DOC.#479

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: STRUCTURAL ENGINEERING

Code No.: ARC 219-4

Program: CIVIL AND ARCHITECTURAL TECHNICIAN

Semester: IV

Date: JANUARY, 1988

Author: S. IENCO

New: _____ Revision: X

APPROVED: _____ March 9/88
Chairperson Date

CALENDAR DESCRIPTION

STRUCTURAL ENGINEERING	ARC 219-4
COURSE NAME	COURSE NUMBER

PHILOSOPHY/GOALS:

The student will acquire a basic knowledge in the design of structural elements such as beams, columns, tensile members, base plates and connections. The interaction of these various elements will be exercised by designing a truss. In addition, the student will be introduced to the design of retaining walls.

METHOD OF ASSESSMENT:

The final grade will be based on the average of four term tests, which will carry an equal weight of 25% each.

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 55%.

2. Notice of a term test will be given in class at least one week in advance.

3. Homework problems are assigned during lecture and the solution to selected problems is discussed subsequently. They are not graded.

4. If at the end of the semester your overall average of the combined tests 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 grade.

5. In case a rewrite is granted it will be permitted only once and will be subjected to the following conditions.

   a) It will cover the entire semester's course outline
   b) The maximum obtainable grade is "C".
   c) The student must score a 60% overall average on the rewrite in order to obtain a "C" grade.

STRUCTURAL ENGINEERING
ARC 219-4

PREREQUISITE: Strength of Materials (MCH 212)

TEXT(S): Applied Strength of Materials
Jensen/Chenoweth
McGraw-Hill

Design of Reinforced Concrete
Jack C. McCormac
Harper and Row

REFERENCES: Handbook of Steel Construction
Canadian Institute of Steel Construction

Fundamentals of Structural Shop /Drafting
Canadian Institute of Steel Construction

COURSE OUTLINE

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1	14	BEAM DESIGN - STEEL & WOOD - review of flexure formula - shearing stress - types of loading - design loads - failure modes - deflection
2	12	COLUMN DESIGN - types of columns - axial loading - column design, steel and wood - base plate design
3	6	CONNECTIONS - standard connection - special connection - use of tables

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
4	10	TRUSSES - loading - analysis - panel points - member design - joint design - splices
5	6	COMBINED STRESSES - combined bending and axial stresses - eccentric axial loads
6	12	RETAINING WALLS - types of retaining walls - soil pressure - design

COURSE OBJECTIVES

Beam Design

1. Identify point loading, UDL loading and varying loads.
2. Calculate bending moment and shear force diagrams for various loading combinations.
3. Identify the flexure formula.
4. Design steel beams using structural steel tables.
5. Design wood beams using tables.
6. Identify the different failure modes for both steel and wood beams.
7. Design for end bearing plate.
8. Design for web crippling.
9. Calculate beam deflections.
10. Calculate shearing stresses.

Column Design

1. Identify columns under axial load.
2. Identify the failure modes of columns.
3. Identify the slenderness ration of a column.
4. Identify Euler's formula.
5. Differentiate between a main structural steel column and a secondary member.
6. Identify the unsupported length of a column.
7. Calculate the least radius of gyration.
8. Identify short, medium and long columns.
9. Design simple steel columns.
10. Design wood columns using the l/d ranges.
11. Design base plates for a steel column.

Connections

1. Identify single and double shear connections.
2. Identify the failure modes for a bolted connection.
3. Calculate both shear and bearing value for a bolted connection.
4. Calculate the number of bolts required for a simple beam connection, and for a tensile and compressive member connection.
5. Calculate the size of gusset plate for a truss connection.
6. Calculate the size of clip angles for a simple beam connection.
7. Identify a fillet, butt, flat and plug weld.
8. Describe the throat and leg of a weld.
9. Calculate the size and length of a fillet weld for connections of structural members.
10. Select simple beam connections from a structural steel handbook.

Trusses

1. Identify statically determinate and statically indeterminate trusses.
2. Calculate panel point loadings for roof dead loads and live loads.
3. Analysis of trusses using Maxwell's diagram.
4. Analysis of trusses using method of sections and joints.
5. Proportion a truss given a span length.
6. Design all member and connections for a given truss.

Combined Stresses

1. Identify combined stresses.
2. Identify the formula for combining bending and axial stress.
3. Define eccentric loading.
4. Calculate stresses for members loaded in bending and axial loads.

COURSE OBJECTIVES (Continued)

Retaining Walls

1. Identify the base, heel, toe and stem of a retaining wall.
2. Identify active pressure and passive pressure.
3. Identify surcharge loading.
4. Identify gravity walls, cantilevered walls and counterfort walls.
5. Calculate the bearing pressure under the retaining wall.
6. Calculate the overturning moment of the retaining wall.
7. Dimension a retaining wall.
8. Calculate the base length.
9. Calculate the design moment for the stem.
10. Calculate the design moment for the heel.
11. Calculate the design moment for the toe.
12. Calculate the safety factors against overturning and sliding.