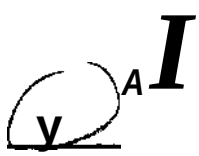
SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE, MARIE, ONTARIO

COURSE OUTLINE

Course Title:	APPLIED MECHANICS
Code No.:	MCH 110-4
Program:	AVIATION
Semester:	FIRST
Date:	MAY 19, 1983
Author:	NORMAN TRIPLETT

New: Revision 

APPROVED

Cha#JDersoff i-frffr-ff/r. ^?" Date

APPLIED MECHANICS — Course Name

MCH 110-4 — Course Number

PHILOSOPHY/GOALS:

In attempting to understand the nature of things around us there is probably no science more basic than mechanics. The student of engineering could not begin to design/construct a building, bridge or automobile without some prior analysis based on the principles of mechanics- As the title would imply, a concentrated effort is put forth to make the course as practical and realistic as possible.

METHOD OF ASSESSMENT:

- See Attached Sheet -

TEXTBOOK:

Introduction to Mechanics - Levinson

MECHANICAL TECHNOLOGY

APPLIED MECHANICS

MCH 110-4

TEXT:

Introduction to Mechanics - Levinson - (Prentice-Hall).

REFERENCES:

Applied Mechanics - Brown - (Prentice-Hall).

Applied Engineering Mechanics - Jensen and Chenoweth - (McGraw-Hill).

TOPIC—POTTODS—TOPIC NO.		DESCRIPTION	REFERENCE
1	[x]I&* *AT*	Conversion of Units Basic Trig. Functions	
2	10	Forces **Characteristics and units of force** **Vector and scalar quantities** **Components of a force** **Resultant of parallel forces** **Moment of a force** **Principle of moments** **Couples**	
3	**6**	**Centroid and Centre of Gravity** **Determination of centroid** **Determination of centre of gravity** **Centre of gravity of simple and composite solid**	
4	8	Equilibrium Equilibrant of force system Equilibrium of two dimensional systems Beam reactions	
5	8	Friction Force of friction Co-efficient of friction Angle of friction Laws of friction	
\e*	*f*	.^—•—•—••————7————^———.———..	

?(^au*jec-re?> ^o.NTi

APPLIEO MECHANICS - MCH 110-4

Course Textbook: Introduction to Mechanics - Levison

Unit # 1 - Mathematics of Mechanics

GENERAL OBJECTIVE:

The student will be able to solve a number of varied problems dealing with the Mathematics of Mechanics,

SPECIFIC OBJECTIVES:

1. To be able to define the term sine of an angle in a right-angled triangle.
2. To be able to define the term cosine of an angle in a right-angled triangle.
3. To be able to define the term tangent of an angle in a right-angled triangle.
4. To be able to state the Sine Law for any triangle.
5. To be able to state the Cosine Law for any triangle.
6. To be able to convert physical quantities of length, time and weight; eg: inches to feet, feet to yards, seconds to minutes, pounds to tons,
7. Using the s-lrUw-jmUCand the above specific objectives, the student will solve correctly the following problems in the texbook: Qu. 1-5, 7, 8, 16, 17, 20, 21, 22, 24, 27 and 29.

Unit # 2 - Forces

GENERAL OBJECTIVE:

The student will be able to solve a number of varied problems dealing with the characteristics of forces, moments and couples.

Unit # 2 continued . . .

SPECIFIC OBJECTIVES:

1. a) To be able to state Newton's First Law of Force.
   b) To be able to state Newton's Second Law of Force.
   c) To be able to state Newton's Third Law of Force.

2. a) To be able to define the Magnitude of a force.
   b) To be able to define the Direction of a force.
   c) To be able to define the Line of Action of a force.

3. To be able to state the meaning of the principle of the transmissibility of a force.

4. To be able to define the term scalar quantity.

5. To be able to define the term vector quantity.

6. To be able to distinguish between vector and scalar quantities.

7. To be able to add vectors graphically using the String Polygon Method by drawing the vectors accurately to scale and in the proper direction.

8. To be able to define the term Resultant of vector addition.

9. To be able to resolve a force into horizontal and vertical components,

10. a) To be able to add algebraically horizontal components using a rectangular coordinate system.

    b) To be able to add algebraically vertical components using a rectangular coordinate system.

11. To be able to determine the resultant in magnitude of the algebraic vector sum of vertical and horizontal components.

12. To be able to determine the direction of the resultant in of the algebraic vector sum of vertical and horizontal components.

13. To be able to define the term magnitude of the Moment of Force.

Applied Mechanics - MCH 110-4

Unit # 2 continued . . .

14. To be able to state the theorem of statics: the moment of a force is equal to the sum of the moments of the components of that force.

15. a) To be able to calculate the magnitude of the resultant of a force system by algebraic addition.

    b) To be able to determine the location of the resultant of a force system using the Principle of Moments.

16. To be able to define the term couple.

17. To be able to calculate the magnitude and direction of a couple.

18. To be able to define the term direction cosine in a three dimensional force system.

19. To be able to add direction cosines algebraically.

20. a) To be able to calculate the magnitude of the resultant of a three dimensional force system, using direction cosines.

    b) To be able to calculate the direction of the resultant of a three dimensional force system, using direction cosines.

21. Using graphical means, the student will accurately construct a string polygon to solve for the resultant force in each of the following problems: - 2-10, 11, 12, 34 and 35.

22. Using the sfcirita**** the student will solve correctly the following problems by means of algebraic horizontal and vertical vector component addition: - 2-11, 12, 15, 19, 33, 34, 35, 36 and 37.

23. Using the *&*4immaate*$_t$ algebraic vector component addition and the principle of moments, the student will solve correctly the following problems: - 2-53, 54, 55, 56, 57 and 58.

24. Using the ^Jariwaadr" and specific objectives 16 and 17, the student will solve correctly the following problems: 2-62, 63 and 66.

Applied Mechanics - MCH 110-4

Unit # 2 continued . . .

25. Using the sMriMNtorand specific objectives 18, 19 and 20, the student will solve correctly the following problems: - 2-43, 44, 45 and 46.

Unit # 3 - Centre of Gravity and Centroids of Section

GENERAL OBJECTIVE:

The student will be able to ascertain both mathematically and experimentally the location of the centre of gravity of mass and the centroid of area.

SPECIFIC OBJECTIVES:

1. To be able to determine the centre of gravity of mass experimentally by suspending the object from various points.
2. To be able to calculate, using the principles of resultants and moments, the centre of gravity of grouped particles.
3. To be able to calculate, using the principles of resultants and moments, the centroid of any homogeneous plane figure.
4. - To be able to recall the formulae for the centroidal location of the centroids of a rectangle, circle, triangle, and semicircle.
5. To be able to calculate the centroidal location of areas using the formulae from specific objective 4.
6. To be able to ascertain from properties of Structural Shape Tables the centroid of Standard Shapes.
7. Using the s^qrivaMPFe, and the above objectives, the student will be able to solve correctly the following problems in the textbook: - 3-1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 16, 17 and 18.

Applied Mechanics - MCH 110-4

Unit # 4 * Equilibrium

GENERAL OBJECTIVE:

The student will be able to calculate the forces, moments or couples required to maintain equilibrium in any two-dimensional force system.

SPECIFIC OBJECTIVES:

1. To be able to define the term equilibrium.
2. a) To be able to state the equation of Horizontal equilibrium,

   bl To be able to state the equation of Vertical equilibrium,

   c) To be able to state the equation of Moment equilibrium.
3. To be able to define the expression free-body diagram.
4. To be able to draw a free-body diagram.
5. To be able to recall the method of determination of the resultant of a force system.
6. To be able to balance a resultant force to give a condition of equilibrium in a force system,
7. To be able to balance a resultant moment to give a condition of equilibrium in a force system.
8. a) To be able to define the term collinear force system.

   b) To be able to define the term concurrent force system.

   c) To be able to define the term parallel force system.
9. To be able to define the term equilibrant.
10. Using the 3JUJri*MA**and the above specific objectives, the student will solve correctly the following problems: 4-10, 11, 12, 15, 16, 17, 18, 20, 23, 24, 25, 26, 28, 36, 37 and 38.

Applied Mechanics - MCH 110-4

Unit # 5 - Friction

GENERAL OBJECTIVE:

The student will be able to solve a variety of problems dealing with friction.

SPECIFIC OBJECTIVES:

1. To be able to recall the three equations of equilibrium.
2. To be able to recall the method of free-body diagram construction.
3. To be able to state the three laws of friction.
4. a) To be able to define the term Static Friction,
   b) To be able to define the term Kinetic Friction.
5. a) To be able to apply the static friction force formula,
   b) To be able to apply the kinetic friction force formula.
6. To be able to define the term co-efficient of friction.
7. To be able to define the term Normal Force.
8. To be able to define the term Angle of Friction.
9. To be able to explain the relationship between the angle of friction and the co-efficient of friction.
10. With the aid o^*he-*rtrtdauand using the above objectives, the student will solve correctly, the following problems: 6-4, 5, 6, 7, 8, 9_S 10, 11, 13, 15, 16, 17 and 18,

e=^*u-0