Course Name : 03 Years Diploma in Mining Engineering

Year   : First

Subject Title : Engineering Physics

Subject Code : M103/M110

Teaching and Examination Scheme:

Teaching Scheme			Examination					
L	T	P	Full Marks.	External Exam Marks	Internal Exam Marks	External Pas Marks	Total Pass Marks	Duration of External Exams
02			100	80	20	26	40	3 Hrs
Practical		2	50	40	10	13	20	4 Hrs

NOTE:

Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

Basic science forms the foundation of Engineering. In particular Physics provides fundamental facts, principles, laws, and proper sequence of events to streamline Engineering knowledge.

Subject objective:

This subject is classified under basic science. It describes basic facts, concepts, principles and techniques of scientific investigation of physical quantities and physical processes which are used in Core Technology & Technology subjects.

Chapter	Name of the Topic	Hours	Marks
01	**UNITS AND MEASUREMENTS** **1.1** Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units **1.2** Definition of dimensions with examples, principle of homogeneity of dimensions, limitations of dimensions. **1.3** Definition of accuracy, precision and error, estimation of errors – absolute error, relative error and percentage error, rules and identification of significant figures.	**03**	**04**

	(Numericals on percentage error and significant figures)		
02	**MECHANICS** **2.1 Kinetics** Definitions of momentum, impulse, impulsive force, Statements of Newton's laws motion and with equations, Applications of laws of motion- Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift. **(Numericals on impulse, recoil velocity and motion of lift.)**	**03**	**04**
	2.2 Angular Motion Definition of angular displacement, angular velocity and angular acceleration, relation between linear velocity and angular velocity, definition of simple harmonic motion (SHM), SHM as a projection of uniform circular motion on any diameter, equation of SHM, derivation of displacement, velocity and acceleration of a body executing SHM.	04	**05**
03	**Work, Power, Energy** Definition of work, power and energy, equations for P.E. & K.E., Work-Energy principle, Representation of work by using graph, work done by a torque (no derivation) **(Numericals on work, potential and kinetic energy)**	**03**	**04**
4	**GENERAL PROPERTIES OF MATTER** **4.1 Elasticity** Deforming force, restoring force, elastic and plastic body, stress and strain with their types. elastic limit, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity and relation between them (no derivation). **(Numerical on stress, strain and Young's modulus)**	**03**	**04**
	4.2 Surface Tension. Molecular force, cohesive and adhesive force, Molecular range , sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I. unit, angle of contact, capillary action with examples, shape of meniscus for water and mercury, relation between surface tension , capillary rise and radius of capillary (no derivation),effect of impurity and temperature on surface tension **(Numerical on relation between surface tension, capillary rise and radius)**	**02**	**03**

	4.3 Viscosity Definition of viscosity, viscous force, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its S.I. unit, streamline and turbulent flow with examples, critical velocity, Reynolds's number and its significance, derivation of viscous force for free fall of spherical body through viscous medium, upthrust, terminal velocity, Stoke's law (statement and formula). **(Numerical on coefficient of viscosity, Reynolds number and Stoke's formula)**	**02**	**03**
5	**HEAT** **Transmission of heat and expansion of solids:** Three modes of transmission of heat -conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity and its S.I. unit, Definition of linear, aerial and cubical expansion and relation between them. (no derivation) (Numericals on law of thermal conductivity, and coefficients of expansions)	**03**	**04**
6	**6.1 SOUND** Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength , longitudinal and transverse wave, definition of stationary wave , node and antinode, forced and free vibrations, definition of resonance with examples, derivation of formula for velocity of sound with end correction. **(Numericals on relation $v = n\lambda$ and resonance)**	04	05
	6.2 Acoustics of Building Acoustics-concept and definition, Intensity and loudness of sound, echo, Reverberation standard reverberation time, Sabine's formula, Conditions for good acoustics, Factors affecting Acoustical planning of auditorium. **(Numericals on Sabine's formula)**	**03**	**04**
7	**7.1 Properties of light** Reflection, refraction, Snell's law, physical significance of refractive index, definition of dispersion of light along with ray diagram. **(Numericals on refractive index)**	**02**	**03**
	7.2 Fiber Optics Introduction, Total internal reflection, critical angle, acceptance angle. Structure of optical fiber, Numerical Aperture, Fiber optic materials, Types of optical fibers, Applications in communication systems. **(Numerical on critical angle, numerical aperture)**	04	5

8	**8.1- Electric field** Electric charge, Coulomb's inverse square law, Definition of unit charge, Electric field, Electric lines of force and their properties, Elect field intensity, Electric flux, Electric flux density. **(Numericals on Coulombs law, Electrical Intensity)**	04	5
	8.2 Electric Potential Concept of potential, Definition and unit, Potential due to point charge using integration method, Potential difference between two points, Definition of dielectric strength and breakdown potential. **(Numericals on electric potential)**	04	5
9	**9.1 Modern Physics** **9.1.1 Band Theory of Solids** Energy levels in solids, Valence & conduction bands, forbidden gap, Conductors, Semiconductors and Insulators, Intrinsic and Extrinsic Semiconductors, p-type and n-type semiconductors, P-N junction diode-forward and reversed biased characteristics. **(No Numericals)**	04	5
	9.1.2 Photo electricity Concept of photon**,** Plank's hypothesis, properties of photon, photo electric effect, Laws of photoelectric effect, work function, Einstein's photoelectric equation(no derivation), Basic Concept of Solar Energy. **(Numericals on Energy of photon, work function, photoelectric equation)**	**04**	4
	9.1.3 LASER Properties of laser, Characteristics and applications of laser.	02	4
	9.1.4 X-rays Introduction to X-rays, production of X-rays using Coolidge tube, minimum wavelength of X-rays, properties and applications. of X-rays **(Numericals on minimum wavelength of x-rays)**	**02**	03

	9.1.5 Introduction to nanotechnology Definition of nanoscale, nanometer & nanoparticle, applications of nanotechnology- electronics, automobiles, medical, textile, cosmetics, environmental, space and defence.	02	03
10	**Non- Conventional Sources of energy** Introduction- Non Renewable and renewable (Alternate) energy sources, Examples- Solar Energy, Wind Energy, Tidal Energy, Geo-Thermal Energy and Bio-Mass. Advantages and disadvantages of renewable energy.	02	03
	Total	60	80

List of Experiments:

1. To use Vernier Callipers for the measurement of dimensions of given object.
2. To use Micrometer Screw Gauge for the measurement of dimensions (Length, Thickness, Diameter) of given object.
3. To use spherometer for the measurement of thickness of a given glass piece.
4. To determine time period of oscillation of compound bar pendulum and calculate acceleration due to gravity (g).
5. To calculate Young's modulus of elasticity of steel wire by vernier method
6. To study capillary phenomenon and to verify that the height of liquid in capillary is inversely proportional to the radius of capillary
7. To determine coefficient of viscosity of given liquid using Stoke's Method
8. To determine the velocity of sound by using resonance tube.
9. To calculate the Linear Thermal coefficient of expansion for copper by using pullinger's apparatus.
10. To determine refractive index of a glass using glass slab by pin method. (sin i/sin r=µ).
11. To calculate refractive index of material of prism using spectrometer device.
12. To verify Total Internal Reflection (TIR) phenomenon for given glass slab and to calculate critical angle of incidence.
13. To measure the numerical aperture the plastic fibre using 660 nm wavelength LED.
14. Verification of Ohm's Law.
15. To verify inverse square law by using photoelectric cell.
16. To determine I-V characteristics of P-N junction Diode.

REFERENCE :

Sl. No.	Author	Title	Publisher
01	VP Bhatnagar	I.Sc. Physics Volume I & II	Pitamber Publication Co. New
02	ArthurBeiser	Appliedphysics	TataMcGraw-Hill
03	R.K.Gaur and S.L.Gupta	EngineeringPhysics	DhanpatraiandSons.
04	Rensic and Halliday	Physics	Wileypublications
05	Dr.S.K.Kulkarni	Nanotechnology-principles	Capitalpublishingcompany
06	S.K.Gupta	ABC of Physics	Modern Publisher New Delhi
07	A. S. Vasudeva	Senior Practical Physics	S.K. Kataria & Sons.
08	E. ZEBROWSKI	Physics For Technicians	TATA MCGRAW HIL
09	H. H. LAL, B. K.	Applied Physics	TATA MCGRAW HILL
10	A Kumar	Core Physics- I & II	Bharti Bhavan
11.	K.L. Gomber & K. L Gogia	Pradeep's Fundamental Physics- XI & XII	Pradeep Publication
12.	V. K. Mehta & Rohit Mehta	S. Chand's Priniciples of Physics- XI & XII	S. Chand Publication
13	S.K Sharma	Dinesh New Millennium Physics- XI & XII	Dinesh Publication