GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ENGINEERING

I YEAR

SEMESTER SYSTEM

L - SCHEME

2011 - 2012

I SEMESTER

ENGINEERING PHYSICS - I

CURRICULUM DEVELOPMENT CENTER

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY 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

Subject Code : **21004**

Semester : I Semester

Subject Title : **ENGINEERING PHYSICS - I**

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	5 Hrs	80 Hrs	25	75	100	3 Hrs

Topics and Allocation of Hours:

Sl.No.	Topic	Time(Hrs)
1.	S I UNITS AND STATICS	16
2.	PROPERTIES OF MATTER	16
3.	DYNAMICS – I	16
4.	DYNAMICS – II	16
5.	SOUND AND MAGNETISM	16
Total		**80**

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 modules 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.
- Understand the propagation of sound, ultrasonic and acoustics of buildings.
- Explain the importance of hysteresis of magnetic materials and its uses.
- Solve simple problems involving expressions derived in all the above topics.

Learning Structure:

Applications

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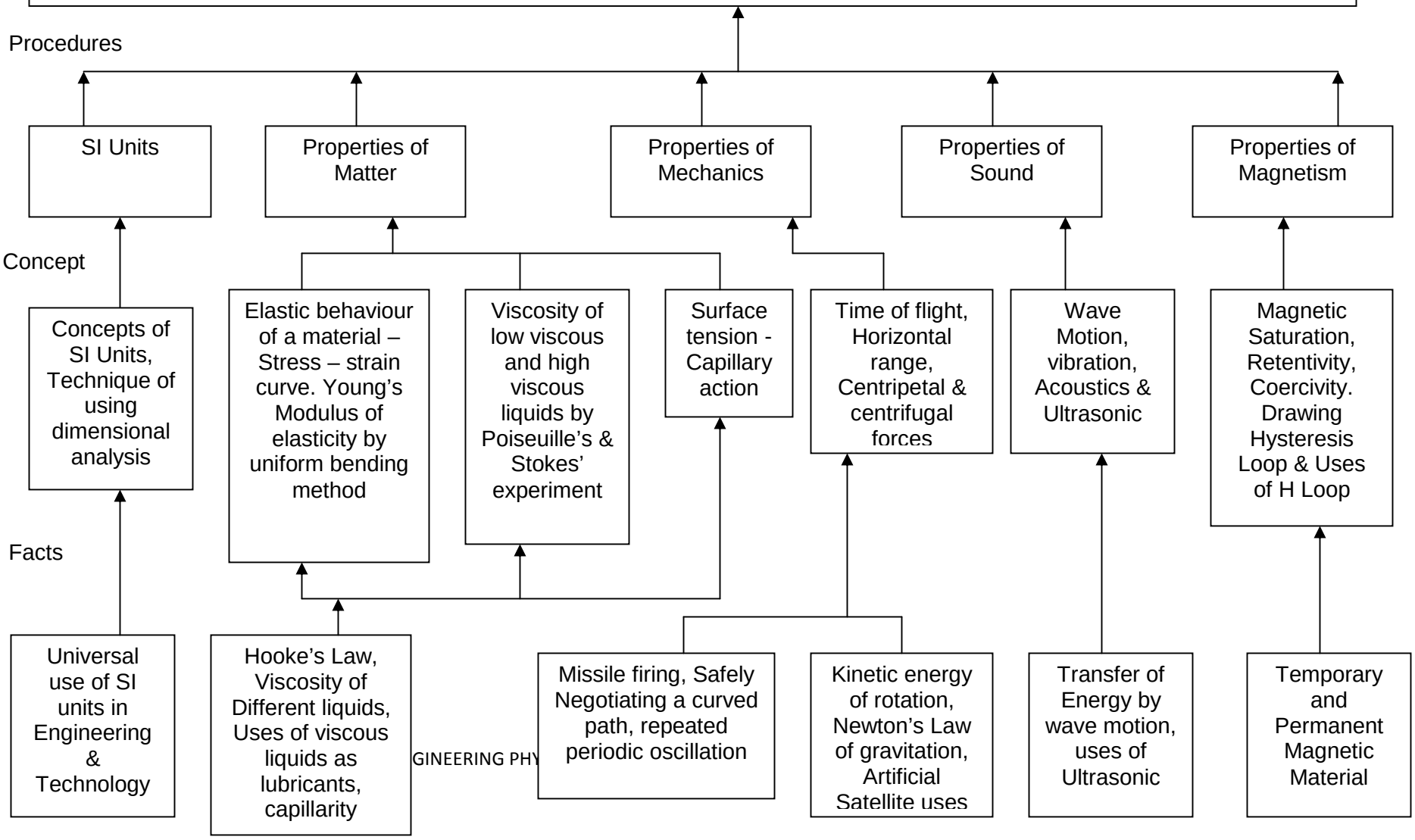
Enable to understand principles, laws, facts, concepts, mathematical derivation and experimental determination of values of different physical properties of materials by studying physics and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field problems in different fields of engineering

Procedures



GINEERING PHY

21004 ENGINEERING PHYSICS – I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours	Marks
I	**S I UNITS AND STATICS** **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. 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. **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 given body using principle of moments.	**5 Hrs** **11 Hrs**	**15**
II	**PROPERTIES OF MATTER** **2.1 ELASTICITY** Elastic and plastic bodies – Definition - stress, strain - Definitions – Hooke's law –statement - three types of strain– Elastic and plastic limit – Elastic behaviour of a material – Stress- Strain curve, elastic range, elastic limit, yield point, plastic limit and breaking point - Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio – Definitions - 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. Simple problems based on stress, strain and Young's modulus.	**6 Hrs**	**15**

Unit	Name of the Topic	Hours	Marks
II	**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 using graduated burette (Variable pressure head method)– Terminal velocity – Definition - Experimental determination of coefficient of viscosity of a high viscous liquid by Stokes' method – Practical applications of viscosity. **2.3 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.	**6 Hrs** **4 Hrs**	
III	**<u>DYNAMICS – I</u>** **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. **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. **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.	**5 Hrs** **5 Hrs** **3 Hrs**	**15**

Unit	Name of the Topic	Hours	Marks
III	**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.	**3 Hrs**	
IV	**<u>DYNAMICS – II</u>** **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. **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 – Expression for variation of acceleration due to gravity with altitude – Concept of weightlessness. **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.	**7 Hrs** **4 Hrs** **5 Hrs**	**15**
V	**<u>SOUND AND MAGNETISM</u>** **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. 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.	**10 Hrs**	**15**

Unit	Name of the Topic	Hours	Marks
V	Acoustics of buildings – Reverberation, reverberation time, Sabine's formula for reverberation time (no derivation) – Coefficient of absorption of sound energy – Noise pollution – Noise control in machines. 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- Method of drawing hysteresis loop of a specimen using a solenoid – Uses of Hysteresis loop	**6 Hrs**	

Text Book :

1) Physics – Higher secondary – First year – Volume I & II – Tamil Nadu Text book Corporation 2004
2) Intermediate physics – Volume I & II – Anwar Kamal – Foundation books private Ltd. 2008

Reference Book :

1) Physics – Resnick and Haliday – Wisley Toppan publishers – England
2) Engineering Physics – B.L.Theraja – S. Chand Publishers
3) A text book of sound – R.L. Saighal & H.R. Sarna – S. Chand & Co.
4) Mechanics – Narayana Kurup – S. Chand Publishers.

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I SEMESTER

21004 ENGINEERING PHYSICS – I

MODEL QUESTION PAPER - 1

Time : 3 Hrs Max Marks : 75

PART- A

Marks 15 x 1 = 15

Note : Answer any 15 Questions. – All Questions carry equal marks

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 resonance.
18. What is ultrasonic?
19. Define intensity of magnetisation.
20. Define retentivity.

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 Young's modulus of the material of a beam by uniform bending method.

b) Derive Poiseuille's formula for the co-efficient of viscosity of a 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) Show that simple harmonic motion can be obtained by the projection of a uniform circular motion on any diameter.

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) Derive the expression for the variation of acceleration due to gravity with altitude.

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

b) A sonometer wire is loaded with a mass of 2 kg. The linear density of the wire is 2×10^{-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.

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

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I SEMESTER
21004 ENGINEERING PHYSICS – I
MODEL QUESTION PAPER - 2

Time : 3 Hrs Max Marks : 75

PART- A

Marks 15 x 1 = 15

Note : Answer any 15 Questions.- All Questions carry equal marks

1. Write the two supplementary quantities.
2. Derive the dimensional formula for force.
3. Define coplanar forces.
4. Define moment of a couple.
5. Define Poisson's ratio.
6. What is the significance of Reynolds number?
7. Write any two practical applications of viscosity.
8. Define angle of contact.
9. Define time of flight of a projectile.
10. What is the relation between linear velocity and angular velocity ?
11. What is banking of a curved path?
12. Define simple harmonic motion.
13. Define radius of gyration.
14. Write the Newton's second law of gravitation.
15. What is the difference between mass and weight of a body?
16. Define orbital velocity.
17. Write the relation between wavelength, frequency and velocity of a wave.
18. Write any two applications of ultrasonic.
19. Define reverberation time.
20. What is coercivity?

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) Explain multiples and sub-multiples and the corresponding prefixes of units.

b) Describe an experiment to verify Lami's theorem.

c) Find the magnitude and direction of the resultant of two forces 3 N and 4 N acting at a point, if the angle between the forces is 60^{o} .

II a) Explain the elastic behavior of a material with the help of stress – strain curve.

b) Describe an experiment to determine the coefficient of viscosity of a high viscous liquid by Stokes' method.

c) Derive an expression for the surface tension of the liquid by capillary rise method.

III a) Show that the path of a projectile is a parabola.

b) Derive expressions for the normal acceleration and centripetal force acting on a body executing uniform circular motion.

c) An aero plane travelling in a curved path with a speed of 500 kmph tilts through an angle of 30^{o}, for safe negotiation. What is the radius of the curve?

IV a) Derive an expression for kinetic energy of a rigid body rotating about an axis.

b) Explain geo – stationary and polar satellites.

c) Assuming the average radius of the earth as 6380 km, find the escape velocity of a body from the surface of the earth.

V a) Describe an experiment to determine the frequency of a tuning fork using sonometer.

b) Explain noise pollution and the measures to control the noise in machines.

c) Explain the uses of hysteresis loop in the selection of magnetic materials.

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