BSPH-103 Applied Physics- I L T P C = 2 1 0 3

Total Theory Load: 4 months (48 Hours) (36 L + 12 T) (To the Maximum)

Course Outcomes:

After successful completion of the course, the students should be able to

- CO1: Understand the basics of physics in prescribed syllabus.
- CO2: Know the conceptual physics and its use in solving the physical problems.
- CO3: Apply the principles of physics.
- CO4: Describe the physics in his /her words.
- CO5: Identify the reasons for physical happenings.
- CO6: Preparing for vocational skills at diploma level
- CO7: Standardization of the knowledge acquired

CO/PO Mapping

1 (S)-strong, 2(M)-medium and 3(W)-weak indicate the strength of correlation

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	3	1	2	2	2	2	3	2	1
CO2	1	2	1	2	1	2	2	3	2	2	2	3
CO3	1	1	1	2	2	2	3	2	2	3	3	3
CO4	2	1	2	2	3	2	3	3	3	3	3	3
CO5	1	1	1	2	2	3	2	3	3	2	3	3
CO6	1	1	2	2	1	2	3	3	2	3	3	3
CO7	2	1	1	2	2	3	3	3	3	3	3	2

BSPH-103 **APPLIED PHYSICS- I**

L	T	P	C
2	1	0	3

Total Theory Load: 4 months (48 Hours) (36 L +8T)

UNIT-I

UNITS AND MEASUREMENTS: Need for measurements, fundamental and derived units, system of units (FPS, CGS, MKS), S.I. units. Dimensions and Dimensional formula of physical quantities, Dimensional equations and their applications. Error in Physical measurements-causes & types, Combination of errors (qualitative ideas). Simple numerical problems.

6 Lectures

FORCE AND MOTION: Scalar and vector quantities, types of a vector, Resolution of a vector, laws of vector addition, scalar and vector products. Newton's Laws of motion and their engineering applications, second law is the real law, concept of linear momentum, impulse. Projectile motion, uniform circular motion, qualitative concepts of torque, angular momentum, conservation of angular momentum, centripetal and centrifugal forces. Concept of rotational motion. Introducing: work, power, energy and friction. Numerical Problems.

8 Lectures

GRAVITATION: Universal law of gravitation, Inertial and gravitational mass, relation between g and G, variation of acceleration due to gravity (with altitude and depth), orbital velocity, escape velocity, elementary ideas of geo-stationary satellite. Simple numerical problems.

4 Lectures

UNIT-II

WAVES AND VIBRATIONS: Generation of waves, wave motion: transverse and longitudinal wave motion with examples, sound waves, light waves, velocity, frequency and wavelength of a wave and their applications. SHM: definition, expression for displacement, velocity, acceleration, time period and frequency in S.H.M. Free. Numerical Problems. ***6 Lectures***

PROPERTIES OF MATTER: Inter-atomic and intermolecular forces, elastic properties, Hooke's law, three moduli of elasticity, Poisson's ratio, surface tension and surface energy, angle of contact, capillary rise, Viscosity, Stokes law (treatment by dimensional analysis), Streamline and turbulent flow, Introduction to Bernoulli's theorem and its applications. Simple numerical problems. ***6 Lectures***

HEAT AND THERMODYNMICS: First law of thermodynamics, specific heat at constant volume and constant pressure of ideal gas, relation between C_p and C_v, Thermodynamic processes (reversible, irreversible, isothermal and adiabatic), second law of thermodynamics. Thermal conductivity, black body radiation, Wien's law, Stefan's law, Newton's law of cooling. Numerical Problems. ***6 Lectures***

Recommended Books:

Author	Title	Publisher
NCERT	Physics for XI	NCERT New Delhi
Haliday and Resnick and Walker	Fundamentals of Physics	John Wiley & Sons
K L Gomber and K L Gogia	Fundamental Physics Class (XI)	Pardeep Publications
S. K. Gupta	ABC of Physics, Class (XI)	Modern Publications

Proposed lecture plan:

UNITS AND MEASUREMENTS:

Introduction to Measurements (0.5 hour)

- Understanding the need for measurements
- Importance of accuracy and precision

Fundamental and Derived Units (0.5 hour)

- Definition of fundamental units (e.g., mass, length, time)
- Understanding derived units (e.g., velocity, acceleration, force)
- Examples and exercises to reinforce concepts

Systems of Units (0.5 hour)

- Introduction to FPS (Foot-Pound-Second), CGS (Centimeter-Gram-Second), and MKS (Meter-Kilogram-Second) systems
- Comparison between different systems

SI Units (1 hour)

- Detailed explanation of SI units for various physical quantities (e.g., meter, kilogram, second, ampere, kelvin)
- Significance of SI units in scientific measurements

Dimensions and Dimensional Formula (1 hour)

- Definition of dimensions and dimensional formula
- Derivation of dimensional formulas for physical quantities
- Examples and exercises to practice dimensional analysis

Dimensional Equations and Applications (1.5 hours)

- Understanding dimensional equations
- Applications of dimensional analysis in solving problems and verifying equations
- Practice problems related to dimensional analysis

Error in Physical Measurements (0.5 hours)

- Causes of errors in measurements (e.g., instrumental, environmental, human)
- Types of errors (e.g., systematic errors, random errors)

Combination of Errors (0.5 hours)

- Qualitative explanation of combining errors
- Introduction to error propagation and uncertainty analysis
- Simple numerical problems demonstrating error combination

FORCE AND MOTION:

Scalar and Vector Quantities (0.5 hour)

- Differentiation between scalar and vector quantities & examples of scalar and vector

Types of Vectors and Resolution (0.5 hour)

- Introduction to different types of vectors: position, displacement, velocity, acceleration, force, etc.
- Explanation of vector resolution into components
- Practice problems on resolving vectors

Laws of Vector Addition and Scalar/Vector Products (1 hour)

- Explanation of the laws of vector addition (commutative, associative)
- Understanding scalar and vector products
- Applications of vector addition and scalar/vector products

Newton's Laws of Motion (0.5 hour)

- Statement and explanation of Newton's three laws
- Engineering applications of Newton's laws
- Emphasis on the practical implications of the second law

Linear Momentum and Impulse (0.5 hour)

- Concept of linear momentum and its conservation
- Definition and explanation of impulse
- Engineering applications of momentum and impulse

Projectile Motion and Uniform Circular Motion (2 hours)

- Introduction to projectile motion
- Analysis of motion in uniform circular paths
- Examples and problems related to both types of motion

Torque, Angular Momentum, and Conservation (2 hours)

- Qualitative understanding of torque, angular momentum, and conservation of angular momentum
- Explanation of centripetal and centrifugal forces

Concept of Rotational Motion, Work, Power, Energy, and Friction (1 hour)

- Introduction to rotational motion
- Definitions and explanations of work, power, and energy
- Introduction to friction and its effects
- Numerical problems involving work, power, energy, and friction

GRAVITATION:

Universal Law of Gravitation (0.5 hour)

- Statement and explanation of the universal law of gravitation
- Understanding the gravitational force between two objects
- Mathematical formulation of Newton's law of gravitation

Inertial and Gravitational Mass (0.5 hours)

- Definition and distinction between inertial and gravitational mass
- Concept of equivalence principle

Relation between g and G (0.5 hours)

- Derivation of the relation between acceleration due to gravity (g) and gravitational constant (G)
- Understanding how mass and distance affect gravitational acceleration
- Variation of Acceleration due to Gravity (1 hour)
- Explanation of how acceleration due to gravity varies with altitude and depth
- Calculations and examples related to variations in g

Orbital Velocity and Escape Velocity (1 hour)

- Definition and explanation of orbital velocity
- Concept of escape velocity and its significance
- Calculations and examples involving orbital and escape velocities

Elementary Ideas of Geo-stationary Satellite (0.5 hour)

- Explanation of geo-stationary satellites and their characteristics
- Applications and significance of geo-stationary satellites

Simple Numerical Problems (1 hour)

- Practice solving numerical problems related to the topics covered
- Incorporate problems involving universal gravitation, variations in gravity, orbital/escape velocities, and geo-stationary satellites

WAVES AND VIBRATIONS:

Generation of Waves (0.5 hours)

- Explanation of how waves are generated
- Various methods of wave generation (e.g., mechanical, electromagnetic)

Wave Motion (1 hour)

- Introduction to transverse and longitudinal wave motion
- Examples of transverse and longitudinal waves
- Properties and characteristics of waves

Sound Waves (1 hour)

- Detailed explanation of sound waves
- Velocity, frequency, and wavelength of sound waves
- Applications of sound waves in various fields

Light Waves (1 hour)

- Introduction to light waves
- Properties of light waves (e.g., velocity, frequency, wavelength)
- Applications of light waves in optics and technology

Simple Harmonic Motion (SHM) (1.5 hours)

- Definition and characteristics of SHM
- Equations describing displacement, velocity, and acceleration in SHM
- Time period and frequency in SHM

Numerical Problems (1 hour)

- Practice solving numerical problems related to the topics covered

PROPERTIES OF MATTER:

Inter-atomic and Intermolecular Forces (1 hour)

- Explanation of inter-atomic and intermolecular forces
- Different types of intermolecular forces (e.g., van der Waals forces, hydrogen bonding)

Elastic Properties and Hooke's Law (1 hour)

- Introduction to elastic properties of materials
- Statement and application of Hooke's law
- Understanding stress and strain

Three Moduli of Elasticity and Poisson's Ratio (1 hour)

- Definition and explanation of Young's modulus, Shear modulus, and Bulk modulus
- Poisson's ratio and its significance

Surface Tension and Surface Energy (1 hour)

- Explanation of surface tension and surface energy
- Angle of contact and capillary rise
- Applications of surface tension in daily life

Viscosity and Stokes Law (1 hour)

- Definition and explanation of viscosity
- Application of Stokes law in viscosity calculation through dimensional analysis
- Understanding streamline and turbulent flow

Bernoulli's Theorem and its Applications (1 hour)

- Explanation of Bernoulli's theorem
- Applications of Bernoulli's theorem in fluid dynamics

Simple numerical problems related to elasticity, surface tension, viscosity, and Bernoulli's theorem

HEAT AND THERMODYNMICS:

First Law of Thermodynamics (1 hour)

- Statement and explanation of the first law of thermodynamics
- Understanding energy conservation in thermodynamic processes
- Application of the first law in various scenarios

Specific Heat and Relation between C_p and C_v (2 hour)

- Explanation of specific heat at constant volume (Cv) and constant pressure (Cp)
- Derivation of the relation between Cp and Cv for ideal gases
- Practical significance of specific heat in thermodynamics

Thermodynamic Processes (1 hours)

- Introduction to reversible and irreversible processes
- Explanation of isothermal and adiabatic processes

Second Law of Thermodynamics (0.5 hour)

- Statement and explanation of the second law of thermodynamics

Thermal Conductivity and Laws of Radiation (1 hour)

- Definition and explanation of thermal conductivity
- Introduction to black body radiation
- Explanation of Wien's law and Stefan's law
- Application of Newton's law of cooling

Numerical Problems (0.5 hours)