SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

SAULT COLLEGE

COURSE OUTLINE

COURSE TITLE: Machine Dynamics

CODE NO. : MCH 320   **SEMESTER:** FIVE

PROGRAM: Mechanical Engineering Technology

AUTHOR: Kevin Sloss

DATE: September 2011   **PREVIOUS OUTLINE DATED:** N/A   January 2011

APPROVED: *"Corey Meunier"*

                      CHAIR   DATE

TOTAL CREDITS: FOUR

PREREQUISITE(S): MCH 110 – Applied Mechanics
MTH 551 – Calculus 1 for Technology

HOURS/WEEK: FOUR

I.   COURSE DESCRIPTION:
This subject includes the study of the following: principles of machines, types of machines, velocity ratio, mechanical advantage, and efficiency, dynamics, speed, velocity, acceleration, projectiles, work energy and power, impulse, impact and momentum, rotational motion and of kinematic energy of rotation.

II.   LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:
1. ***Kinematics: Rectilinear Motion***
   - Solve for displacement, velocity and accelerations using the three equations of constant acceleration rectilinear kinematics for objects in motion, including projectile motion.

2. ***Kinematics: Angular Motion***
   - Solve for values of angular displacement, velocity, and acceleration using the three equations of angular motion with uniform acceleration.

3. ***Plane Motion***
   - Solve for linear values of displacement, velocity, or accerleration in either absolute or relative terms.
   - Determine both linear and angular velocities of various mechanisms by means of instantaneous centres.

4. ***Kinetics***
   - Solve for forces or torque and respective accelerations of linear and angular motion.
   - Solve for force, torque, linear acceleration, and angular acceleration of plane motion.

5. ***Work, Energy and Power***
   - Calculate the work of a constant or a variable force.
   - Apply the conservation of energy principles to linear, angular, and plane motion.
   - Calculate power and efficiency.

6. ***Impulse and Momentum***
   - Use the impulse momentum method to solve problems with linear, angular and plane motions.
   - Apply the conservation of momentum method to solve for various

velocities for both linear and angular motion.

III.   TOPICS:

1.   Kinematics: Rectilinear Motion
   - Displacement
   - Velocity
   - Acceleration
   - Rectilinear Motion with Uniform Acceleration
   - Projectiles
2.   Kinematics: Angular Motion
   - Angular Displacement
   - Angular Velocity
   - Angular Acceleration
   - Angular Motion with Uniform Acceleration
   - Relationship Between Rectilinear and Angular Motion
   - Normal and Tangential Acceleration
3.   Plane Motion
   - Relative Motion
   - The Rolling Wheel
   - Instantaneous Centre of Rotation
4.   Kinetics
   - Linear Inertia Force
   - Linear Inertia Force: Dynamic Equilibrium
   - Angular Inertia
   - Angular Dynamic Equilibrium
   - Angular Inertia
   - Angular Dynamic Equilibrium
   - Plane Motion
5.   Work, Energy, and Power
   - Work of a Constant Force
   - Work of a Variable Force
   - Potential and Kinetic Energy: Translational
   - Conservation of Energy: Translational
   - Kinetic Energy: Angular
   - Conservation of Energy: Angular
   - Conservation of Energy: Plane Motion
   - Power and Efficiency
6.   Impulse and Momentum
   - Linear Impulse and Momentum
   - Angular Impulse and Momentum
   - Conservation of Momentum

IV.   REQUIRED RESOURCES/TEXTS/MATERIALS:

Applied Mechanics for Engineering Technology, Eighth Edition
Author: Keith M. Walker
Publisher: Prentice Hall
ISBN# 978-0-13-172151-7

V.   EVALUATION PROCESS/GRADING SYSTEM:

Assignments (10) – 40%
Midterm – 30%
Final Exam – 30%

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:

<u>Attendance:</u>
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.