SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: Applied Mechanics

CODE NO.: MCH 128

PROGRAM: Machine Shop

SEMESTER: Three

AUTHOR: W. J. Adolph

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PREVIOUS OUTLINE: June 1990 by Norm Triplett

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APPLIED MECHANICS **MCH128**

TOTAL CREDIT HOURS *3*

PREREQUISITES The only prerequisite for this course is to have successfully completed the first year of the Machine Shop program.

I. PHILOSOPHY /GOALS

This course provides the theroretical background required to support the 4th semester course called JIG and FIXTURES. The course deals with principles and techniques involved in analyzing forces. As a result, the student will feel more confident in the design of holding devices as used in the machine shop.

II. STUDENT PERFORMANCE OBJECTIVES

Upon completion of this course, the student will be able to:

1. Solve force systems using the laws of equilibrium both analytically and graphically.
2. Differentiate between Stress and Strain.
3. Determine the size specifications of metal members in compression and in tension by making stress/strain calculations.
4. Understand the role played by friction in the design of holdown devices.
5. Understand and solve problems involving WORK, ENERGY and POWER.
6. Understand how simple hold-down devices use the principles of simple machines.

III. TOPICS TO BE COVERED

	TOPICS TO BE COVERED	APPROXIMATE HOURS
1.	Force and Vectors	12
2.	Equilibrium and Friction	18
3.	Torque and Rotational Equilibrium	• 6
4.	Stress and Strain	12
5.	Simple Machines, work, energy and power	6

IV. LEARNING ACTIVITIES

1.0 FORCE AND VECTORS

At the conclusion of this topic the student will be able to:

1.1 Differentiate between Vector and Scalar quantities

1.2 Determine the components of a force vector

1.3 Determine the resultant of two or more vectors both graphically and analytically

1.4 Solve problems from force and vectors problem set

REQUIRED RESOURCES for 1.0

Handout of problems for solution using graphical and analytic means

2.0 EQUILIBRIUM AND FRICTION

Upon completion of this topic the student will be able to:

2.1 State the first condition for equilibrium

2.2 Construct a *free* body diagram representing all the forces acting on an object in equilibrium and solve for the unknown forces using the first condition.

2.3 Apply the principles of static and kinetic friction to the solution of equilibrium problems

2.4 Use trigonometry and vector components to solve equilibrium problems set.

REQUIRED RESOURCES for 2.0

Handout of problems for solution of equilibrium condition problems

IV. Learning activities cont'd

3.0 TORQUE AND ROTATIONAL EQUILIBRIUM

At the conclusion of this unit the student will be able to:

3.1 Show by example, an understanding of of the terms torque and moment arm.

3.2 Determine the resultant TORQUE about any axis when provided with a force loading applied to an object.

3.3 Solve for unknown forces by applying first and second conditions for equilibrium.

REQUIRED RESOURCES for 3.0

Handout of problem set on TORQUE AND ROTATIONAL EQUILIBRIUM

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4.0 STRESS AND STRAIN

At the conclusion of this topic the student will be able to:

4.1 Demonstrate by example and discussion the meaning of the following terms: elasticity, compression, elastic limit, stress, strain, shearing, tension, hardness, malleability, ductility, ultimate strength.

4.2 Conduct a simple torsion test on a prepared ferrous metal sample to determine its modulus of rigidity.

4.3 Write and apply formulae for the solution of problems involving stress and strain to determine sizes of metal sections.

REQUIRED RESOURCES for 4.0

Handout of problems on stress and strain to be solved
Laboratory exercise - Torsion test

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IV. Learning activities cont'd

5.0 SIMPLE MACHINES

At the conclusion of this topic the student will be able to

5.1 Write and apply formulae for computing the efficiency of simple machines in terms of work and power.

5.2 Distinguish between ideal and actual mechanical advantage.

5.3 Sketch a diagram and beside it write the formula for computing the ideal mechanical advantage for: lever, inclined plane, wedge, gears, pulley systems and screw jacks.

5.4 Make calculations of the mechanical advantage and efficiecy of each of the simple machines listed above. Solve handout problems.

5.5 Distinquish between work, energy and power

REQUIRED RESOURCES FOR 5.0

Handout of problems on simple machines

V. EVALUATION METHODS:

1. There will be three topic tests during the semester.

Test one - Force and vectors	**25 %**
Test two - Equilibrium (including friction)	**55 %**
Test three - Stress and strain	**10 %**
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2. There will be a quizz worth 5 % on simple machines and a final 5 % related to your class room manner including attendance (80 % attendance is worth 5 %)

3. Tests will be announced one week prior to the event.

Evaluation methods cont'd

5. Test marks will be converted to letter grades according to the following schedule:

A+	91 - 100 %
A	80 - 90
B	69 - 79
C	55 - 68
R	less than 55 %

. X - GRADES:

If, at the end of the semester your numerically weighted average is less than 55%, you would normally be assigned an "R" grade requiring you to repeat the course. However an "X" grade can be assigned which allows you an opportunity to clear the deficiencies provided that:

a) By successfully writing one topical test, the grade can be improved to a "C"
b) Your attendance has been better than 80 %
c) You can prove that you have completed the problem set of the topic.

VI. REQUIRED STUDENT RESOURCES

There is no textbook for the course. Problem sets and special notes will be provided as needed.