NORTH MAHARASHTRA UNIVERSITY, JALGAON

S.Y.B.Sc. (Physics) (W.e.f. June, 1993)

Paper - I : Section - I

Waves and Oscillations

Unit - I : Oscillations

1> Simple hormonic oscillations :

Linear and angular S.H.M., Applications of S.H.M., Compound pendulum, Torsional pendulum, L - C circuits.

2> Composition of two S.H.M.'s and Lissajous figures :

Two S.H.M.'s -

i> Equal frequencies along the same line of vibration (Analytical method only)

ii> Equal frequencies acting at right angles (Analytical method only with different cases)

iii> At right angles to each other (Time periods in the ratio 1 : 2)

Lissajous figures:Demonstration by mechanical,optical and electrical method, Uses of Lissajous figures (State only).

3> Types of oscillations :

i> Free vibrations, undamped free vibrations, damped vibrations, Differential equation of a damped hormonic oscillator, Descussion of different three cases, Logarithmic decrement energy equation of damped hormonic oscillator, quality factor, damped S.H.M. in an electric circuit (L - C - R example of the reverberation of hall) (Descriptive part only)

ii> Forced vibrations, Resonance, Barton's pendulum, Equation of forced vibrations and its solution, Amplitude of forced vibrations velocity and amplitude resonance, Sharpness of resonance, Energy of forced vibrations, band width, quality factor in terms of absorption, band width application, L - C - R series circuit.

4) Coupled oscillations :

Differential equations of coupled oscillations, co-efficient of coupling (Richardson) electrical and mechanical coupled oscillations.

(25 Periods. 30 mks)

Unit - II : Wave motion

Differential equation of wave motion, equation for longitudinal and transverse wave and their solutions in one dimension, Principle of superposition of waves, Formation of stationary waves, Relation between particle velocity, wave velocity and group velocity, Energy of simple hormonic progressive wave, Energy density and intensity of wave. (8 Periods. 10 mks)

Unit - III : Doppler effect

Doppler effect, Doppler effect in sound and astronomy, Expression for apparent frequency (Different cases when source, the observer and medium are in motion), Asymmetrie nature of Doppler effect in sound,Doppler effect in light (Symmetric effect) and applications, Limitations of Doppler's principle. (5 Periods. 6 mks)

Unit - IV : Ultrasonics

Production of ultrasonic waves, Piezo-electric effect, Piezo-electric oscillator, magnetostriction effect and magnetostriction oscillator, Detection of ultrasonic waves and its applications.

(4 Periods. 4 mks)

NORTH MAHARASHTRA UNIVERSITY, JALGAON

S.Y.B.Sc. (PHYSICS) (W.e.f. June, 1993)

Paper - I Section - II

Optics

1> Geometrical optics :

Introduction to spherical and chromatic aberration . Condition for minimum spherical aberration achromatism of two lenses (a) in contact and (b) seperated from each other. Combination of two thin lenses - seperated by a distance and in contact. Cardinal points, Ramsden and Huygen eye pieces with their merits and demerits. (6 Periods, 8 mks)

2> Physical optics :

a> Interferences : Idea of coherence. Intensity distribution in interference pattern. Phase chang on reflection (Stoke's treatment).. Thin films reflected and transmitted systems. Fringes of equal inclination and equal thickness, Wedge shaped film (normal incidence) Newton's rings- theory and its applications (Determination of wave length, Refractive index of liquids). (10 Periods, 12 mks)

b> Diffraction : Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at single slit and double slits. Theroy of plane transmission grating. Intensity distribution in diffraction pattern. Fresnel diffraction- Rectilinear - Propagation of light. Rayleigh's criterion of resolution. Resolving power of an astronomical telescope.

(10 Periods, 12 mks)

c> Polarization : Concept of polarization. Polarization by reflection, Brewster's law, Double refraction in uniaxial crystals, Double refracting crystals, Huygen's explanation for normal incidence, Production and detection of circularly and elliptically polarized light. Polaroid, Quarter and Half wave plate, Nicol prism, optical activity and Fresnel's explanation. (10 Periods, 12 mks)

3> **Non - linear optics** :

LASER'S - Potical pumping and stimulated emission, Meta-stable state, Principle of laser, Types of lasers- He-Ne, Co , Ruby. Application of lasers. (5 Periods, 6 mks)

REFERENCES :

1. Fundamentals of optics - Jenkins and White
2. Text book of optics - N.Subrahmanyam and Brijlal
3. Principle of optics - B.K.Mathur
4. Lasers and Non linear optics - B.B.Laud

NORTH MAHARASHTRA UNIVERSITY, JALGAON

S.Y.B.Sc. (Physics)

Modern Physics (W.e.f. June, 1993)

Paper - II : Section - I

1> Motion of charged particle in electric and magnetic fields (Lorentz force),Millikan's method of determination of charge on an electron, Thomson's method of e/m of an electron positive rays Dempster mass spectrograph. (6 Periods, 8 mks)

2> Solar energy : INTRODUCTION :

Energy crisis, Alternative sources of energy, Solar energy as an option.

Solar radiation :

Solar radiation outside the earth's is atmosphere,Solar radiation at the earth's surface, Solar spectrum.

Photo thermal conversion of solar energy :

Flat plate collectors, liquid flat plate collector. (Construction, principle of working and area of application)

Photovoltaic conversion of solar energy :

Principle of photovoltaic conversion (P-N junction), Solar cell, types of solar cell (P-N, P-I-N, MIS solar cells) Materials used for solar cell,principle of solar cell, spectral response of solar cell, I-V characteristics of solar cell under dark and illuminated conditions, Open circuit voltage (Voc), Short circuit current (Isc) and Fill Factor of solar cell,Dependence of efficiency of solar cell on the energy gap of semiconductor. (10 Periods, 12 mks)

3> **Matter Waves** :

Duel nature of matter, de-Broglie wave hypothesis, wave packets, phase velocity, group velocity and particle velocity and relations between them, Electron diffraction, Davisson and Germer experiment, Uncertainty principle, proof of $X \times P > h$ (Beiser treatment), different forms of uncertainty principle. **(8 Periods, 10 mks)**

4> **Wave Mechanics** :

Wave function and its physical significance, Schroedinger's equation, Time dependant and independant forms, (One dimensional equation) Particle in a one dimensional box. **(6 Periods, 8 mks)**

5> **Bohr and Sommerfield theory of hydrogen atom** :

Introduction of atomic spectra, Inadequecy of classical planetory model of hydrogen atom, Bohr's theory of hydrogen atom, Extension of Bohr's theory, Experimental (Frank and Hertz) verification of discrete atomic energy levels. Correspondence principle, Bohr Sommerfield model and relativistic effects, Limitations of quantam mechanical model. **(10 Periods, 12 mks)**

REFERENCES :

1> Fundamental of solar cell. - M. A. Green.

2> Solar energy. - S. P. Sukhatme.

3> Elementary Modern Physics. - A. P. Arya. (Addison Wesley)

4> Perspectives of modern physics. - Beiser.

NORTH MAHARASHTRA UNIVERSITY,JALGAON

(W.e.f. June, 1993)

S.Y.B.Sc (Physics)

Electronics Paper - II (Second Term)

1) SEMICONDUCTORS :- Review of atomic structure, Formation of energy bands, Energy band diagrams for conductors, Semiconductor and insulator, Intrinsic and Extrinsic Semiconductor, Dopping (P and N type Semiconductor) p-n junction with forword bias and reverse bias, Junction diode and its characterstics,zener diode,LED. (10 Periods.12 mks)

2) RECTIFIER :-

Diode as a rectifier, Half wave and Fullwave Rectifier, Filter ckt (Simple capacitor,L - section filter) Ripple factor,zener diode as a voltage regulator. (6 Periods.8 mks)

3) TRANSISTOR: (BJT)

Principle of operation, CB, CE and CC configuration,Input output and transfer characterstics for CE configuration, Defination of and , and their interrelation.

Transistor baising methods,DC load line, operating point.

(8 Periods.10 mks)

4) AMPLIFIERS :

Transister as an amplifier,single stage CE transister ampli. Idea of black box, h - parameters. Small signal h - parameter (frequency responce),equivalant circuits (CE only) Power amplifier Classification of power amplifiers (class A, class B and class C) operational amplifier :Basic idea, symbol,parameter of an ideal and practical op-amp.

(10 Periods.10 mks)

5) OSCILLATOR :

Feed back and its types positive feed back, Barkhausen criteria, Phase shift oscillator, Wein bridge oscillator, Crystal oscillator, Hartley oscillator.(without derivation)
(8 Periods.10 mks)

REFERENCES :1) Integrated Electronics - Millman and Halkias.

2) Basic Electronics - V. K. Mehta.

3) Fundamental of Electronics - J. D. Ryder.

4) Electronics Devices and Circuits - Mottershede.

NORTH MAHARASHTRA UNIVERSITY,JALGAON

(W.e.f. June, 1993)

S.Y.B.Sc. (Physics)

Syllabus of Instrumentation

1) Basic principles of measurements:

Different units, standard calibration, accuracy. with reference to elctrical, Mechanical, optical, Magnetic quantities, sensitivity ,linearity, stability,signal to noise Ratio, errors. (10 Periods.12 mks)

2) Measurment of electrical parameters:

Measurment of low and high currents and voltages (examples : ameters and voltmeters of various ranges, electrometers) Measurment of AC and DC voltages using CRO.(7 Periods.9 mks)

3) Measurment of temperature:

Measurment of temp using thermometer, thermocouples and pyrometers. (7 Periods.9 mks)

4) Measurment of Magnetic fields:

Magnetic field (Permanent magnets and electromagnets) Measurement of magnetic field (search coil and Hall gauss-meter) (6 Periods.8 mks)

5) Measurment of pressure:

Bernoullies relation, and conditions for flow of gas and liquid, flow meters for liquid and gas pressure, Measurments, concept of low and high pressures. (10 Periods.12 mks)

REFERENCES :

1> Instrumentation: Measurement and Analysis-
- Nakara and Chaudhari.

2> Instrumentation: Devices and Systems-
- Rangan, Mani, Sharma.

3> Electronics instrumentation and measurement techniques-
(Second and Third edition) - Cooper, Helfrick.

NORTH MAHARASHTRA UNIVERSITY,JALGAON

(W.e.f. June, 1993)

S.Y.B.Sc.(Physics)

Syllabus of Meteorology and Space Physics

1> Atmosphere :- Composition of the atmosphere, Hydrostatic equilibrium. The hydrostatic of special atmosphere,The homo--geneous atmosphere, Isothermal and adiabatic atmosphere, Standard atmosphere.

Vertical divisions of the atmosphere,troposphere,streto--sphere, mesosphere, thermosphere.

Ionosphere : methods of exploring the ionosphere (e.g. cathode ray oscillograph method, an imaginary method. etc)

The cause of aurora, The air glow, The cause of the air glow. (12 Periods,15 mks)

2> Solar and terristrial radiation :- The nature of solar radiation, terristrial radiation, Radiative heating and cooling of the atmosphere, Radiative equilibrium and the stratosphere, The mean annual heat balance.

(8 Periods,10 mks)

3> Ozone in the atmosphere :-General characeristics of ozone, Measurement of the amount of ozone in the atmosphere, Ozone and weather day to day variations. (6 Periods,8 mks)

4) Basic measurements in meteorology and space physics, Different parameters to be measured and their ranges, (temperature, density,wind, humidity, rainfall,pressure etc)

(8 Periods,10 mks)

5) Basic devices and transducers suitable for atmospheric study and their uses platinum resistance thermometer, aneroid barometer, rain gauge, pyranometer, anemometer, photomultiplier, intra-red detector.

Theory of radiosonde and its use in the measurement of meteorological parameters. Theory and use of radio telescope.
(6 Periods,7 mks)

REFERENCES :1) Introduction to thearetical metearolgy - Hoss

2) General climatology - Critechtield.

3) Exeploring the atmosphere -- G.M.B. Dobson.

NORTH MAHARASHTRA UNIVERSITY,JALGAON

(W.e.f. June, 1993)

S.Y.B.Sc. (physics)

List of experiments

(At least four experiments from each group)

Group I : General Physics. Heat and sound.

i) Kater's pendulum.
ii) 'Y' by Koenig's method.
iii) Log decrement.
iv) Surface tension by Jaeger's method.
v) S.T. by fergusson's method.
vi) Stefan's fourth power law.
vii) Thermocuple.
viii) Stroboscope : frquency of A.C and tunnig fork.
ix) Bottle as a resonater (Neck constant).

Group II : Light

i) Dispersive power of a prism.
ii) Double refracting prism.
iii) Diffraction grating.
iv) Fresnel's biprism.
v) Newton's Rings.
vi) Polarimeter.
vii) Diffraction at cylindrical obstacle.

Group III : Electricity Magnetism and Modern physics

i) Carey Foster's Bridge : Low resistance and calibration.
ii) Earth Inducter : Determination of H,V and dip.
iii) Measurement of high resistance.
iv) Verification of circuit theorems.
v) Mutual inductance by Maxwell's method.
vi) Comparision of capacities by De Sauty's method.
vii) I-V characteristics of solar cell.
viii) Characteristics of photo cell.

Group IV (A) Electronics

i) Zener regulated power supply.
ii) Bridge rectifier with filters and study of ripple factor.
iii) Transistor characteristics Common base, Common emitter.
iv) Single stage transistor amplifier.
v) Study of phase shift oscillator.(using transistor)
vi) Hartley oscillator.

OR

Group IV (B) Instrumentation

i) Study of multimeter.
ii) Verification of Bernoulie's equation.
iii) Measurement of frequency by beat method.
iv) Measurement of magnetic field by search coil method.
v) Use of C.R.O. as a tool for measurements.

OR

Group IV (C) : Metereology and space physics.

i) Determination of absolute humidity by chemical hygrometer.
ii) Construction of dew ceil and its calibratation to measure dew point.
iii) Measurement f the rainfall using a tipping bucket rain gauge.
iv) Construction of a cup counter anemometer for measurement of wind speed.
v) Platinum resistance thermometer.
vi) Thermister.

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