

**COURSE TITLE** : ENGINEERING PHYSICS I  
**COURSE CODE** : 1003  
**COURSE CATEGORY** : F  
**PERIODS PER WEEK** : 3  
**PERIODS /SEMESTER** : 45  
**CREDITS** : 3

#### TIME SCHEDULE

Module	Name of Module	Course Objective Number	Total periods per Semester		
			Instructional	Test	Total
I	Force and Motion	1.1 - 1.4	10	1	11
II	Vectors and Statics	2.1 - 2.2	12	1	13
III	Properties of Matter	3.1 - 3.4	11	1	12
IV	Periodic Motion and Waves	4.1 - 4.3	8	1	9
	<b>TOTAL</b>		<b>41</b>	<b>4</b>	<b>45</b>

#### COURSE OUTCOME

After the completion of the course student will be able to

- Differentiate different Physical quantities and its standard units.
- Understand concepts of force, Linear momentum, etc. which helps him to extend these concepts to Engineering mechanics.
- Solve fundamental problems in Mechanics related to force and its effects.
- Understand the fundamental principles of Rocket propulsion.
- Work with various vector algebraic tools which help to understand various concepts of Physics and technology.
- Acquire broad ideas about resultant force, moment of force and moment of a couple.etc. enables to perform vector operations and interpret the results geometrically and understand the applications in various Engineering branches.
- Understand basic ideas of different types of moduli of elasticity with special reference to Young's Modulus.
- Study concepts of technical terms such as stress, strain, elastic limit, elastic fatigue, plastic material etc
- Get an introductory idea of liquid flow with special reference to Bernoulli's theorem leading to its practical applications
- Impart basic ideas of viscosity and its practical applications

- Inculcate qualitative and quantitative knowledge of Simple Harmonic Motion.
- Contemplate basic concepts of wave motion and its characteristics leading to the understanding of various types of applications such as vibrations of air column.
- Recognise the characteristics of Ultrasonic sound and hence to apply the same in various applications in the field of Engineering and technology.

### **Specific Outcome**

#### **MODULE - I FORCE AND MOTION**

- 1.1.0 Understand the concept of units and measurements.
- 1.1.1. Define Unit of a Physical quantity.
- 1.1.2. Explain the principle of measurement.
- 1.1.3. Identify fundamental and derived units.
- 1.1.4. Apply the dynamics of particles in practical situations.
- 1.1.5. Identify the vector and scalar quantities.
- 1.1.6. Derive the expression  $S_n = u + a(n - \frac{1}{2})$ .
- 1.1.7. Solve problems related to gravity with equations of motion.
- 1.1.8 State Newton's laws of motion.
- 1.1.9 Define the terms force, Inertia, Momentum and Impulse.
- 1.1.10 Derive the relation  $F = ma$ .
- 1.1.11 State law of conservation of momentum and prove it in the case of two bodies making a collision .
- 1.1.12 Explain the principle behind the recoil of gun.
- 1.1.13 Solve problems related to laws of motion.

#### **MODULE - II VECTORS AND STATICS**

- 2.1.0 Understand the principles of statics and its applications.
- 2.1.1 Add vectors using triangle method.
- 2.1.2 Define Resultant and Equilibrant of vectors.
- 2.1.3 State Parallelogram law of forces.
- 2.1.4 Derive expression for resultant using Parallelogram law.
- 2.1.5 State the law of triangle of forces.
- 2.1.6 State Lami's theorem.
- 2.1.7 Explain moment of a force.
- 2.1.8 State the conditions of equilibrium of a rigid body acted upon by a large number of coplanar parallel forces.
- 2.1.9 Derive expression for work done by a couple.

#### **MODULE - III PROPERTIES OF MATTER**

- 3.1.0 Comprehend the concept of elasticity.
- 3.1.1 Define stress, strain, and elastic limit.
- 3.1.2 State Hooke's law.
- 3.1.3 Derive expression for Young's modulus, rigidity modulus, and bulk modulus.
- 3.1.4 Understand the term elastic fatigue.

- 3.1.5 Solve the problems related to modulus of elasticity.
- 3.1.6 Understand the principle of fluid flow.
- 3.1.7 Distinguish between Streamline and Turbulent flow.
- 3.1.8 Explain Pressure energy, Kinetic energy and Potential energy of a liquid.
- 3.1.9 Mention equation of continuity.
- 3.1.10 State Bernouille's theorem.
- 3.1.11 Explain the working of airfoil and atomizer.
- 3.1.12 Apply the principle of viscosity in solving problems.
- 3.1.13 Define coefficient of viscosity.
- 3.1.14 Give the Poiseuille's formula.
- 3.1.15 Explain terminal velocity.
- 3.1.16 Mention Stoke's formula.
- 3.1.17 Explain the effect of temperature on viscosity.
- 3.1.18 Solve problems using Poiseuille's formula.

#### **MODULE - IV PERIODIC**

- 4.1.1 Comprehend the concept of wave motion.
- 4.2.0 Define Simple Harmonic motion.
- 4.2.1 Derive equation for simple harmonic motion.
- 4.2.2 Explain period, frequency and amplitude.
- 4.2.3 Distinguish between transverse and longitudinal waves.
- 4.2.4 Define wavelength.
- 4.2.5 Derive the relation  $v = f\lambda$
- 4.2.6 Explain resonance.
- 4.2.7 Distinguish between closed pipes and open pipes.
- 4.2.8 Calculate the velocity of sound using resonance column experiment.
- 4.2.9 Explain ultrasonic waves.
- 4.2.10 Mention applications of ultrasonic waves.

### **COURSE CONTENT**

#### **MODULE - I FORCE AND MOTION (11Hrs)**

Physical Quantities – units - fundamental and derived units - SI System and its advantages-  
 One dimensional motion- Scalar and vector quantities - speed- velocity- acceleration -  
 recapitulation of equations of motion - derivation of the formula  $S_n = u + a(n-\frac{1}{2})$  - motion  
 under gravity - problems.

Force and motion - linear momentum - Newton's laws of motion - derivation of  $F = ma$   
 law of conservation of momentum - derivation - recoil of gun - expression for recoil  
 velocity rocket propulsion - impulse - problems.

## **MODULE - II VECTORS AND STATICS (13Hrs)**

Vectors and scalars- Triangle method of vector addition- Concurrent forces- Resultant and Equilibrant- parallelogram law –Derivation of resultant in magnitude and direction-Law of triangle of forces- Lami's theorem- Resolution of forces- Parallel forces- like and unlike parallel forces- moment of a force- conditions of equilibrium under the action of a number of coplanar parallel forces- couple-moment of a couple- work done by a couple- numerical problems.

## **MODULE - III PROPERTIES OF MATTER (12Hrs)**

Elasticity – stress – strain - elastic limit. Hook's law - Young's modulus - rigidity modulus - bulk modulus – determination of Young's modulus by stretching - elastic fatigue – plastic – problems.

Fluid flow- streamline and turbulent flow- pressure energy, potential energy and kinetic energy of a liquid- equation of continuity –Bernoulli's theorem – applications- airfoil and atomizer.

Viscous force- coefficient of viscosity- Poiseuille's formula – Stoke's formula and experiments – Variation of viscosity with temperature – numerical problems

## **MODULE - IV PERIODIC MOTION AND WAVES (9Hrs)**

Simple harmonic motion – definition – simple harmonic motion as projection of a uniform circular motion along the diameter of a circle – equation for simple harmonic motion – period, frequency, amplitude and phase –Examples of simple Harmonic Oscillators - problems.

Waves – longitudinal and transverse – relation between velocity, frequency and wavelength – free vibration, forced vibration and resonance – nodes and antinodes - vibration of air column in a tube – closed pipes – open pipes – end correction – resonance column experiment – variation of velocity with temperature – ultrasonic waves – production – applications - problems.

## **REFERENCE BOOKS**

- |                         |                       |
|-------------------------|-----------------------|
| 1. Resnick and Halliday | - Physics             |
| 2. D.S.Mathur           | - Mechanics           |
| 3. Narayana Kurup       | - Mechanics           |
| 4. A.Marikani           | - Engineering Physics |
| 5. H D Young            | - University Physics  |