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, 1989

Author: S. IENCO

New: _____ Revision: ____X____

APPROVED: _____ Chairperson

Date: Jan 11/89

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, connections and footings. The interaction of these various components will be emphasized by investigating a one-story structural steel building. In addition, the student will be introduced to using the computer for beam design.

METHOD OF ASSESSMENT:

The final grade will be based on the average of three term tests and assignments.

Assignments	25%
Three term tests, each worth 25%	75%
	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 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 assignment/assignments and 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.

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

   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.

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

Ref.
TH 1621 .C3 1985

- Fundamentals of Structural Shop /Drafting
Canadian Institute of Steel Construction

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TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1	26	**BEAMS AND CONNECTIONS** - review of shear and moment diagrams - review of flexure formula - horizontal shearing stress - building code requirements for floor and roof loading - design of steel beams - design for laterally unsupported beams - failure modes - design of timber beams - deflection - design of steel beam bearing plates - double angle beam connections - weld types and strength design - allowable loads on fasteners - design of simple beam connections
2	10	**COMBINED AXIAL AND BENDING STRESSES** - eccentric axial loads - stress computation for combined bending and axial stresses
3	14	COLUMNS - types of columns cross sections - buckling loads on columns - Euler's formula - effect of end restraints - slenderness ratio - design formulas for columns - design of stocky, intermediate and long steel columns - design of steel base plates - design of timber columns - design of eccentrically loaded columns
4	10	FOOTINGS - types of footings - allowable loads on soil - load distribution to soil - critical sections for bending and shear - design of square footings - design of wall footings

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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 timber beams using tables.
6. Identify the different failure modes for both steel and timber beams.
7. Design for end bearing plates.
8. Calculate beam deflections.
9. Identify single and double shear connections.
10. Identify the failure modes for a bolted connection.
11. Calculate both shear and bearing value for a bolted connection.
12. Calculate the number of bolts required for a simple beam connection and for a tensile and compressive member connection.
13. Calculate the size of clip angles for a simple beam connection.
14. Identify a fillet, butt, flat and plug weld.
15. Calculate the size and length of a fillet weld for structural member connections.
16. Select simple beam connections from a structural steel handbook.
17. Produce structural floor plans and shop drawings.

Combined Stresses

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

Footings

1. Identify pile, spread, isolated, wall and raft footings.
2. Calculate the distribution of loads to soil for a square footing and strip footing.
3. The student must design a square footing and wall footing for bearing under column, soil capacity, shear strength and reinforcement.
4. The student must perform an analysis for footings loaded with both axial and bending moment.
5. The student shall draft a typical wall and square footing.

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Column Design

1. Identify columns under axial load.
2. Identify the failure modes of columns.
3. Identify the slenderness ratio 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. Design simple steel columns.
8. Design timber columns using the l/d ranges.
9. Design base plates for a steel column.
10. Design eccentrically loaded columns.