

## PHY113 – Physics I

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**Module Name:** Physics I

**Nominal Duration:** 52 hours (4 hours/week)

**Module Code:** PHY113

### Module Purpose

This is a first year level (non-calculus) course in Physics dealing primarily with mechanics and the mechanical and thermal properties of matter.

### Prerequisites

This unit is appropriate for students who have not studied Physics to Year 12 level or for those who obtained marginal results only.

### Relationship to endorsed Competency Standards

Nil

### Content

1. Mechanics
2. Mechanical and thermal properties of matter.

### Assessment Strategy

The final mark will be made up as follows:

Tests	2 x 12.5% (in lecture time)
Laboratory reports	25%
Final Examination	50%
Total	100%

### Learning Outcome/Assessment Criteria

The section and chapter references shown below are for the *Fifth Edition of Physics: Principles with Applications*. (Author D.C. Giancoli)

#### Section A: Mechanics

Introduction to Science and Physics (Chapter 1)

Mathematics (Appendix A)

#### Kinematics

The International System of Units (SI units) (1.5)

Converting Units (1.6)

Describing Motion (Kinematics in one dimension):

Rectilinear Motion: speed, velocity, acceleration (2.1 – 2.4)

Motion at constant acceleration, equations of motion (2.5 – 2.7)

Graphical analysis of motion (2.8)

Describing Motion (Kinematics in two dimension):

Vectors (3.1 – 3.4)

Projectile motion (3.5 – 3.6)

Relative velocity (3.8)

Uniform Circular Motion: Angular quantities, equations of motion (8.1)

Uniform Circular Motion: Centripetal acceleration (5.1, 8.1)

### Dynamics

Forces of nature (4.1, 5.10)

Newton's laws of motion (4.2 – 4.5)

Dimensions (Appendix B)

Weight, gravity (4.6, 5.5, 5.6)

Applications (inc friction) (4.7 – 4.9)

Uniform circular motion (5.2 – 5.5, 5.8, 5.9)

### Work and Energy

Work, kinetic and potential energy, conservation of energy, power (6.1 – 6.10)

### Momentum

Momentum, impulse (7.1, 7.3)

Conservation of momentum (7.2)

Conservation of energy and momentum in collisions (7.4 – 7.7)

Centre of mass (7.8, 7.9)

### Rotational Dynamics

Torque and rotational inertia (8.4 – 8.6)

Rotational kinetic energy (8.7)

Angular momentum and its conservation of (8.8)

### Bodies in Equilibrium

Forces in equilibrium, stability and balance (9.1 – 9.5)

## **Section B: Mechanical and Thermal Properties of Matter**

### Introduction

States of matter (Introduction to Chapter 10)

Structure of materials. Brownian motion (13.1)

Types of solids. Types of bonds (29.1, 29.5)

### Simple Harmonic Motion (SHM)

Nature of simple harmonic oscillations, energy in SHM, the simple pendulum, damping, resonance (11.1 – 11.6)

### Mechanical Properties

Elasticity: Stress, strain and elastic moduli (9.6, 9.7)

Different materials

### Thermal Properties 1

Heat and temperature (13.2, 14.1, 14.2)

Measurement of temperature (13.2)

Different types of thermometer (13.2)

Expansion (13.4, 13.5)

Thermal stresses (13.6)

## Thermal Properties 2

Specific heat capacity: Specific latent heat (14.4 –14.6)

## Thermal Properties 3

Heat transfer by conduction (14.7)

Heat transfer by convection (14.8)

Heat transfer by Radiation: Black body radiation and emissivity (14.9)

Nature of thermal radiation (22.5 [qualitative])

## Heat Losses

Heat losses and the energy balance

Human Metabolism (15.3)

Energy Resources (15.12)

## Fluids at Rest 1

Density (10.1). Pressure (10.2 – 10.5). Flotation (10.6)

Applications

## Fluids at Rest 2

Surface tension. Capillarity (10.12)

Applications

## Fluids in Motion 1

Streamline and turbulent flow (10.7). Bernoulli's equation (10.8 – 10.9)

Applications

## Fluids in Motion 2

Viscosity (10.10 – 10.12)

Applications

## **Delivery of the Module**

- (a) a two hour lecture every week
- (b) a two hour laboratory every second week
- (c) problem solving classes

## **Resource Requirements**

### **Textbooks**

Giancoli, D.C., *Physics – Principles with Applications* (**Fifth** edition, 1998). Problems will be set from this edition

CURTIN: *Physics 113 Laboratory Manual* (2000 Edition)

These are available at the Curtin Bookshop.

### **References**

(Not required to be purchased)

The Library has many (non-calculus) Physics texts suitable as references.

The following Year 11/12 secondary books may be helpful.

Mayfield, M.J., Parham, R.T. & Webber, B.J., *Fundamentals of Senior Physics – Book One and Two*, Heinemann Educational Australia.

Banyard, B., Hopfmuller, V., King, E., Wood, D. and Anderton, J. (ed), *Fundamental Physics*, Longman Cheshire.

Williams, Trinklein, F.E., Metcalf, H.C., R.W. *Modern Physics*, Holt, Rinehart and Winston.

## Student Support

### Problem Solving Classes (not compulsory)

Three one-hour time-slots will be made available for students to receive assistance in solving problems set in the lectures or the laboratory.

## Laboratories

Laboratory times are assigned at the first lecture.

**ALL** students **MUST** attend the laboratory in **WEEK 2**. After this they will attend the laboratory on alternate weeks. Groups A and B will be identified at the first laboratory class in Week 2. If they miss the first lecture then in week 2 they should attend the first laboratory class that fits their timetable.

Each laboratory session will generally begin with a brief discussion about the experiment, however they will be expected to prepare themselves for each laboratory experiment by reading the instructions and familiarizing themselves with the topic before the class begins.

Laboratory work is an important component of the course. **Attendance and the submission of a report** for all experiments will be required for a pass in this unit. The late submission of laboratory reports will attract a penalty. If for some reason students cannot avoid being absent from a class they should arrange with the laboratory supervisor to “catch up”. It is up to the student to coordinate with their laboratory supervisor to catch up on all uncompleted experiments. Failure to meet the requirements will result in an F (fail) grade for the unit irrespective of the final mark for the unit.

## Laboratory Program

Week	Experiment	Other
1	No Laboratory class	Students register for preferred Lab. Time.
2	<b>INTRODUCTION TO LABS</b>	<b>ALL STUDENTS</b>
3	Measurement	Group A
4	Measurement	Group B
5	Pendulum	Group A
6	Pendulum	Group B
7	Collisions in 2D	Group A
8	Collisions in 2D	Group B
9	Stability & Friction	Group A (Friday Group misses this Experiment)
10	Stability & Friction	Group B
11	Thermal Conductivity/Calorimetry	Group A
12	Thermal Conductivity/Calorimetry	Group B
13	Viscosity/Surface Tension	Group A/B

## Occupational Health and Safety

Not applicable other than those applying to laboratory procedures.

## **Acknowledgement**

PIBT acknowledges that this unit is based on Physics 113 from Curtin University of Technology. PIBT undertakes not to offer this unit, or authorize other providers to use this unit, without the written approval of Curtin University of Technology.