile steel
4	**Wood** a) Compression parallel to grain b) Compression perpendicular to grain c) Stress strain relationship d) Measurement of moisture content and density
5	**Concrete** a) Cement fineness b) Cement ultimate compressive strength c) Aggregate grading d) Mix design-manufacture and test
6	**Projects** a) Truss design, construction and testing to ultimate failure

Note: Due to laboratory re-construction, the above list may be revised.

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COURSE OBJECTIVES

General

1. By direct weighing and volume calculation, the student must experimentally determine the mass densities of three structural materials.

Soils

1. The student must identify gravels and sand.
2. The student must identify clays.
3. The student must identify silt.
4. Experimentally, the student must determine the grain size of a granular soil.
5. Experimentally, the student must determine the Atterburg Limits for a cohesive soil.
6. The student must classify three given soils using the Unified Classification system.
7. The student must solve mass-volume relationships problems for various soils.
8. Experimentally, the student must perform a standard compaction test on a granular soil.

Wood

1. The student must differentiate between hardwoods and softwoods.
2. The student must identify at least three commonly used hardwoods and softwoods.
3. The student must be able to list the seven factors considered when grading lumber.
4. The student must identify and describe the three general use classifications of structural lumber.
5. The student must list at least five engineering advantages in the use of glue laminated lumber.
6. The student must list four advantages enjoyed by plywood over sawn lumber.
7. Experimentally, the student must determine the ultimate compressive strength of structural timber loaded parallel to the grain.
8. Experimentally, the student must determine the ultimate compressive strength of structural timber loaded perpendicular to the grain.

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Steel

1. The student must identify the rolled steel sections found in the construction industry.
2. Experimentally, the student must determine the ultimate strength of a structural steel bar.

Concrete

1. The student must identify and differentiate between the five types of Portland cement currently in use.
2. The student must specify the physical requirements of concrete aggregates.
3. The student must define the limits of acceptability of water for use in concrete production.
4. The student must deduce and illustrate by graphical means, the age/strength relationship of normal Portland cement concrete.
5. From a job outline brief, the student must produce a design brief for a concrete mix.
6. From a concrete design brief, the student must develop a theoretical trial mix proportion.
7. The student must define the site conditions necessary for both hot and cold working.
8. The student must describe the objectives and method of achieving adequate curing of concrete.
9. Experimentally, the student must determine the grading of a fine and course aggregate.
10. The student must design, proportion, mix, form, cure and test at least three cylinders of normal Portland Cement concrete at 7 and 28 days including making a slump and air entrainment test.
11. The student must cast cure and test a standard concrete beam to determine its modulous of rapture.

Project

1. The student must design a flat truss using methods of joints and/sections and check the results using Maxwell's diagram.
2. The student must construct a scaled down wooden truss.
3. The student must design a simple laboratory system for bracing, loading and testing the truss to ultimate failure.
4. The student must tabulate the laboratory result and submit a report on all phases of the project.