

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title PHYSICS
Code No.: PHY 113-3
Program: ELECTRICAL/ELECTRONIC TECHNICIAN
Semester: II
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New

Revision

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Date

PHYSICS
Course Name

PHY 113-3
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PHILOSOPHY/GOALS:

METHOD OF ASSESSMENT (GRADING METHOD)

TEXTBOOK(S)

Introduction to Mechanics, Second Edition by Irving J. Levinson

<u>TOPIC NUMBER</u>	<u>PERIODS LECTURE-LAB</u>	<u>DESCRIPTION</u>	<u>REFERENCE</u>
I	4 0	<u>INTRODUCTION</u> - review of trigonometry	Chapter 1
II	11 0	<u>FORCES</u> - vector & scalar quantities - characteristics & units of forces - resultant of parallel forces - addition of vectors - components of a force - subtraction of vectors - moment of a force - principle of moments - couples	Chapter 2
III	6 0	<u>CENTRE OF GRAVITY</u> - determination of centroid - determination of centre of gravity - centre of gravity of simple & composite solids	Chapter 3
IV	4 0	<u>FRICTION</u> - force of friction - coefficient of friction - laws of friction	Chapter 6
V	10 0	<u>MACHINES</u> - mechanical advantage - velocity ratio - efficiency - types of machines: the lever the wheel & axle the pulley the inclined plane the wedge the screw compound machines - gear drives: two gears in mesh gear trains - pulley drives: two pulleys connected by a belt pulley trains	Handouts

<u>TOPIC NUMBER</u>	<u>PERIODS LECTURE-LAB</u>	<u>TOPIC DESCRIPTION</u>	<u>REFERENCE</u>
VI	6 0	<u>MOTION</u> - distance & displacement - speed & velocity - acceleration - uniformly accelerated motion - falling bodies - rotational motion	Chapter 9
VII	4 0	<u>HEAT & GASES</u> - four temperature scales: Fahrenheit Celsius Kelvin Rankine - absolute temperature - absolute & gauge pressure - normal temperature & pressure - Boyle's law - Charles' law - the General Gas law	

PHY 113-3

COURSE OBJECTIVES

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

INTRODUCTION

Review of Trigonometry

- with reference to a given angle in a right-angled triangle specify the "hypotenuse", the "opposite side" and the "adjacent side".
- in terms of the hypotenuse, the opposite side and the adjacent side define the six trigonometric functions: sine, cosine, tangent, cotangent, secant and cosecant.
- write a verbal statement and a mathematical statement of the "Pythagorean theorem".
- write a verbal statement and a mathematical statement of the cosine law.
- write a verbal statement and a mathematical statement of the sine law.
- calculate sine and cosine values for angles lying between 90 degrees and 180 degrees.
- solve problems in basic trigonometry at a level sufficient to enable him/her to deal with the mathematics of mechanics.

FORCES

1) Vector and Scaler Quantities

- define and list examples of "scaler quantities".
- define and list examples of "vector quantities".

2) Characteristics and Units of Forces

- define "force" incorporating into the definition the essential ideas of Newton's first law of motion.
- list 9 categories of forces,
- state the two characteristics of force - magnitude and direction.
- solve problems using the standard American engineering units of force - the pound, the kip and the ton.

3) Resultant of Parallel Forces &

4) Addition of Vectors &

5) Components of a Force

- define "resultant force".
- determine the resultant of two coplanar forces by means of the "parallelogram method" using a graphical approach,
- determine the resultant of two coplanar forces by means of the "parallelogram method" using a mathematical approach.
- determine the resultant of two or more coplanar forces by means of the "polygon method" using a graphical approach.
- determine the resultant of two or more coplanar forces by means of the "component method" using a mathematical approach.

6) Subtraction of Vectors

- determine the difference between two forces by means of "vector subtraction".

7) Moment of a Force

- state a definition of "moment of a force" or "torque".
- write an equation for the moment of a force about a point.
- calculate the moment produced by a force about a point.

8) Principle of Moments

- write a statement of the "principle of moments",
- solve problems involving forces acting upon systems in rotational equilibrium.

9) Couples

- state a definition of a "couple".
- solve problems involving couples.

CENTRE OF GRAVITY

1) Determination of Centroid

- state a definition of Centre of Gravity

2) Determination of Centre of Gravity

- state a definition of "centre of gravity".
- describe an experiment by which the centre of gravity of any two dimensional figure may be determined.

3) Centre of Gravity of Simple and Composite Solids

- determine the centre of gravity of particles grouped along a straight line.
- determine the centre of gravity of particles grouped in a plane.
- determine the centre of gravity of particles grouped in space.
- determine the centre of gravity of simple and composite two dimensional figures.
- determine the centre of gravity of simple and composite three dimensional solids.

FRICTION

1) Force of Friction

- state a definition of "friction".

2) Coefficient of Friction

- write an equation for the "coefficient of static friction".
- write an equation for the "coefficient of kinetic friction".

3) Laws of Friction

- state the three "laws of friction".
- solve problems involving static and kinetic friction.

MACHINES

- state a definition of a "simple machine".

1) Mechanical Advantage

- state a definition of "mechanical advantage".
- write an equation for mechanical advantage.

2) Velocity Ratio

- state a definition of "velocity ratio".

- write an equation for velocity ratio.

3) Efficiency

- state a definition of "efficiency".

- write two equations for efficiency.

4) Types of Machines

- draw diagrams of

- describe the operation of &

- write equations for the mechanical advantage, the velocity ratio and the efficiency of

i) the "Lever".

- the first class lever
- the second class lever
- the third class lever

ii) the "Wheel and Axle",

iii) the "Inclined Plane",

iv) the "Screw".

v) the "Pulley".

- a single fixed pulley
- a single moveable pulley
- pulley systems

- draw diagrams of

- describe the operation of &

- write the basic equations for the angular velocity of

1) two gears in mesh.

ii) two pulleys connected by a belt.

iii) gear and pulley trains.

- solve problems involving the mechanical advantage, the velocity ratio and the efficiency of both simple machines as well as composite machines composed of simple machines-

MOTION

1) Distance and Displacement

- state a definition of "distance".

- state a definition of "displacement".
- explain the major difference between distance and displacement.

2) Speed and Velocity

- state a definition of "speed".
- state a definition of "velocity".
- explain the major difference between speed and velocity.

3) Acceleration

- state a definition of "acceleration".
- state the 3 instances in which an acceleration is said to occur.
- state a definition of "uniform acceleration".
- state the units of acceleration.

4) Uniformly Accelerated Motion

- write the 4 equations involving uniformly accelerated motion that interrelate original velocity, final velocity, acceleration, displacement and time.
- solve a wide variety of problems involving displacements, constant velocities and uniformly accelerated motion,

5) Falling Bodies

- state the value of the acceleration due to gravity "g" in F.P.S. units, M.K.S. units and C.G.S. units.
- solve problems involving bodies falling under the influence of gravity.

6) Rotational Motion

- state the equation used to calculate the "normal acceleration" of a body travelling at constant speed "v" in a curved path of radius "r"
- solve problems involving rotational motion.

HEAT AND GASES

1) Four Temperature Scales

- Fahrenheit
- Celsius

- Kelvin
- Rankin

2) Absolute Temperature

- state the fundamental concepts of the "kinetic theory of heat".
- explain the difference between the heat possessed by a body and the temperature of the body,
- explain what is meant by the concept of "absolute zero".
- state the 4 temperatures scales in common use today.
- state on each of the 4 temperature scales the temperature at which water boils at atmospheric pressure, the temperature at which water freezes and absolute zero.
- write the equations used to convert:
 - i degrees Celsius to degrees Fahrenheit,
 - ii degrees Fahrenheit to degrees Celsius,
 - iii degrees Fahrenheit to degrees Rankin,
 - iv degrees Rankin to degrees Fahrenheit,
 - v degrees Celsius to degrees Kelvin-
 - vi degrees Kelvin to degrees Celsius,
 - vii degrees Rankin to degrees Kelvin,
 - viii degrees Kelvin to degrees Rankin.
- convert temperatures in any one of the scales to corresponding temperatures in any of the other 3 scales.

3) Absolute and Gauge Pressure

- write the relationship between "absolute pressure", "gauge pressure" and atmospheric pressure.

4) Normal Temperature and Pressure

- explain what is meant by and give values for "normal temperature and pressure".

5) Boyle's Law

- explain what is meant by an "Isothermal change".
- write a verbal statement of "Boyle's Law".
- write a mathematical statement of "Boyle's Law".
- solve problems involving Boyle's Law.

6) Charles' Law

- explain what is meant by an "Isobaric change".
- write a verbal statement of "Charles' Law".
- write a mathematical statement of "Charles' Law".
- solve problems involving Charles' Law.

7) The General Gas Law

- write a mathematical statement of the General Gas Law.
- solve problems involving the General Gas Law.