

## Semester 1 (Chemistry Main)

### PY1131.2 – Rotational dynamics and Properties of matter (36 hours )

#### Unit I (28 hours)

##### Dynamics of rigid bodies (7 hours)

Theorems of M.I with proof -Calculation of M.I of bodies of regular shapes-  
rectangular lamina, uniform bar of rectangular cross section, annular disc,  
circular

disc, solid cylinder, solid sphere-K.E of a rotating body-Determination of MI of a  
flywheel(Theory and Experiment).

##### Oscillations and waves (13 hours)

Examples of S.H oscillator-compound pendulum-determination of g-torsion  
pendulum-oscillations of two particles connected by a spring-vibration state of a  
diatomic molecule-

Wave motion-general equation of wave motion-plane progressive harmonic wave -  
energy density of a plane progressive wave -intensity of wave and spherical waves-

##### Mechanics of solids (8 hours)

Bending of beams-bending moment-cantilever-beam supported at its ends-and  
loaded in the middle-uniform bending-experimental determination of Y using the  
above principles with pin and microscope-twisting couple on a cylinder-angle of  
twist and angle of shear-torsional rigidity.

#### Unit II (8hours)

##### Surface Tension (5 hours)

Excess of pressure on a curved surface-force between two plates separated by a  
thin layer of liquid-experiment with theory to find surface tension and its  
temperature dependence by Jaeger' method-equilibrium of a liquid drop over solid  
and liquid surfaces.

##### Viscosity (3 hours)

Flow of liquid through a capillary tube-derivation of Poiseuille's formula  
-limitations-Ostwald's viscometer-variation of viscosity with temperature.

#### References

1. Mechanics: J.C.Upadhyaya, Ram Prasad & Sons
2. Oscillations&Waves: K.RamaReddy, S.B.badami & V.Balasubramaniam (University Press)

**Semester 2 (Chemistry Main)**  
**PY1231.2 – Thermal Physics (36 hours)**

**Unit I – Diffusion (4 hours)**

Graham's law of diffusion in liquids-Fick's law-analogy between liquid diffusion and heat conduction-methods of estimating concentrations-determination of coefficient of diffusivity.

**Unit II. Transmission of Heat (14hours)**

Thermal conductivity and thermometric conductivity – Lee's Disc experiment-Weidmann and Franz law (statement only) -Radiation of heat-black body radiation-Kirchoff's laws of heat radiation-absorptive power-emissive power-Stefan's law (no derivation) -energy distribution in the spectrum of black body and results-Wien's displacement law - Rayleigh-Jeans law-their failure and Planck's hypothesis -Planck's law-comparison-solar constant-temperature of sun.

**Unit III – Thermodynamics (9 hours)**

Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity. Heat engines-carnot's cycle -derivation of efficiency-petrol and diesel engine cycles-efficiency in these two cases-second law of thermodynamics-Kelvin and Clausius statements.

**Unit IV – Entropy (9 hours)**

Concept of entropy-change of entropy in reversible and irreversible cycles-principle of increase of entropy-entropy and disorder-entropy and available energy-T-S diagram for Carnot's cycle-second law in terms of entropy-calculation of entropy when ice is converted into steam.

**References**

1. The general Properties of matter: F.H.Newman & V.H.L.Searle
2. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
3. Heat & Thermodynamics: W.Zemansky, McGraw Hill
4. Heat & Thermodynamics: C.L.Arora.

**Semester 3 (Chemistry Main)**

## **PY1331.2 – Optics, Magnetism and Electricity (54 hours)**

### **Unit I (34 hours)**

#### **Interference (11 hours)**

Analytical treatment of interference-theory of interference fringes and bandwidth. Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength and refractive index of a liquid.

#### **Diffraction (11 hours)**

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge.

Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength.

#### **Polarisation (6 hours)**

Experiments showing the transverse nature of light-plane polarized light-polarization by reflection-Brewster's law-double refraction-Nicol prism-propagation of light in uni-axial crystals-positive and negative crystals-principal refractive indices-half wave plate and quarter wave plate-elliptically and circularly polarized light-optical activity.

#### **Laser and Fibre Optics (6 hours)**

Principle of operation of laser-population inversion-optical pumping-ruby laser-applications of lasers. Light propagation in optical fibres-step index fibre-graded index fibre-applications.

### **Unit II (20 hours)**

#### **Magnetism (10 hours)**

Magnetic properties of matter-definition and relation between magnetic vectors B, H and M. Magnetic susceptibility and permeability. Magnetic properties-diamagnetism-paramagnetism-ferromagnetism-antiferromagnetism. Electron theory of magnetism-explanation of ferromagnetism.

#### **Electricity (10 hours)**

EMF induced in a coil rotating in a magnetic field-peak, mean, rms and effective values of A.C. AC circuits-AC through RC, LC, LR and LCR series circuits-resonance-sharpness of resonance-power factor and choke coil-transformers.

#### **References**

1. A text book of optics – Brijlal & Subramaniam
2. Electricity and Magnetism – R.Murugesan, S.Chand & Co Ltd.
3. A text book of B.Sc subsidiary Physics – P.Vivekanandan .

### **Semester 4 (Chemistry Main)**

#### **PY1431.2 – Atomic Physics, Quantum Mechanics and Electronics (54 hours)**

##### **Unit I Atomic physics (12 hours)**

Basic features of Bohr atom model-Bohr's correspondence principle -vector atom model-various quantum numbers-magnetic moment of orbital electrons -electron spin-Spin-Orbit coupling-Pauli's exclusion principle-periodic table.

##### **Unit II Superconductivity (8 hours)**

Properties of superconductors-zero electrical resistance- Meissner effect- electrical magnetic field-Type I and Type II superconductors-isotope effect-high temperature ceramic superconductors-applications of superconductors.

##### **Unit III Quantum mechanics (14 hours)**

Inadequacies of classical physics-experimental evidences-evidences for quantum theory-Planck's hypothesis-foundation of quantum mechanics-wave function and probability density-Schrodinger equation-time dependent and time independent-particle in a potential box.

##### **Unit IV. Spectroscopic Techniques(4hours)**

EM Spectrum- UV, Visible, IR,, Radio and microwave regions-principle of various spectrometers used in specific regions of EM spectrum-absorption spectroscopy, emission spectroscopy.

##### **Unit V. Electronics (12 hours)**

Current-voltage characteristics of a diode -forward and reverse bias-breakdown

mechanism of p -n junction diode-zener diode and its characteristics-half wave and full wave rectifiers-bridge rectifier-ripple factor, efficiency.

Construction and operation of a bipolar junction transistor-transistor configurations-current components-transistor characteristics-DC load line-Q point-

AC load line transistor biasing-need for biasing-bias stabilization-biasing circuits-fixed bias, emitter feed back bias, voltage divider bias (qualitative study only). Transistor amplifier-basic features of an amplifier-gain, input and output resistances-frequency response and band width

#### **Unit V. Digital Electronics(4hours)**

Number systems and codes-decimal numbers-binary arithmetic -1's and 2's compliment-decimal to binary conversion-octal numbers-hexadecimal numbers-binary coded decimal-digital codes-logic gates-NOT, OR, AND, NOR and NAND gates..

#### **References**

1. Modern Physics – R.Murugesan, S.Chand & Co. Ltd.
2. A text book of B.Sc subsidiary Physics – P.Vivekanandan.
3. Principles of Electronics – V.K.Mehta.

### **Semester 1 (Statistics Main)**

#### **PY1131.3 – Mechanics and Properties of matter (36 hours)**

##### **Unit I (28 hours)**

##### **Dynamics of rigid bodies (8 hours)**

Theorems of M.I with proof -Calculation of M.I of bodies of regular shapes-rectangular lamina, uniform bar of rectangular cross section, annular disc, circular disc, solid sphere-K.E of a rotating body. Determination of M.I of a fly wheel (theory and experiment).

##### **Oscillations and waves (12 hours)**

Examples of S.H oscillator-compound pendulum-determination of g-torsion pendulum-oscillations of two particles connected by a spring. Wave motion-general equation of wave motion-plane progressive harmonic wave energy density of a plane progressive wave-intensity of wave and spherical waves transverse waves in stretched string-modes of transverse vibrations of string longitudinal waves in rods and in gases.

##### **Mechanics of solids (8 hours)**

Bending of beams-bending moment-cantilever-beam supported at its ends-and loaded in the middle-uniform bending-experimental determination of Y using the