**SAULT STE. MARIE, ON**
**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**COURSE OUTLINE**

COURSE TITLE:     STRENGTH OF MATERIALS

CODE NO.:     MCH212          SEMESTER:     III

PROGRAM:          CIVIL ENGINEERING TECHNOLOGY

AUTHOR:          D. J. ELLIOTT

DATE:     SEPT  1994     PREVIOUS OUTLINE DATED:     AUG  1991

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STRENGTH OF MATERIALS                                                    MCH212
COURSE NAME                                                         COURSE CODE

TOTAL CREDIT HOURS:    64

PREREQUISITE(S):   MCH100

I.      PHILOSOPHY/GOALS:

        The goal of this course is to build on the basic knowledge that the student
        acquired in the introductory statics course.  A review of statics will be followed by
        stress/strain relationships, connections, geometric properties of sections and
        stresses in simple beams.

H.       STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

1)      Investigate and solve problems using free body diagrams and equations of
        equilibrium

2)      Analyze trusses for member forces

3)      Apply fundamental principles of stress/strain relationships to analyze and design
        simple engineering problems

4)      Analyze and design bolted, and welded structural connections

5)      Calculate centroid, moment of inertia and radius of gyration for simple geometric
        areas and composite areas

6)      Calculate and draw shear force and bending moment diagrams for simple beams

7)      Perform laboratory experiments that will enhance the students' basic
        understanding of stress/strain and load flexure relationship in beams.

HI.     TOPICS TO BE COVERED:

1)      Brief Statics Review

2)      Truss Analysis

3)      Stress/Strain Relationships

4)      Bolted, Welded Connections and Thin-walled Pressure Vessels

5)      Centroid, Moment of Inertia and Radius of Gyration

6)      Shear and Moments and Beams

7)      Laboratory Experiments

## IV.    LEARNING ACTIVITIES/REQUIRED RESOURCES

1.    <u>Statics Review</u>

<u>Learning Activities</u>:  In class instruction and problem sets for the review of:
- Forces and Units
- Force Vectors
- Free-Body Diagram

<u>Resources</u>:          Chapters 1 to 3, and Appendix A


<u>Truss Analysis</u>

<u>Learning Activities</u>:  In class instruction and problem sets for the review of:
- Method of Joints
- Method of Sections

<u>Resources</u>:          Chapter 4


3.    <u>Stress/Strain Relationships</u>

<u>Learning Activities</u>:  In class instruction and problem sets on:
- Axial and Shearing Stresses
- Units, Ultimate Stress, Allowable Stress
- Factor of Safety
- Structural Shapes
- Axial and Shearing Strain
- Poisson's Ratio
- Elastic Limit, Modulus of Elasticity
- Stress-Strain Diagram
- Axial Stresses in Members of Two Materials
- Thermal Stresses

<u>Resources</u>:          Chapter 7 and 8

4.    <u>Bolted, Welded Connections and Thin-walled Pressure Vessels</u>

<u>Learning Activities</u>:  In class instruction and problem sets on:
• Types of Bolted Connections
• Types of Failures in Bolted Connections
- Stresses in Bolted Connections
- Analysis and Design of Bolted Connections
- Types of Welds
- Strength of Welded Connections
- Design of Welded Connections
- Thin-walled Pressures Vessels

Resources:          Chapter 9


5*      Centroid and Moment of Inertia

Learning Activities   In class instruction and problem sets on:
                                - Centre of Gravity of an area
                                - Centroid of Composite Areas
                                - Moment of Inertia
                                - Transfer Formula
                                - Moment of Inertia of Composite Areas
                                - Radius of Gyration
Resources            Chapter 10


Stresses in Simple Beams

Learning Activities   In class instruction and problem sets on:
                                - Types of Beams and Loadings
                                - End Supports
                                - Shear-Force Diagram
                                - Bending Moment Diagram
                                - Relationship Between Beam Loading, Shear and
                                  Moment Diagrams
                                - Moving Loads
                                - Flexure Formula
Resources            Chapters 11 and 12


Laboratory Experiments

Learning Activities   Physical experiments on stress/strain and bending

Resources            Civil Testing Lab
                     Chapters 8,**11** and 12


**EVALUATION METHODS:** (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

A final grade will be derived as follows:
|                          |          |
|--------------------------|----------|
| Assignments              | 15%      |
| Two Term Tests at 25%    | 50%      |
| Final Test               | 35%      |
| Total                    | **100%** |

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)    If at the *end* of the semester the overall mark is below 55%, then it will be up to the instructor whether or not a rewrite test **will** be granted.  The criteria employed for arriving at that decision is class attendance, class participation and overall grade, which should be at least 45%.

3)    In the 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

Required Text          Statics and Strength of Materials
                       Fourth Edition
                       Bassin/Brodsky/Wolkoff,   McGraw Hill

## \TL    ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section           Applied Strength of Materials
                       Latest Edition
                       Jensen/Chenoweth,  McGraw **Hill**

## Vni.   SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing 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 students.