STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

SYLLABUS

L-SCHEME

(Implements from the Academic year 2011-2012 onwards)

Course Name	:	**All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and Film & TV**
Semester	:	**I Semester**
Subject Title	:	**Engineering Physics - I**
Subject Code	:	**1004**

Teaching and Scheme of Examination:　　　　　**No of weeks per semester: 16 weeks**

Subject	Instructions		Examination			
	Hours/Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Engineering Physics-I	**4 Hrs**	**64 Hrs**	**25**	**75**	**100**	**3 Hrs**

Topics and Allocation of Hours:

Sl.No.	Topic	Time(Hrs)
1.	S I UNITS AND STATICS	13
2.	PROPERTIES OF MATTER	13
3.	DYNAMICS – I	13
4.	DYNAMICS – II	12
5.	MAGNETISM AND SOUND	13
	Total	64

RATIONALE:

　　　　The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Science such as Physics.

　　　　The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the

Foundation by enlightening the **Fundamental facts, Principles, Laws and Correct sequence of events** to develop the Engineering and Technology field for the prosperity of human beings.

OBJECTIVES:

At the end of the study of I Semester the student will be able to

- Understand the importance of SI units and dimensional formulas.

- Acquire broad ideas about resultant, moment of a force and torque of a couple.

- Understand the elastic property and the types of modulii of elasticity.

- Explain the surface tension of liquids and viscosity of fluids.

- Acquire knowledge about projectile motion, circular motion and its application.

- Understand the concepts of simple harmonic motion.

- Gain knowledge about rotational kinetic energy and angular momentum.

- Acquire broader ideas about variation of acceleration with respect to height and its importance in launching satellites and concept of weightlessness.

- Explain the importance of hysteresis of magnetic materials and its uses.

- Understand the propagation of sound, ultrasonic and acoustics of buildings.

- Solve simple problems involving expressions derived in all the above topics.

I SEMESTER
1004 ENGINEERING PHYSICS – I

Contents: Theory

Unit	Name of the Topic	Hours	Marks
I	**S I UNITS AND STATICS**		15
	1.1 UNITS AND MEASUREMENT Unit-Definition-Fundamental Quantities-Definition-Seven fundamental quantities; their SI units and symbol for the units-Dimensional formula for length, mass and time - Supplementary quantities-plane angle and solid angle; their SI units and symbol for the units – Accuracy and precision of measuring instruments – Significant figures, rounding off and errors in measurement. Derived physical quantities-Definition-SI units, symbol for the units and derivation of dimensional formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power. Conventions followed in SI-Multiples & sub-multiples and prefixes of units.	**5 Hrs**	
	1.2 STATICS Scalar and vector quantities – Definitions and examples – Concurrent forces and coplanar forces – Definition - Resolution of a vector into two perpendicular components- Resultant and equilibrant – Definitions- Parallelogram law of forces-statement- Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them - Lami's theorem- Statement and explanation-Experimental verification of parallelogram law of forces and Lami's theorem. Simple problems based on expressions for magnitude and direction of resultant. Moment of a force- Clockwise and anti-clockwise moments - Principle of moments- Couple – Torque acting due to a couple – Experimental determination of mass of the metre scale and mass of the given body using principle of moments.	**8 Hrs**	

II	**PROPERTIES OF MATTER** **2.1 ELASTICITY** Elastic and plastic bodies – Definition - stress, strain - Definitions – Hooke's law –statement - three types of strain– Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio – Definitions - . Relation between three modulii of elasticity (no derivation) - Uniform and non uniform bending of beams- Explanation.- Experimental determination of the Young's modulus of the material of a beam by uniform bending method - Torsion pendulum- Experimental determination of the rigidity modulus of the material of a thin wire using symmetrical masses. Simple problems based on stress, strain and Young's modulus.	**5 Hrs**		**15**
	2.2 VISCOSITY Viscosity – Definition - Coefficient of viscosity - Definition, SI unit and dimensional formula - Stream line flow, turbulent flow-Explanation - Critical velocity –Definition- Reynolds number - Derivation of Poiseuille's formula by dimensional method- Experimental determination of coefficient of viscosity of a low viscous liquid by capillary flow method (Variable pressure head method)– Terminal velocity – Definition - Derivation of Stokes' formula for coefficient of viscosity of a high viscous liquid by dimensional method – Experimental determination of coefficient of viscosity of a high viscous liquid by Stokes' method – Practical applications of viscosity.	**4 Hrs**		
	2.3 SURFACE TENSION Surface tension – Molecular theory of surface tension - Surface tension & angle of contact- Definitions - Explanation for capillary rise and dip - Expression for surface tension of a liquid by capillary rise method - Experimental determination of surface tension of water by capillary rise method – Practical applications of capillarity. Simple problems based on expression for surface tension.	**4 Hrs**		

III	**DYNAMICS – I**		15
	3.1. PROJECTILE MOTION Projectile motion, angle of projection, trajectory, maximum height, time of flight, and horizontal range – Definitions - Expressions for maximum height, time of flight and horizontal range – Condition for getting the maximum range of the projectile- Derivation of the equation to show that the trajectory of the projectile is a parabola. Simple problems based on expressions for maximum height, time of flight and horizontal range.	**5 Hrs**	
	3.2 CIRCULAR MOTION Circular motion, angular velocity, period and frequency of revolutions– Definitions – Relation between linear velocity and angular velocity – Relation between angular velocity, period and frequency – Normal acceleration, centripetal force and centrifugal force – Definitions – Expressions for normal acceleration and centripetal force. Simple problems based on expression for centripetal force.	**4 Hrs**	
	3.3 APPLICATION OF CIRCULAR MOTION Banking of curved paths – Angle of banking – Definition – Expression for the angle of banking of a curved path. { $\tan \theta = v^2 / (r\,g)$ } Simple problems based on expression for angle of banking.	**2 Hrs**	
	3.4 SIMPLE HARMONIC MOTION Simple harmonic motion, amplitude, frequency, period and phase - Definitions – Simple harmonic motion as a projection of a uniform circular motion on any diameter – Expressions for velocity, acceleration and period of a body executing simple harmonic motion.	**2 Hrs**	

IV	**DYNAMICS – II** **4.1 ROTATIONAL MOTION OF RIGID BODIES** Rigid body – Definition - Moment of inertia of a particle about an axis, moment of inertia of a rigid body about an axis – expressions – Radius of gyration – Definition – Expression for the kinetic energy of a rotating rigid body about an axis – Angular momentum – Definition – Expression for the angular momentum of a rotating rigid body about an axis – Law of conservation of angular momentum – Examples. Simple problems based on expressions for rotational kinetic energy and angular momentum, by giving formula for moment of inertia about the chosen axis.	**5 Hrs**	**15**
	4.2 GRAVITATION Newton's laws of gravitation – Acceleration due to gravity on the surface of earth –Difference between mass and weight of a body - Variation of acceleration due to gravity with altitude – Concept of weightlessness	**1 Hrs**	
	4.3 SATELLITES Satellites – Natural and artificial – Escape velocity and orbital velocity – Definitions – Expression for escape velocity – Expressions for orbital velocity and period of revolution of a satellite around earth – Geo-stationary and polar satellites – Uses of artificial satellites. Simple problems based on expressions for escape velocity, orbital velocity and period of revolution.	**5 Hrs**	

V	**SOUND AND MAGNETISM**		15
	5.1 SOUND		
	Wave motion – Introduction and definition – Progressive waves, longitudinal and transverse waves – Examples and comparison –Amplitude, wave length, period and frequency of a wave – Definitions - Relation between wavelength, frequency and velocity of a wave - Stationary or standing waves.	**9 Hrs**	
	Vibrations - Free & forced vibrations and resonance – definitions and examples –Laws of transverse vibrations of a stretched string – Sonometer – Experimental determination of frequency of a tuning fork.		
	Ultrasonic – Introduction – Production of ultrasonic waves by piezo-electric method – Properties and applications.		
	Acoustics of buildings – Reverberation, reverberation time, Sabine's formula for reverberation time (no derivation) – Coefficient of absorption of sound energy – Echo - Loudness – Extraneous and Internal noise.		
	Simple problems based on expression for frequency of vibration.		
	5.2 MAGNETISM		
	Coulomb's laws of magnetism – Pole strength and unit pole – Definitions – Magnetic moment, intensity of magnetisation, magnetising field intensity, magnetic induction, permeability, hysteresis, saturation, retentivity and coercivity – Definitions- Magnetising field intensity along the axis of the solenoid (no derivation) - Method of drawing hysteresis loop of a specimen using a solenoid – Uses of Hysteresis loop	**4 Hrs**	

I SEMESTER

1004 ENGINEERING PHYSICS – I
MODEL QUESTION PAPER

Time : 3 Hrs   Max Marks : 75

PART- A
Marks 15 x 1 = 15

Note : Answer any 15 Questions.

1. Define unit.
2. Define derived Quantities.
3. Write Parallelogram Law of forces.
4. Define moment of a force.
5. Write Hooke's Law.
6. Define Co-efficient of viscosity.
7. Define Terminal velocity.
8. Write any two practical applications of capillarity.
9. Define trajectory.
10. Define angular velocity.
11. Define angle of banking.
12. Define frequency.
13. Define rigid body.
14. Write law of conservation of angular momentum.
15. Define escape velocity.
16. Write any two uses of artificial satellites.
17. Define intensity of magnetisation.
18. Define retentivity.
19. Define resonance.
20. What is ultrasonic?

PART- B

Marks 5 x 12 = 60
Note : i) Answer all Questions choosing any two sub divisions from each question.
          ii) All sub divisions carry equal marks.

I   a) List the conventions followed in S I.
    b) Derive expressions for the magnitude and direction of the resultant of two forces acting at a point with an acute angle and between them.
    c) Describe an experiment to determine the mass of the given body using principle of moments.

II a) Describe an experiment to determine the rigidity modulus of the material of a thin wire with two symmetrical masses using torsion pendulum.

b) Derive Stokes' formula for the co-efficient of viscosity of a high viscous liquid by dimensional method.

c) A capillary tube of bore 0.5 mm is dipped vertically in water of surface tension 0.072 Nm^{-1}. Find the height of capillary rise.

III a) A missile is fired at an angle of 40° to hit a target situated at a distance of 100 km. Find the velocity of projection of the missile.

b) Derive an expression for the angle of banking of a curved path.

c) Derive an expression for the period of a body executing simple harmonic motion.

IV a) Derive an expression for the angular momentum of a rigid body rotating about an axis.

b) Derive an expression for the orbital velocity of a satellite.

c) Explain the concept of variation of acceleration due to gravity with altitude and weightlessness.

V a) Explain the production of ultrasonic using Piezo electric generator.

b) Explain the method of drawing hysteresis loop of a specimen taken in the form of a rod, using a solenoid.

c) A sonometer wire is loaded with a mass of 2 kg. The linear density of the wire is 2 x 10^{-3} kgm^{-1}. When an excited tuning fork is placed on the sonometer box, the resonating length is found to be 15.4 cm. Find the frequency of the tuning fork.

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