SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE:	MECHANICS OF MATERIALS		
CODE NO. :	MCH212	**SEMESTER:**	3
PROGRAM:	ARCHITECTURAL/CIVIL/CONSTRUCTION		
AUTHOR:	SAL IENCO		
DATE:	AUG 04	**PREVIOUS OUTLINE DATED:**	AUG 03
APPROVED:			
	_____ **DEAN**		_____ **DATE**
TOTAL CREDITS:	4		
PREREQUISITE(S):	MCH 100		
HOURS/WEEK:	4		

I. COURSE DESCRIPTION:

Mechanics of Materials builds on the basic knowledge that you acquired in your introductory statics course. Consequently, this course will start with a brief review of statics, followed with a basic introduction to mechanics of materials. The topics covered will include: The free body diagram, stress/strain relationship, Poisson's ratio, temperature stresses, welded connections, bolted connections, centroid, moment of inertia, shear force diagrams for beams, bending moment diagrams for beams and flexure formula.

The basic concepts studied in this course will be integrated with an independent design, construction and testing of a model bridge.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Review and apply basic concepts of statics

   Potential Elements of the Performance:
   - Solve problems involving the manipulation of vector quantities
   - Draw free body diagrams to investigate and solve problems
   - Solve problems using the three basic equations of equilibrium
   - Perform an experiment using the force table

2. Apply fundamental principles of stress/strain relationship to analyze and design simple engineering problems.

   Potential Elements of the Performance:
   - State, define and illustrate by example the basic equations of axial and shear stresses.
   - Apply the basic stress equations to solve common engineering problems.
   - State and define the meaning of design and analysis.
   - Identify simple structural members.
   - State, define and illustrate by example the basic equations for normal strain.
   - State, define and illustrate by example elasticity, elastic limit and modulus of elasticity.
   - Solve problem involving strain and modulus of elasticity.
   - State, illustrate and define by example shearing strain and Poisson's ratio.

Potential Elements of the Performance Continued:

- Solve problems involving shearing strain and Poisson's ratio.
- State, define and illustrate by example the relationship between stress, strain and modulus of elasticity.
- State, define and illustrate by example the concept of yield stress, permanent set, percent elongation, ultimate stress, allowable stress and factor of safety.
- Solve problems in deformation for two materials in series under axial load or two sizes of the same material in series under axial load.
- Solve problems in deformation for two materials in parallel, deflecting equally under axial load.
- State, define and illustrate by example the equations for thermal expansion or contraction and thermal stresses.
- Solve problems involving thermal expansion or contraction and thermal stresses
- Perform a tensile laboratory experiments on various steel samples

3. Analyze and design bolted structural joints and welded structural joints.

Potential Elements of the Performance:

- State, define and illustrate by example types of structural bolted connections, bearing stresses, shearing stresses and typical failure modes.
- State, define and illustrate by example allowable stresses, bearing-type connections and friction-type connections.
- Analyze structural bolted connections using the working strength method.
- Design structural bolted connections using the working strength method.
- State, define and illustrate by example types of welds (fillet, butt, plug, slot, spot).
- Solve problems involving welded connections that support direct loads.
- Design welded connections using the working strength design.
- State, define and illustrate by example thin-walled pressure vessels, longitudinal stresses and circumferential stresses.
- Develop the stress equations for thin-walled pressure vessels.
- Solve problems involving thin-walled pressure vessels.

4. Calculate centroid, moment of inertia and radius of gyration for simple geometric areas and composite areas.

   Potential Elements of the Performance:

   - State, define and illustrate by example the concepts of canter of gravity and centroid of an area.
   - Solve problems involving centroid of composite areas.
   - State, define and illustrate by example the concepts of moment of inertia of simple areas, moment of inertia of composite areas and radius of gyration.
   - Calculate the moment of inertia for built-up structural shapes, using structural tables.
   - Calculate the radius of gyration of built-up structural shapes.

5. Calculate and draw shear force and bending moment diagrams for simple beams.

   Potential Elements of the Performance:
   - State, define and illustrate by example types of beams, supports and loading (point, uniformly distributed and triangular).
   - State, define and illustrate by example the concept of shear and bending moment in simple beams.
   - Calculate end reactions, shear and moment in beams.
   - Determine critical sections of maximum shear and maximum moment in beams.
   - Draw shear and bending moment diagrams for beams loaded with point loads and geometric loads.
   - State, define and illustrate by example the concept of shear force and bending moment for simple beams with moving loads.
   - Solve problems involving beams with moving loads.
   - State, define and illustrate by example the concept of internal stresses in a beam
   - Solve beam problems involving the flexure formula.
   - Perform a laboratory experiment to observe the load deflection relationship for a simple beam loaded with a point load.

6. Working independently and in small groups, design, construct and test a model truss bridge

   Potential Elements of the Performance:
   - Decide on a truss configuration for the model bridge
   - Calculate end reactions and internal member forces
   - Test the strength of truss material for tension and compression
   - Determine truss member sizes

Potential Elements of the Performance Continued:

- Draw plans of the truss bridge
- Build and test the model truss bridge

III. TOPICS:

1. Statics Review
2. Stress/Strain Relationships
3. Bolted and Welded Joints
4. Center of Gravity, Centroids and Moment of Inertia
5. Shear Force and Bending Moments in Beams
6. Model Truss Bridge

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Statics and Strength of Materials
Bassin/Brodsky/Wolkoff

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	15%
Model Truss Bridge Project	15%
Two term tests of equal weight	40%
Final Test	30%
TOTAL	**100%**

Each laboratory/assignment/quiz carries equal weight. Late submittals receive only a maximum grade of 60%. However, laboratories or assignments handed in later that 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.

The following semester grades will be assigned::

Grade	Definition	Grade Point Equivalent
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% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

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 professor 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.

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/program, as may be decided by the professor/dean. 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.

Course outline amendments:
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 or portfolio.

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.