SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	STRENGTH OF MATERIALS		
CODE NO. :	MCH103	**SEMESTER:**	4
PROGRAM:	Mechanical Engineering Technician		
AUTHOR:	ALVIN OLAR		
DATE:	January 2015	**PREVIOUS OUTLINE DATED:**	January 2014
APPROVED:	*"Corey Meunier"* **CHAIR**		
TOTAL CREDITS:	THREE		
PREREQUISITE(S):	APPLIED MECHANICS – STATICS – MCH110		
HOURS/WEEK:	THREE		

I. COURSE DESCRIPTION:

The general objective of this course is to give students destined for the mechanical trades a basic understanding how materials respond to applied forces. The prerequisite course on Applied Mechanics – Statics deals with the interaction of forces assuming solid bodies are undeformable. This course extends that knowledge to study how solid bodies deform under load, how to calculate the amount of deformation and how to keep deformation within acceptable limits.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Introduction to Statics and Equilibrium Reactions

Potential Elements of the Performance:

- Define the terms mass, weight, force, pressure, energy and work.
- Carry out units analysis in equations.
- State Newton's three laws and explain their significance to the design of structures.
- Determine how loads applied to structures are distributed to supporting members.
- Construct free-body diagrams for particles and rigid bodies.

2. Reactions of Materials Under Load - Stress, Strain, And Deformation

Potential Elements of the Performance:

- Identify and define the various elements of a stress/strain diagram (elastic range, plastic range, proportional limit, elastic limit, yield point, ultimate strength, rupture strength, elongation).
- Define and explain the difference between ductile and brittle materials.
- Explain the concept of toughness for statically and dynamically loaded materials.
- Explain the relationship between safety factor and allowable or working stress.
- Differentiate tensile, compressive and shear stresses and to know which one to use in particular cases.
- Explain Hooke's law and Young's modulus, how they relate and their importance to structures.
- To explain the concept of stress concentration and when it should be taken into consideration.
- Calculate allowance for thermal effects in structures.

3. Centroids and Cross-Sectional Properties of Structural Members

Potential Elements of the Performance:

- Explain the difference between centroid and center of gravity.
- Calculate the center of gravity for masses with compound shapes.
- Explain the concept of moment of inertia and to calculate the moment of inertia for compound members.
- Define the term radius of gyration.
- Calculate a column's resistance to buckling under axial load.

4. Shear and Bending Moments in Beams

Potential Elements of the Performance:

- Construct load, shear and moment diagrams for beams with various support and loading configurations.
- Determine the maximum shear and moment locations for beams with various support and loading configurations.

5. Bending and Shear Stresses In Beams

Potential Elements of the Performance:

- Calculate the bending stresses, shear stresses and deflection in beams with various cross-sectional shapes and various support and loading configurations.
- Describe methods to resist lateral buckling in beams.

6. Column Analysis and Design

Potential Elements of the Performance:

- Describe the various parameters that have to be evaluated to prevent failure in columns under axial and eccentric loading.
- Describe methods to prevent buckling in columns.
- To calculate the load carrying ability of columns with various shapes, support and loading configurations.

III. TOPICS:

1. Introduction to Statics and Equilibrium Reactions
2. Reactions of Materials Under Load - Stress, Strain, And Deformation
3. Centroids and Cross-Sectional Properties of Structural Members
4. Shear and Bending Moments in Beams
5. Bending and Shear Stresses In Beams
6. Column Analysis and Design

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Onouye, Barry, Static and Strength of Materials, Foundation for Structural Design – 1st ed, Pearson Prentice Hall, ISBN 0-13-111837-4

V. EVALUATION PROCESS/GRADING SYSTEM:

Assignments/Quizzes	40%
Mid Term Test	30%
Final Test	30%
TOTAL	**100%**

NOTES:

- Each assignment/quiz carries equal weight. Late submittals will receive a grade of 0%.
- If a student misses a test or surprise quiz without contacting the instructor, the Dean's office or the switchboard prior to the test or quiz, a mark of zero will be granted without a re-write option.
- Makeup Tests are at the discretion of the instructor and will be assigned a maximum grade of 50%.
- The professor reserves the right to adjust the number of tests, practical tests and quizzes based on unforeseen circumstances. The students will be given sufficient notice to any changes and the reasons thereof.
- A student who is absent for 3 or more times without any valid reason or effort to resolve the problem will result in action taken. If action is to be taken, it will range from marks being deducted to a maximum of removal from the course.

The following semester grades will be assigned to students:

Grade	**Definition**	*Grade Point Equivalent*
A+	90 – 100%	4.00
A	80 – 89%	
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:

Attendance:
Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.