SEMESTER 1 (MATHEMATICS MAIN)

PY1131.1 – MECHANICS AND PROPERTIES OF MATTER

(36 HOURS-2 CREDITS)

Unit I (28 hours)

Dynamics of rigid bodies (6 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 (15 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 transverse waves in stretched string-modes of transverse vibrations of strings longitudinal waves in rods and in gases.

Mechanics of solids (7 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 (8 hours);

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.Bbadami & V.Balasubramaniam (University Press)

SEMESTER 2 (MATHEMATICS MAIN)
PY1231.1 – HEAT AND THERMODYNAMICS
(36 HOURS-2 CREDITS)

Unit I – Transmission of Heat (13 hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Weidmann and Franz law (statement only)-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-its determination temperature of sun.

Unit II – Thermodynamics (13 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 III – Entropy (10 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. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
2. Heat & Thermodynamics: W.Zemansky, McGraw Hill
3. Heat & Thermodynamics: C.L.Arora.

SEMESTER 3 (MATHEMATICS MAIN)
PY1331.1 – OPTICS, MAGNETISM AND ELECTRICITY
(54 HOURS-3 CREDITS)

Unit I (34 hours)

Interference (12 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 liquid.

Diffraction (14 hours)

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge and circular aperture. Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength-Resolving power of grating.

Laser and Fibre Optics (8 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

5. A text book of optics – Brijlal & Subramaniam

6. Electricity and Magnetism – R.Murugeshan, S.Chand & Co Ltd.

7. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

SEMESTER 4 (MATHEMATICS MAIN)
PY1431.1 – MODERN PHYSICS AND ELECTRONICS
(54 HOURS-3 CREDITS)

Unit I

Modern Physics (20 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.Atomic nucleus-basic properties of nucleus-charge, mass, spin, magnetic moment binding energy and packing fraction-nuclear forces-salient features-radioactivity radioactive decay-decay laws-decay constant-half life and mean life-radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity-Nuclear detectors (basic ideas).

Quantum mechanics (16 hours)

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

Unit II (18 hours)

Electronics (10 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-small signal CE amplifier-circuit and its operation

Digital Electronics (8 hours)

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.Boolean algebra-Boolean operations-logic expressions-laws of Boolean algebra-DeMorgan's theorem-Boolean expression for gate network-simplification of Boolean expression.

References

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

SEMESTER 1 (CHEMISTRY MAIN)
PY1131.2 – ROTATIONAL DYNAMICS AND PROPERTIES OF MATTER
(36 HOURS-2 CREDITS)

Unit I (26 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-spinning top.

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 (6 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 (10 hours)

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 (5 hours)

Flow of liquid through a capillary tube-derivation of Poiseuille's formula-limitations-Ostwald's viscometer-variation of viscosity with temperature-Stokes formula determination of viscosity of a highly viscous liquid by Stokes method.

References

1. Mechanics: J.C.Upadhyaya, Ram Prasad & Sons

2. Oscillations & Waves: K.RamaReddy, S.Bbadami & V.Balasubramaniam (University Press)

SEMESTER 2 (CHEMISTRY MAIN)
PY1231.2 – THERMAL PHYSICS
(36 HOURS-2 CREDITS)

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 (16hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Radial flow of heat-cylindrical flow of heat-thermal conductivity of rubber-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 (8 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.Phase transition- first order and second order-liquid helium-super fluidity.

Unit IV – Entropy (8 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-3 CREDITS)

Unit I (34 hours)

Interference (10 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.

Diffraction (10 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-Resolving power of grating.

Polarisation (8 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-Fresnel's theory and applications-polarimeters-determination of specific rotation.

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.Murugeshan, 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-3 CREDITS)

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-critical magnetic field-Type I and Type II superconductors-isotope effect-high temperature ceramic superconductors-applications of superconductors.

Unit III Quantum mechanics (12 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 (7 hours)

EM spectrum-UV, Visible, IR, Radio and microwave regions-principle of various spectrometers used in specific regions of EM spectrum-absorption spectroscopy emission spectroscopy-mass spectroscopy-qualitative ideas of ESR & NMR spectrometer.

Unit V Electronics (15 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 feedback bias, voltage divider bias (qualitative study only).Transistor amplifier-basic features of an amplifier-gain, input and output resistances frequency.response and band width-small signal CE amplifier-circuit and its operation.

References

1. Modern Physics – R.Murugeshan, 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-2 CREDITS)

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 strings 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 above principles with pin and microscope-twisting couple on a cylinder-angle of twist and angle of shear-torsional rigidity.

Unit II (8 hours)

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.Bbadami & V.Balasubramaniam (University Press)

SEMESTER 2 (STATISTICS MAIN)

PY1231.3 – THERMAL PHYSICS AND STATISTICAL MECHANICS

(36 HOURS-2 CREDITS)

Unit I – Transmission of Heat (8 hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Weidmann and Franz law (statement only)-energy distribution in the spectrum of black body and results-Wien's displacement law.

Unit II – Thermodynamics (8 hours)

Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity.Heat engines-carnot's cycle-derivation of efficiency- second law of thermodynamics-Kelvin and Clausius statements.

Unit III – Entropy (8 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.

Unit IV – Statistical Mechanics (12 hours)

Concepts of phase-space-ensemble and statistical equilibrium-probability theorems in statistical thermodynamics-distribution laws-Maxwell-Boltzman, Fermi-Dirac and Bose-Einstein distribution laws (no derivation)-comparison of three statistics-Molecular energies in an ideal gas-Quantum statistics-Rayleigh-Jeans formula-Planck's radiation law-specific heat of solids-free electrons in metals-electron energy distribution.

References

1. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
2. Heat & Thermodynamics: W.Zemansky, McGraw Hill
3. Heat & Thermodynamics: C.L.Arora.
4. Concepts of modern physics: Arthur Beiser (TMH).
5. Statistical Mechanics: Sinha (TMH).
6. Theoretical Chemistry: Samuel Gladstone, New York, D Van Nostrand Co.,Inc.
7. Heat: Saha and Srivasthava.

SEMESTER 3 (STATISTIC S MAIN)

PY1331.3 – PHYSICAL AND MODERN OPTICS AND ELECTRICITY

(54 HOURS-3 CREDITS)

Unit I (34 hours)

Interference (12 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 liquid.

Diffraction (14 hours)

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge and circular aperture. Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength-Resolving power of grating.

Laser and Fibre Optics (8 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

4. A text book of optics – Brijlal & Subramaniam
5. Electricity and Magnetism – R.Murugeshan, S.Chand & Co Ltd.
6. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

SEMESTER 4 (STATISTICS MAIN)
PY1431.3– MODERN PHYSICS AND ELECTRONICS
(54 HOURS-3 CREDITS)

Unit I

Modern Physics (20 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. Atomic nucleus-basic properties of nucleus-charge, mass, spin, magnetic moment-binding energy and packing fraction-nuclear forces-salient features radioactivity-radioactive decay-decay laws-decay constant-half life and mean life radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity-Nuclear detectors (basic ideas).

Quantum mechanics (16 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 II (18 hours)

Electronics (10 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-small signal CE amplifier-circuit and its operation.

Digital Electronics (8 hours)

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.Boolean algebra-Boolean operations-logic expressions-laws of Boolean algebra-DeMorgan's theorem-Boolean expression for gate network-simplification of Boolean expression.

References

1. Modern Physics – R.Murugeshan, S.Chand & Co. Ltd.

2. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

3. Principles of Electronics – V.K.Mehta.

SEMESTER 1 (GEOLOGY MAIN)

PY1131.4 – MECHANICS AND PROPERTIES OF MATTER

(36 HOURS-2 CREDITS)

Unit I (29 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-gyroscope-spinning top.

Oscillations and waves (15 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- waves in solids-longitudinal waves-transverse waves-torsional waves-common characteristics-reflection and transmission of waves-reflection and transmission of energy-flexural vibrations-applications in geophysics.

Mechanics of solids (7 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 (7 hours)

Surface Tension (4 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. Rama Reddy, S.Bbadami & V.Balasubramaniam (University Press)

SEMESTER 2 (GEOLOGY MAIN)

PY1231.4 – THERMAL PHYSICS AND PHYSICS OF THE EARTH

(36 HOURS-2 CREDITS)

Unit I – Transmission of Heat (9 hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Weidmann and Franz law (statement only)-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 II – 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-Carnot's theorem with proof.

Unit III – Physics of the Earth (18 hours)

The solar system-origin of solar system-the dynamic earth-continental drift-earth's structure-earth's size and shape-gravitation-gravitational field and potential equi-potential surfaces-gravitational field and potential due to a thin spherical shell and solid sphere-gravitational self energy-gravity measurements-free fall method-rise and fall method-gravity anomalies. The tide-tidal effect of sun-earth quakes-causes seismic wave propagation-seismographs. Atmospheric physics-atmospheric structure and composition-atmospheric pressure, density and temperature-measurement of air temperature-daily cycle of air temperature-atmospheric radiation-ionosphere-magnetosphere.

References

1. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
2. Heat & Thermodynamics: W.Zemansky, McGraw Hill
3. Heat & Thermodynamics: C.L.Arora.
4. Fundamentals of Geophysics: William Lowrie, Cambridge University Press.
5. Applied Physics: G.Aruldas et al, Rajam publishers, Tvpm.

SEMESTER 3 (GEOLOGY MAIN)

PY1331.4 – OPTICS AND ELECTRODYNAMICS

(54 HOURS-3 CREDITS)

Unit I (34 hours)

Interference (12 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 liquid.

Diffraction (14 hours)

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge and circular aperture. Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength-Resolving power of grating.

Polarisation (8 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-Fresnel's theory and applications.

Unit II (20 hours)

Magnetism (12 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.Earth's magnetism-elements of earth' magnetism-dip, declination, horizontal and vertical components-magnetic maps-magnetographs-cause of earth's magnetism geomagnetic prospecting.

Electricity (8 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.Murugeshan, S.Chand & Co Ltd.
3. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

SEMESTER 4 (GEOLOGY MAIN)
PY1431.4 – MODERN PHYSICS, ELECTRONICS AND CRYSTALLOGRAPHY
(54 HOURS-3 CREDITS)

Unit I

Modern Physics (20 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.Atomic nucleus-basic properties of nucleus-charge, mass, spin, magnetic moment-binding energy and packing fraction-nuclear forces-salient features radioactivity-radioactive decay-decay laws-decay constant-half life and mean life radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity-radio carbon dating-age of the earth-biological effects of radiation.

Crystallography (16 hours)

Crystal structure-crystal lattice and translation vectors-unit cell-symmetry operations point groups and space groups-types of lattices-lattice directions and planes interplaner spacing-simple crystal structures-close packed structures-structure of diamond-zinc blend structure-sodium chloride structure.X-ray crystallography-diffraction of x-rays-Bragg's law-x-ray diffraction methods rotating crystal method-powder diffraction method.

Unit II (18 hours)

Electronics (10 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 feedback bias, voltage divider bias (qualitative study only).Transistor amplifier-basic features of an amplifier-gain, input and output resistances frequency response and band width-small signal CE amplifier-circuit and its operation

Digital Electronics (8 hours)

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.Boolean algebra-Boolean operations-logic expressions-laws of Boolean algebra-DeMorgan's theorem-Boolean expression for gate network-simplification of Boolean expression.

References

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

SEMESTER 1 (HOME SCIENCE MAIN)

PY1131.5 – MECHANICS AND PROPERTIES OF MATTER

(36 HOURS-2 CREDITS)

Unit I (26 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 cylinder, solid sphere-K.E of a rotating body-spinning top

Oscillations and waves (12 hours)

Examples of S.H oscillator- 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 (6 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

Unit II (10 hours)

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 (5 hours)

Flow of liquid through a capillary tube-derivation of Poiseuille's formula-limitations - variation of viscosity with temperature-Stokes formula-determination of viscosity of a highly viscous liquid by Stokes method.

References

1. Mechanics: J.C.Upadhyaya, Ram Prasad & Sons

2. Oscillations & Waves: K.RamaReddy, S.Bbadami &V.Balasubramaniam (University Press)

SEMESTER 2 (HOME SCIENCE MAIN)

PY1231.5 – THERMAL PHYSICS

(36 HOURS-2 CREDITS)

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 -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 (10 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. Phase transition- first order and second order-liquid helium-super fluidity.

Unit. IV – Entropy (8 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 (HOME SCIENCE MAIN)

PY1331.5 – OPTICS AND ELECTRICITY

(54 HOURS-3 CREDITS)

Unit I (34 hours)

Interference (12 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 liquid.

Diffraction (14 hours)

Phenomenon of diffraction-classific ation-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge and circular aperture. Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength-Resolving power of grating.

Laser and Fibre Optics (8 hours)

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

Unit II (20 hours)

Electricity

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.Electric motors- principles of working-Devices working with electric motors-Electric fan- wet grinder, Mixer grinder, Microwave oven – principle – technical specifications- applications – advantages,

References

1. A text book of optics – Brijlal & Subramaniam
2. Electricity and Magnetism – R.Murugeshan, S.Chand & Co Ltd.
3. A text book of B.Sc subsidiary Physics – P.Vivekanandan.
4. Electrical Technology (Vol I & II), B.L.Theraja.

SEMESTER 4 (HOME SCIENCE MAIN)

PY1431.5 – ATOMIC PHYSICS AND ELECTRONICS

(54 HOURS-3 CREDITS)

Unit I

Modern Physics (20 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.Atomic nucleus-basic properties of nucleus-charge, mass, spin magnetic moment binding energy and packing fraction-nuclear

forces-salient features-radioactivity radioactive decay-decay laws-decay constant-half life and mean life-radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity-

Unit II Superconductivity (8 hours)

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

Unit III Spectroscopic Techniques (8 hours)

EM spectrum-UV, Visible, IR, Radio and microwave regions-principle of various spectrometers used in specific regions of EM spectrum-absorption spectroscopy emission spectroscopy-mass spectroscopy-qualitative ideas of ESR & NMR spectrometer.

Unit IV (18 hours)

Electronics (10 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 feedback bias, voltage divider bias (qualitative study only).Transistor amplifier-basic features of an amplifier-gain, input and output resistances frequency response and band width-small signal CE amplifier-circuit and its operation

Digital Electronics (8 hours)

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. Boolean algebra-Boolean operations-logic expressions-laws of Boolean algebra-DeMorgan's theorem-Boolean expression for gate network-simplification of Boolean expression.

References

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

COMPLEMENTARY ELECTRONICS FOR PHYSICS MAIN

SEMESTER 1

EL1131- ELECTRONICS I

(36 HOURS-2 CREDITS)

Unit I (Chapters 1, 2, 3, 4, 5, 6 of Book 1) – 16 hrs

Circuit fundamentals (5 hrs), Kirchoff's laws and network theorems (6 hrs), Passive circuit elements (5 hrs).

Unit II (Chapters 7, 8, 9, 12, 13, 14 of Book 1) – 20 hrs

Magnetism and transformers (3 hrs), A.C fundamentals-series AC circuits (4 hrs),Time constant (3 hrs), Solid state Physics (4 hrs), p-n junction diode (6 hrs).

Books of Study

1. Basic Electronics Solid State – B.L.Theraja, S.Chand & Co. Ltd.
2. Principles of Electronics – V.K.Mehta.

SEMESTER 2

EL1231- ELECTRONICS II

(36 HOURS-2 CREDITS)

Unit I (Chapters 11, 15, 16, 17, 18, 19 of Book 1) – 21 hrs

Tuning circuits and filters (4 hrs), Opto-electronic devices (4 hrs), DC power supplies (5 hrs), The basic transistor (4 hrs), Transistor characteristics and approximations (4hrs).

Unit II (Chapters 20, 21 of Book 1) – 15 hrs

Load line and DC bias circuits (5 hrs), Transistor equivalent circuits and models (10 hrs).

Books of Study

1. Basic Electronics Solid State – B.L.Theraja, S.Chand & Co. Ltd.
2. Principles of Electronics – V.K.Mehta.

SEMESTER 3

EL1331- ELECTRONICS III

(54 HOURS-3 CREDITS)

Unit I (Chapters 22, 23, 24 of Book 1) – 22 hrs

Single stage amplifiers (10 hrs), Multi stage amplifiers (8 hrs), Decibels and frequency response (4 hrs).

Unit II (Chapters 25 to 30 of Book 1) – 32 hrs

Feedback amplifiers (4 hrs), sinusoidal and non-sinusoidal oscillators (10 hrs), Field effect transistors (6 hrs), Breakdown devices (4 hrs), Modulation and demodulation (8hrs).

Books of Study

1. Basic Electronics Solid State – B.L.Theraja, S.Chand & Co. Ltd.
2. Principles of Electronics – V.K.Mehta.

SEMESTER 4

EL1431- ELECTRONICS IV

(54 HOURS-3 CREDITS)

Unit I (Chapters 31 to 35 of Book 1) – 32 hrs

Integrated circuits (8 hrs), Number systems (6 hrs), Logic gates (8 hrs), Boolean algebra (6 hrs), Logic families (4 hrs).

Unit II (Chapters 36, 37, 38 of Book 1) – 22 hrs

Transducers (8 hrs), Electronic instruments (6 hrs), Fibre optics (8 hrs).

Books of Study

1. Basic Electronics Solid State – B.L.Theraja, S.Chand & Co. Ltd.
2. Principles of Electronics – V.K.Mehta.

COMPLEMENTARY PRACTICALS (PHYSICS)

(COMMON FOR ALL COMPLEMENTARY SUBJECTS)

PY1432-PRACTICAL

List of Experiments (Minimum 20 experiments to be done)

1. Torsion Pendulum- n by torsional oscillations
2. Torsion Pendulum- n and I using equal masses
3. Fly Wheel
4. Cantilever- Y by pin and microscope method
5. Uniform bending- Y by pin and microscope
6. Symmetric bar pendulum- g and radius of gyration
7. Surface tension- capillary rise method
8. Coefficient of viscosity- capillary flow method

9. Specific heat-method of mixtures applying Barton's correction
10. Lee's disc- Thermal conductivity of cardboard
11. Melde's string- frequency of tuning fork
12. Method of parallax- optical constants of convex lens using i) mirror and mercury ii) mirror and water
13. Method of parallax- refractive index of liquid.
14. Spectrometer- A, D and n
15. Spectrometer- dispersive power of a prism
16. Spectrometer- Grating-normal incidence
17. Deflection and vibration magnetometer- M and Bh
18. Circular coil- magnetization of a magnet
19. Carey Foster's bridge- Resistivity
20. Potentiometer- Resistivity
21. Potentiometer- Calibration of ammeter
22. Mirror galvanometer- Current and Voltage sensitivity
23. Diode Characteristics (for Ge and Si diodes)
24. Half wave rectifier-Measurement of ripple factor with and without filter capacitor
25. Full wave rectifier- Measurement of ripple factor with and without filter capacitor

COMPLEMENTARY ELECTRONICS PRACTICALS

EL1432-PRACTICAL

LIST OF EXPERIMENTS (MINIMUM 20 EXPERIMENTS TO BE DONE)

1. Semiconductor diode (IN 4001/ IN 4007) Characteristics;To (i) trace and construct the circuit,

(ii) to draw the forward V-I characteristic curve and

(iii) to determine the static and dynamic resistances of the diode at a particular operating point.

2. Zener diode characteristics:To (i) trace and construct the circuit,

(ii) to plot the V-I characteristic under reverse biased condition and

(iii) to calculate the dynamic resistance of the diode under reverse bias when conducting.

2. LED and photo diode characteristics:

To (i) study the variations in resistance with varying current and
(ii) to study the output characteristics of a photo diode.

4. Thevenin and Norton equivalent circuits:

To (i) determine Thevenin's and Norton's equivalent circuits of Wheatstone's bridge and (ii) to verify the power transfer theorem.

5. R-C resonant circuits:

To (i) study the input-output characteristics of an R-C circuit as a function of frequency and
(ii) to study the square wave response of R-C circuits.

6. Transistor characteristics; CE configuration:

(i) Construct the circuit,

(ii) To plot the input characteristics (IB-VBE graph for constant VCE) and to calculate the dynamic resistance at an operating point,

(iii) To study the output characteristics (IC-VCE graph for constant IB) and to calculate the output ac resistance, dc gain and ac current gain at a given operating point.

7. Transistor characteristics; CB configuration:

(i) Construct the circuit,

(ii) Plot the input characteristics (IE-VEB graph for constant VCB) and to calculate the dynamic resistance at an operating point,

(iii) To study the output characteristics (IC-VCB graph for constant IC) and to calculate the output dynamic resistance, dc current gain and ac current gain at a given operating point.

8. FET characteristics:

(i) Trace the circuit

(ii) To plot the static drain characteristics of FET

(iii) To calculate the FET parameters (drain dynamic resistance, mutual conductance and amplification factor at a given operating point).

9. Fixed-bias circuit with and without emitter resistor:

(i) Trace the circuit

(ii) To measure the Q -Point (IC and VCE) with and without emitter resistor RE.

(iii) To note the variation of Q-point by increasing the temperature of the transistor in fixed bias circuit with and without emitter resistor

(iv) To note the variation of Q-point by changing the base resistor in bias circuit with and without emitter resistor

10. Collector-to-base feedback bias circuit:

(i) Trace the circuit

(ii) To measure the Q-Point (IC and VCE)

(iii) To note the variation of Q-point by increasing the temperature of the transistor

11. Potential-divider biasing circuit:

(i) Trace the circuit

(ii) To measure the Q-Point (IC and VCE)

(iii) To note the variation of Q-point by increasing the temperature of the transistor

(iv) To measure the operating point when one of the bias resistor changes

12. Half-wave rectifier:

(i) To draw the input and output wave shapes

(ii) To verify Vdc = Vm/p and ripple factor = 1.21 (Observe for different load resistances)

13. Full-wave rectifier – Centre tapped:

(i) To draw the input and output wave shapes

(ii) To verify Vdc = 2Vm/p and ripple factor = 0.482 (Observe for different load resistances)

14. Bridge rectifier:

(i) To draw the input and output wave shapes

(ii) To verify Vdc = 2Vm/p and ripple factor = 0.482 (Observe for different load resistances)

15. Filter circuits (shunt capacitor, LC and CLC filters):

(i) To plot the output wave shapes with and without shunt capacitor

(ii) To find the ripple factor with and without different filters

16. Single stage RC coupled amplifier:

(i) To measure the Q-point (IC and VCE)

(ii) To measure the maximum signal that can be amplified by the amplifier without clipping

(iii) To measure the voltage gain at 1 KHz

(iv) To plot the frequency response

(v) To find the voltage gain for different values of load resistance

17. FET amplifier:

(i) To measure the frequency response

(ii) To measure voltage gain, BW and gain-BW product

18. Hartley oscillator:

(i) Trace the circuit

(ii) To measure the Q-point of the transistor

(iii) To observe the output wave form and to measure the frequency of oscillations

19. Phase shift oscillator:

(i) Trace the circuit

(ii) To measure the frequency from the output wave form

(iii) To observe the phase shift at different points

20. Clipping circuits:

(i) To observe the output wave form corresponding to different clipping circuits

21. Clamping circuits:

(i) To observe the output wave form corresponding to different clamping circuits

22. OP amp. - Inverting amplifier using IC 741

(i) Trace the circuit

(ii) To construct an inverting amplifier using IC 741 and determine its voltage gain for different input voltage

23. OP amp. - Non inverting amplifier using IC 741

(i) Trace the circuit

(ii) To construct a Non inverting amplifier using IC 741 and determine its voltage gain for different input voltage

24. OP amp. - Unity gain buffer using IC 741

(i) Trace the circuit and

(ii) To construct a unity gain buffer using IC 741 and to find the voltage gain