



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 |
| | TOTAL | | 41 | 4 | 45 |

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 |