

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:           STRUCTURES**

**CODE NO. :               ARC 219                               SEMESTER:     4**

**PROGRAM:               CIVIL ENGINEERING TECHNCIAN**

**AUTHOR:                 S. IENCO**

**DATE:                    Jan-04               PREVIOUS OUTLINE DATED:     Dec-02**

**APPROVED:**

	_____	_____
	DEAN	DATE

**TOTAL CREDITS:       4**

**PREREQUISITE(S):    MCH 212**

**LENGTH OF COURSE:       16 WEEKS           TOTAL CREDIT HOURS:     64**

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*For additional information, please contact Colin Kirkwood, Dean*  
*School of Technology, Technical Trades & Natural Resources*  
*(705) 759-2554, Ext. 405*

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Course Name

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Code No.**I. COURSE DESCRIPTION:**

This course provides you with a general understanding and overview of structures. You will combine the basic understanding gained in your statics and strength of materials courses with additional skills to analyze and design structural elements such as beams, columns, tensile members, and base plates. The interaction of these various components will be emphasized by designing the main structural components for a simple building.

The WoodWorks Sizer Software package will be utilized as a tool to enhance the learning process. Approximate methods of analyzing indeterminate beams and frames are introduced.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

1. Relate the basic principles of statics to understanding the behavior of structures.

Potential Elements of the Performance:

- Identify general types of structures.
- Classify structures.
- Identify primary structural elements.
- Discuss basic issues in the analysis and design of structures.
- Produce a scaled model of a simplified structure.

2. Investigate general principles of structural analysis and design, including appropriate sections of the building code.

Potential Elements of the Performance:

- Differentiate between analysis and design of structures.
- State, define and determine live and dead loads applied to buildings using the appropriate codes.
- Identify the basic steps in the analysis of structures.
- Model the physical structure on paper for analysis purposes.
- Model the external loading on a structure.

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3. Analyze and design statically determinate beams.

Potential Elements of the Performance:

- Review the three equations of equilibrium.
- Review shear and moment diagrams for simply supported beams.
- Review shear and flexural formulas.
- Identify major beam failure modes.
- Calculate bending stresses in beams.
- Calculate shear stresses in beams.
- Calculate beam deflections.
- Identify general beam design principles.
- Design simple beams.

4. Analyze and design members in compression: columns.

Potential Elements of the Performance:

- Identify types of column cross sections.
- Summarize and employ Euler's formula.
- Identify and interpret effects of column end restraints.
- Identify column and connecting components of an actual building.
- Design columns with axial loads only.
- Design columns with combined bending and axial loads.

5. Analyze indeterminate beams and frames using approximate methods.

Potential Elements of the Performance:

- Discuss the approximate versus the exact method of analysis.
- Perform approximate analysis calculations for continuous beams
- Perform approximate analysis calculations for rigid frames using the Portal Method.

6. Qualitatively discuss and investigate the general principles of structural design.

Potential Elements of the Performance:

- Discuss the general characteristics of structural hierarchies.
- Discuss basic design issues for the effects of lateral forces on low and medium-rise structures.
- Compare the constructional approaches for wood, steel and reinforced concrete structural systems.

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Code No.**III. TOPICS:**

1. Overview of Structures
2. Introduction to Structural Analysis and Design
3. Analysis and Design of Beams
4. Analysis and Design of Columns
5. Analysis of Statically Indeterminate Beams and Frames
6. Principles of Structural Design

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:****Elementary Structures for Architects and Builders**

Ronald E. Shaeffer

**V. EVALUATION PROCESS/GRADING SYSTEM:**

You will be assigned a final grade based on successful completion of laboratories, assignments and tests, weighted as follows:

Laboratories/Assignments/Quizzes	30%
Two term tests of equal weight	40%
Final Test	<u>30%</u>

**TOTAL** **100%**

Each laboratory/assignment/quiz carries equal weight. Late submittals receive only a maximum grade of 50%. However, laboratories or assignments handed in later than one week will receive a grade of 0%.

An average of 50% on laboratories/assignments and 50% on tests is required for successful completion of this course.

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The following semester grades will be assigned to students in postsecondary courses:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	4.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 - 59%	1.00
F (Fail)	49% or below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field placement or non-graded subject areas.	
U	Unsatisfactory achievement in field placement or non-graded subject areas.	
X	A temporary grade. This is used in limited situations with extenuating circumstances giving a student additional time to complete the requirements for a course (see <i>Policies &amp; Procedures Manual – Deferred Grades and Make-up</i> ).	
NR	Grade not reported to Registrar's office.	

## VI. SPECIAL NOTES:

### Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1101 or call Extension 703 so that support services can be arranged for you.

### Retention of course outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

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### Plagiarism

Students should refer to the definition of “academic dishonesty” in *Student Rights and Responsibilities*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course, as may be decided by the professor. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

### Testing Absence

If a student is unable to write a test on the date assigned, the following procedure is required:

- The student shall provide the Professor with advance notice preferably in writing of his/her need to miss the test.
- The student may be required to document the absence at the discretion of the Professor.
- All decisions regarding whether tests shall be re-scheduled will be at the discretion of the Professor.
- The student is responsible to make arrangements, immediately upon return to the College with his/her course Professor related to make-up of the missed test prior to the next scheduled class for the course in question.
- In the event of an emergency on the day of the test, the student may require documentation to support the absence and must telephone the College to identify the absence. The college has a 24 hour electronic voice mail system (759-2554 Ext 600)

## **VII. PRIOR LEARNING ASSESSMENT:**

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam and/or portfolio.

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**VIII. DIRECT CREDIT TRANSFERS:**

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.