

NORTH MAHARASHTRA UNIVERSITY, JALGAON

SYLLABUS OF F.Y.B.Sc

(with effect from June, 1992)

Subject:- PHYSICS- I

Section- I

MECHANICS & PROPERTIES OF MATTER

UNIT- I

MOTION :- Projectile Motion (Without resistive force), Two stage rocket, Geo Stationary orbits, Kepler's Laws (Statements only.) (6 periods-10 Marks.)

ROTATIONAL MOTION:

Moment of Inertia :- Physical significance of radius of gyration. M.I. of rod/disc, spherical shell and sphere about different axes of rotation. M.I. of Fly-wheel (Torque & K.E.), A body rolling down the inclined plane. (8 periods-12 marks)

UNIT-II

PROPERTIES OF MATTER

1) Elasticity:-

Definition of Y, K, n, δ . Work done during longitudinal Strain, Volume strain and shearing strain. Relation between Y, K, n and δ . Expression for n by torsional oscillations.

(6 periods-10 marks.)

2) Viscosity :

Stream-line flow and turbulent flow of liquid through capillary tube. (Poiseuille's method), Stoke's Law & its applications. (Determination of Viscosity of liquid) Bernoulli's theorem. (8 periods 12 marks.)

3) Surface Tension:-

Definition & explanation of surface tension on the basis of molecular theory. Surface Tension as surface energy. Angle of contact and its explanation on the basis of intermolecular forces. Relation between S.T. pressure and curvature, application of S.T. Soap bubble, rise of liquid in a capillary tube with explanation and derivation. Determination of S.T. By capillary tube method. (10 periods-16 marks)

38 periods-60 marks.

Section-II
MATHEMATICAL PHYSICS

UNIT-ICOMPLEX ALGEBRA:-

Idea of complex number (about addition, subtraction, multiplication and division) Argand diagram. Rectangular & Polar form of complex number. Euler's formula (exponential form & its application) Algebra complex numbers using Argand diagrams. De-Moivre's theorem (Statement only) trigonometrical function. Application of exponential form for power and roots of complex number. Application of complex number to determine velocity and acceleration.

Hyperbolic functions, representation of A.C. by complex number. (12 periods- 18 marks)

UNIT-IIPARTIAL DIFFERENTIATION :-

Definition of partial differentiation, total differential, chain rule, implicit functions, change of variable from cartesian to polar co-ordinates. (8 periods-12 marks.)

UNIT-IIIVECTOR ALGEBRA & VECTOR ANALYSIS:-

(Revision of Scalar and vector product of two vectors). Scalar product and vector triple product, geometrical interpretation of Scalar triple product.

Scalar and Vector fields (Gradient of Scalar), del operator, differential and integration of a vector (line, surface, Volume) divergent and curl of a vector, their physical significance, Laplacian operator.

Discussion on following identities.

(18 periods-30 marks)

$$i) \vec{\nabla} \times (\vec{\nabla} \phi) = 0 \text{ i.e. } \text{Curl grad } \phi = 0.$$

$$ii) \vec{\nabla} \cdot (\vec{\nabla} \times \vec{A}) = 0 \text{ i.e. } \text{div curl } \vec{A} = 0$$

$$iii) \vec{\nabla} \times (\vec{\nabla} \times \vec{A}) = \vec{\nabla} (\vec{\nabla} \cdot \vec{A}) - \nabla^2 \vec{A}$$

$$iv) \vec{\nabla} \cdot (\phi \vec{A}) = \phi (\vec{\nabla} \cdot \vec{A}) + \vec{A} \cdot (\vec{\nabla} \phi)$$

$$v) \vec{\nabla} \cdot (\vec{A} \times \vec{B}) = \vec{B} \cdot (\vec{\nabla} \times \vec{A}) - \vec{A} \cdot (\vec{\nabla} \times \vec{B})$$

$$vi) \vec{\nabla} \times (\phi \vec{A}) = \phi (\vec{\nabla} \times \vec{A}) - \vec{A} \times (\vec{\nabla} \phi) \\ = \phi (\vec{\nabla} \times \vec{A}) + (\vec{\nabla} \phi) \times \vec{A}$$

38 periods-60 marks.

PHYSICS PAPER-II

Section-I

II ELEMENTARY KINETIC THEORY, HEAT & THERMODYNAMICS.

UNIT-I

KINETIC THEORY OF GASES :

- A) Mean free path (simple derivation) Maxwell's velocity distribution law, average velocity RMS velocity, most probable velocity and their correlation. Transport phenomenon, coefficient of viscosity, Thermal conductivity (approximate derivation) (8 periods-12 marks)
- B) Equation of state: Avogadro's experiment and Amagat's experiment, van-der-waals equation, critical constants, Reduced equation of state, Boyle temperature. (8 periods-12 marks)

UNIT- II

Isothermal, adiabatic, isochoric & isobaric changes, work done on a gas & by a gas. Indicator diagram, work done in isothermal and adiabatic changes. Reversible and irreversible processes, statement of first, second & third law of thermodynamics, Entropy, Entropy-temp. diagram (Change of phase.) First & Second latent heat equation, Dissipation of energy & increase of entropy in natural processes. (12 periods-18 marks.)

UNIT-III

Carnot's cycle, Otto cycle, Diesel cycle. The refrigerator principle, steps in refrigeration plant and P-V diagram symbolic representation of refrigerator. Applications of refrigerator (Heating and cooling of the house). (10 periods-18 marks.)

38 periods - 60 marks.

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PHYSICS PAPER- IISection-IIELECTRICITY & ELECTROMAGNETIC FIELDSUNIT- IELECTROSTATICS :-

Concept of dielectric, Electrical polarization p , electric displacement vector D , Use dielectric in capacitor, Introduction to electrical images and force between two point charges by the method of electrical images. Secondary conditions for E & D at dielectric media. Analogy of B, M, H vectors D, P, E vectors.

(8 periods-12 marks)

UNIT- IICURRENT ELECTRICITY :

Krichnoff's Laws, Method of loop analysis of network. Thevenen's theorem, Norton's theorem with illustrations, Maximum power transfer theorem (for all theorems source is D.C.) Current density vector, Power consumption and Joule's law, Watt.

(10 periods 16 marks.)

UNIT- IIIELECTRO-MAGNETIC INDUCTION :-

Self inductance, mutual inductance, Principle of transformer, Relation between turns ratio, efficiency of transformer. Discussion of losses in a transformer.

(6 periods 10 marks).

UNIT- IVA) ELECTRICAL D.C. CIRCUITS :

Growth and decay of currents in a circuit, containing L and R charging and discharging of a condenser through a resistor. Concept of time constant.

(6 periods- 10 marks)

B) A.C. CIRCUITS :

L.R. Circuits and R-C series circuits L-C-R series and parallel circuits. Expression for impedance, reactance, band width, Q factor, resonance, power factor, etc.

(8 periods- 12 marks)

38 periods-60 marks.

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F.Y.B.Sc. (PHYSICS)PRACTICAL COURSESSection- I

Any eight expts. of the following :

- 1) S.T. by rise in capillary tube.
- 2) γ be bending.
- 3) Viscosity by flow through capillary.
- 4) g by bar Pendulum.
- 5) Probable error.
- 6) Poisson's ratio of rubber card.
- 7) K by lee's method.
- 8) M.T. by Torsional pendulum (using ring & disc)
- 9) Y & h by flat spiral spring.
- 10) Viscosity by Stoke's method.
- 11) J by Calender & Barnc's method.
- 12) M.I. of Fly wheel.

Section- II

Any eight expts. of the following :

- 1) Use of Spectrometer(Calibration) using Schuster's method and optical levelling.
- 2) Study of transformer- Determination of Efficiency and turn-ratio.
- 3) L.R. Circuit- Vector diagram. Power factor.
- 4) Study of analog Multimeter.
- 5) Varification of Kirchhoffs Law.
- 6) Characteristics of Semi cond. diode.
- 7) Frequency of A.C. using Vibrating wise & magnet.
- 8) Charging and discharging of condenser through resistance.
- 9) m by Spestrometer.
- 10) Figure of Merit by B.G.
- 11) Hysterisis by Magnetometer.
- 12) L.C.R. Circuit series resonance.