RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (I Semester)

Lectures	**: 3 Hrs**
Examination Time	**: 3 Hrs**
Maximum Marks:	**50(20+30)**
Subject : Mechanics	**Paper Code : : PHY-101**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Background of Vector calculus**:** Concepts of gradient**,** Divergence and curl **;** Line**,** Surface and Volume Integrals**,** Frame of Reference**,** Galilean transformation**,** Galilean Invariance**,** Inertial and Non Inertial frames**,** Pseudo forces**,** Rotating reference frame**,** Centrifugal force**,** corilis force, motion uder central force, Kepler's law, Conservative and Non-conservative force.

UNIT-II

Ideal fluids**,** Equation of continuity**,** Streamline flow**,** Rotational and irrotational flows**,** Euler's equation**,** Bernouli's Theorem**,** Viscous fluids**,** Poiseuille's equation**,** Viscosity by rotating cylinder method. Elasticity Hook's law and elastic constant of isotropic solid.

UNIT-III

Strain and Stress in an isotropic homogeneous medium**,** Elastic moduli and relations between them**,**Torsion of cylinders**,** Bending of beams**,** Internal energy of a strained body, surface tension and surface energy.

UNIT-IV

Inference of Michelson-Morley Experiment**,** Postulates of special relativity**,** Lorentz transformations**,** Length contraction**,** Time dilation**,** Simultaneity in relativity theory**,** Addition of velocities**,** Relativistic dynamics**,** Variation of mass with velocity**,** Mass-Energy relation**.**

Books Recommended:

1. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell

2. Concepts of Modern Physics by Arthur Beiser

3. Properties of Matter by D.S. Mathur.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (I Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Thermodynamics Paper code: PHY - 103

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

First Law of Thermodynamics and Internal Energy, Joule's Law, Applications of First Law, Carnot Cycle, Carnot Engine and Refrigerator, Reversible and Irreversible Process, Carnot Theorem, Thermodynamically Scale of Temperature

UNIT-II

Entropy, Calculation of Entropy in various processes, Entropy and unavailable energy, Physical Significance of Entropy, Second law of Thermodynamics, Thermodynamic Potentials and Maxwell's Equations, Application of Maxwell's equations, Phase diagram and triple point of a substance, Joule's Thomson effect.

UNIT-III

Maxwell-Boltzmann Law of Distribution of Molecular Velocities, Evaluation of r.m.s. velocity, Average and Most Probable Speeds, Mean Free Path, Transport Phenomenon .Degree of freedom, equi-partition of energy and its application for specific heat of gases.

UNIT-IV

Emissive and Absorptive Powers, Black Body Radiation, Kirchoff's Law , Intensity and Energy Density, Pressure and Energy density, Stefan-Boltzmann Law, Distribution of energy in the spectrum of black body radiation, Wein's Distribution Law, Wein's displacement law, Wein's formula, Rayleigh- Jean's law, Plank's law

Books Recommended:

1. Thermodynamics By Enrico Fermi (Courier Dover Publications, 1956)

2. A Treatise on Heat : Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics By Meghnad Saha, B. N. Srivastava (Indian Press, 1958)

3. Heat and Thermodynamics: An Intermediate Textbook By Mark Waldo Zemansky, Richard Dittman (McGraw-Hill, 1981

4. Thermal Physics by Garg, Bansal and Ghosh (Tata McGra-Hill, 1993)

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (I Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Waves & Oscillations Paper code: PHY – 105

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Simple Harmonic Oscillations. Differential Equation of SHM and its Solution. Amplitude, Frequency, Time Period and Phase. Velocity and Acceleration. Kinetic, Potential and Total Energy and their Time Average Values. Reference Circle. Rotating Vector Representation of SHM.

UNIT –II

Free Oscillations of Systems with One Degree of Freedom :- (1) Mass-Spring system, (2)Simple Pendulum, (3) Torsional Pendulum, (4) Oscillations in a U-Tube, (5) Compound pendulum: Centres of Percussion and Oscillation, and (6) Bar Pendulum.

UNIT –III

System with Two Degrees of Freedom : Coupled Oscillators. Normal Coordinates and Normal Modes. Energy Relation and Energy Transfer. Normal Modes of N Coupled Oscillators.

UNIT –IV

Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves : Ripple and Gravity Waves.

Books Recommended:

1 . Vibrations and Waves by A. P. French.(CBS Pub. & Dist., 1987)

2. The Physics of Waves and Oscillations by N.K. Bajaj (Tata McGraw-Hill, 1988)

3. Fundamentals of Waves & Oscillations By K. Uno Ingard (Cambridge University Press, 1988)

4. An Introduction to Mechanics by Daniel Kleppner, Robert J. Kolenkow (McGraw-Hill, 1973)

5. Waves: BERKELEY PHYSICS COURSE (SIE) by Franks Crawford (Tata McGrawHill, 2007).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Nuclear and Particle Physics -I **Paper code: PHY – 102**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density, matter density (experimental determination of each), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/Z plot, angular momentum, parity, magnetic moment, electric moments

Unit – II Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, nucleon separation energies(up to two nucleons), Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure and the basic assumption of shell model

Unit – III Radioactivity decay: Decay rate and equilibrium (Secular and Transient) (a) Alpha decay: basics of α-decay processes, theory of α-emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy, decay Chains. (b) β-decay: energy kinematics for β-decay, β- spectrum, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission from the excited state of the nucleus& kinematics, internal conversion.

Unit – IV Nuclear Reactions: Types of Reactions, units of related physical quantities, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

Reference Books:

- Basic Ideas and concepts in Nuclear Physics: An introductory Approach by K Heyde, Third edition, IOP Publication, 1999.
- Nuclear Physics by S. N. Ghoshal, First edition, S. Chand Publication, 2010.
- Concepts of Nuclear Physics by Bernard L Cohen, Tata McGraw Hill Publication, 1974.
- Introductory Nuclear Physics by Kenneth S, Krane, Wiley-India Publication, 2008
- Nuclear Physics : principles and applications by John Lilley, Wiley Publication, 2006.
- Physics and Engineering of Radiation Detection by Syed Naeem Ahmed, Academic Press Elsevier, 2007.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Semiconductor Physics **Paper code: PHY – 104 Note:**

Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Energy bands in solids, Intrinsic and extrinsic semiconductors, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode , Light emitting diodes (LED), Photodiode, Solar Cell, P-n junction, half wave and full wave rectifiers, Zener diode as a voltage regulator. Logic gates and its combination.

UNIT -II

Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes), Constants of a transistor, Relation between alpha and beta, Common base, Common emitter and common collector characteristics of transistor, Advantages and disadvantages of C-E configuration, Emitter follower.

UNIT -III

Transistor amplifier, Methods a of transistor biasing and stabilization, D.C. load line , Common base and Common emitter biasing, Common base and common emitter amplifiers, Classification of amplifiers, Feedback in amplifiers, Positive and negatice feedback. Advantages of negative feedback,.

UNIT -IV

Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, RC oscillator, Phase shift and Wein-Bridge oscillator, Advantage of of RC oscillator over lC oscillator.

Books Recommended:

1. Integrated Electronics – J. Millman and C. C. Halkias (Mc Graw Hill).
2. Electronic Fundamentals and Applications – D. Chattopadhyay and P. C. Rakshit.
3. Digital Logic and Computer Design – M. Moris Mano, (PHI (Pvt.) Ltd.).
4. Microprocessor Architecture, Programming and Application – R. A. Gaonkar (Willey EasternLtd.).
5. Introduction to Microprocessor – Software, Hardware Programming – Laventhal (PHI Ltd.).
6. Electronics – R.K. Kar

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Laser and Fibre Optics Paper code: PHY – 106

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Laser: Principle of Laser action, Population Inversion, Einstein's A and B coefficients, feedback of energy in a resonator, Threshold condition of laser formation. 3 level and 4 level laser systems.

UNIT –II

Characteristics of laser radiation. He-Ne , Nd-YAG Laser, Ruby Laser, Semiconductor Lasers and Dye lasers. Application of Laser. Significance of non-linear polarization of lasers: Second harmonic generation using non-linear optical methods.

UNIT -III

Principle of holography (basic principle), isotope separation. Precision measurements (frequency and distance). Optical fiber, core and cladding, total internal reflection, optical fiber as waveguide, step index and graded index fiber.

UNIT -IV

communication through optical fibers, energy loss, band width and channel capacity for a typical system, attenuation and dispersion, splicing and couplers, Fiber optic sensors.

Books Recommended:

1. Laser Principles and Applications – A. K. Ghatak and K. Tyagrajan (Tata – Mc Graw Hill).
2. Optics and Atomic Physics – B. P. Khandelwal (Siblal Agarwala).
3. Optical Electronic – A. K. Ghatak and K. Tyagrajan.
4. Introduction to Fibre Optics - R. A. Shotwell (EEE, Prentice Hall).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Nuclear and Particle Physics – II **Paper code: PHY – 201**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (BetheBlock formula), energy loss of electrons, Cerenkov radiation. Gamma ray interaction through matter(photoelectric effect, Compton scattering, pair production), neutron interaction with matter. **(9 Lectures)**

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT).Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector. **(9 Lectures)**

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons (Principal, construction, working, advantages and disadvantages). **(7 Lectures)**

Particle physics: Particle interactions (concept of different types of forces); basic features, types of particles and its families. Conservation Laws(energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness), concept of quark model, color quantum number and gluons. **(11 Lectures)**

Reference Books:

- Radiation detection and measurement, G.F. Knoll, John Wiley & Sons, 2010.
- Technique for Nuclear and Particle Physics experiments by William R Leo, Springer, 1994.
- Introduction to Modern Physics by Mani & Mehta, Affiliated East-West Press, 1990.
- Introduction to elementary particles by David J Griffiths, Wiley, 2008.
- Modern Physics by Serway, Moses and Moyer, CENGAGE LEARNING, 2012.
- Concepts of Modern Physics by Arthur Beiser, McGraw Hill Education, 2009.

For Numericals

- Schaum"s Outline of Modern Physics, McGraw-Hill Education, 1999
- Modern Physics by R. Murugaeshan. S.ChandPublication, 2010.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Electrostatics **Paper code: PHY – 203**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Electric Field and Electric Potential

Electric field: Electric field lines. Electric flux. Gauss‟ Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace‟s and Poisson equations.The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole.

Unit – II Capacitors : Electrostatic energy of system of charges. Electrostatic energy of a charged sphere.Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.

Unit – III Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss‟ Law in dielectrics.

Unit – IV Solution of field problems in case of a point charge near a grounded conducting infinite plane. Boundary value problem : in uniform external field for (i) conducting spherical shell and (ii) dielectric sphere.

Books Recommended:

1. Introduction to Electrodynamics by A.Z.Capri & P.V.Panat.(New Delhi: Narosa Pub.House, 2002).
2. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill, 2006).
3. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
4. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
5. David J. Griffiths, Introduction to Electrodynamics, 3rd edition, (Benjamin Cummings 1998).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Magnetism **Paper code: PHY – 205(A)**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Magnetic Field: Magnetic force between current elements and definition of Magnetic Field**B**. Biot-Savart‟s Law and its simple applications: straight wire and circular loop.Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole).Ampere‟s Circuital Law and its application to (1) Solenoid and (2) Toroid. Properties of **B**: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field.

Magnetic Properties of Matter: Magnetization vector (**M).** Magnetic Intensity(**H).** Magnetic Susceptibility and permeability. Relation between **B, H, M**. Ferromagnetism.BH curve and hysteresis.

Electromagnetic Induction: Faraday‟s Law. Lenz‟s Law. Self Inductance and Mutual Inductance. Energy stored in a Magnetic Field. Time varying Magnetic fields, Betatron,Self inductance of a long solenoid, coefficient of Mutual Inductance Introduction to Maxwell‟s Equations. Integral and Differential forms, Charge Conservation and Displacement current.

Unit – IV Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Reference Books:

- Fundamentals of Electricity and Magnetism, Arthur F. Kip, 2nd Edn.1981, McGrawHill.
- Electricity, Magnetism & Electromagnetic Theory, S.Mahajanand Choudhury, 2012, Tata McGraw Hill
- Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
- Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
- Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
- Electricity and Magnetism, J.H.Fewkes& J.Yarwood. Vol.I, 1991, Oxford Univ. Press.
- Network, Lines and Fields, John D. Ryder, 2nd Edn., 2015, Pearson.

- Schaum‟s Outline of Electric Circuits, J. Edminister& M. Nahvi, 3rd Edn., 1995, McGraw Hill.

OR

Paper Code : PHY-205(B)

Material Sciences

UNIT-I

Atomic structure and bonding in materials. Crystal structure of materials, crystalsystems, unit cells
and space lattices, determination of structures of simple crystals byx-ray diffraction, miller indices
of planes and directions, packing geometry in metallic,ionic and covalent solids. Concept of amorphous, single and polycrystalline structuresand their effect on properties of materials. Crystal
growth techniques. Imperfections incrystalline solids and their role in influencing various properties.

UNIT –II

Imperfections in crystalline solids and their role in influencing various properties. Smart materials,
exhibiting ferroelectric, piezoelectric, optoelectric, semiconducting behavior, lasers and optical fibers, photoconductivity and superconductivity,nanomaterials.

UNIT -III

Stress-strain diagrams of metallic, ceramic and polymeric materials, modulus of elasticity, yield strength, tensile strength, toughness, elongation, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile and brittle fracture.

UNIT –IV

Reflection, refraction, absorption and transmission of electromagnetic radiation in solids. Origin of
magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, antiferro magnetism,
ferromagnetism, ferrimagnetism, magnetic hysterisis.

Books Recommended:

1. Material Science by V.Raghwan
2. Material science by Dierk Raabe
3. Material Science by kelester

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: SOLID STATE PHYSICS Paper code: PHY – 202

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.

Unit -II Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

Unit -III Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.

Unit – IV Super Conductivity: Introduction to superconductors, Properties of superconductors, Dependence of SC on various factors BCS theory, Meissner effect, Penetration depth, types of super conductors, AC and DC Josephson effect, SQUIDS, Applications of SC.

Reference Books:

Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.

Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill

Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning

Solid-state Physics, H.Ibach and H Luth, 2009, Springer

Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India Solid State Physics, M.A. Wahab, 2011, Narosa Publications

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Statistical Mechanics **Paper code: PHY – 204**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Statistical Mechanics: microstates and macrostates-classical description in terms of phase space and quantum description in terms of wave functions. Idea of ensemble. Hypothesis of equal a priori probability for microstates of an isolated system in equilibrium.

UNIT –II

Micro-canonical ensemble, Canonical and Grand canonical ensemble. Partition function of a system in thermal equilibrium with heat bath. Law of equipartition of energy, its limit of validity and application.

UNIT -III

Quantum Statistics: Gibbs' Paradox, Identical particle and symmetry requirement. Derivation of FD and BE statistics as the most probable distributions (micro- canonical ensemble). Classical limit of quantum statistics.

UNIT –IV

Bose Einstein (BE) distribution law: Derivation, Application of BE statistics to derive Planck's law. Rayleigh Jean's and Wien's law as limiting cases of Planck's law. Phonons and lattice, specific heat of solids: Einstein and Debye's theory, Bose- Einstein condensation.

Books Recommended:

1. Statistical Physics, F. Mandle (ELBS).
2. Fundamentals of Statistical and Thermal Physics, F. Reif, (Mc Graw Hill).
3. Statistical Mechanics by R. K. Patharia.(Oxford: Butterworth, 1996).
4. Statistical Mechanics by K. Huang (Wiley, 1987.)
5. Statistical Mechanics by eyring eyring eyring

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Optics **Paper code: PHY – 206(A)**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.
Interference: Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment.

Unit – II Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.**Michelson's Interferometer:** (1) Idea of form of fringes (no theory needed), (2) Determination of wavelength,(3) Wavelength difference,(4) Refractive index, (5) Visibility of fringes.

Unit – III Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern, Resolving power of grating, Criterion for resolution, of a straight edge, a slit and a wire using half-period zone analysis.

Unit – IV Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. , Nicol Prism, Double Refraction, Optical Activity, Laurent's Half shade Polarimeter

Reference Books:

Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill

Principles of Optics, B.K. Mathur, 1995, Gopal Printing

Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication

UniversityPhysics.FWSears,MWZemanskyandHDYoung13/e, 1986.AddisonWesley

OR

Paper Code : PHY-206(B)

Astrophysics & Cosmology

UNIT-I

Ancient astronomical systems and their utility. Celestial sphere. Calendrical phenomena. Major planets,
their orbits and their satellites. Asteroid belt, comets and other objects of the solar system.

UNIT –II

Variety of stellar objects; classification of stars; distance scales. Current survey of galaxies; clusters, voids, quasars Hubble expansion. Mass distribution in galaxies and clusters; Dark Matter. Type II a supernova and Dark Energy.

UNIT –III

Main sequence stars, H-R Diagram. White dwarfs, neutron stars, supernovae, quasars and gamma ray
bursters. Equivalence principle and a metric for the spacetime. Black Holes; FRW models; gravitational
lensing.

UNIT –IV

Primordial formation of neutral Hydrogen; CMBR. Chandershekher limit, Big Bang Nucleosynthesis; Baryon to entropy ratio; Neutrinos and other relics.

Books Recommended:

1. Bradly W. Carrol and Dale A. Ostlie, An introduction to Modern Astrophysics 2nd Ed., Pearson publication
2. P. J. E. Peebles, Principles of Physical Cosmology Princeton Univ. Press (1993)
3. T. Padmanabhan, Cosmology and Astrophysics through Problems Cambridge Univ. Press (1996)
4. T. Padmanabhan, Theoretical Astrophysics, vol I, II and III (Cambridge Univ. Press (1992 - 96)

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: ANALOG SYSTEMS AND APPLICATIONS - I **Paper code: PHY – 301**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

Unit - I Semiconductor Diodes: P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity.PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Derivation for Barrier Potential, Barrier Width and Current for abrupt Junction. Equation of continuity, Current Flow Mechanism in Forward and Reverse Biased Diode.

Unit – II Two-terminal Devices and their Applications: (1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter, (2) Zener Diode and Voltage Regulation. Principle,

Unit – III Types of Diodes structure and characteristics of (1) LED, (2) Photo diode and (3) Solar Cell, Qualitative idea of Schottky diode and Tunnel diode.

Unit – IV Bipolar Junction transistors: n-p-n and p-n-p Transistors. I-V characteristics of CB and CE Configurations. Active, Cut off and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Transistor Biasing and Stabilization Circuits. Fixed Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
- Solid State Electronic Devices, B.G.Streetman& S.K.Banerjee, 6th Edn.,2009, PHI Learning
- Electronic Devices & circuits, S.Salivahanan& N.S.Kumar, 3rd Ed., 2012, Tata McGraw Hill
- Semiconductor Devices: Physics and Technology, S.M. Sze, 2nd Ed., 2002, Wiley India
- Microelectronic Circuits, M.H. Rashid, 2nd Edition, Cengage Learning
- Microelectronic Devices & Circuits, David A.Bell, 5th Edn.,2015, Oxford University Press

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Evaluation w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: DIGITAL SYSTEMS AND APPLICATIONS **Paper code: PHY – 303**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

Unit -I Digital Circuits: Difference between Analog and Digital Circuits. Examples of linear and digital ICs, Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and application as Parity Checkers.

Unit – II Boolean algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Min terms and Maxterms. Conversion of Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

Unit -III Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor.

Unit -IV Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Pre-set and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip flop.

Reference Books:

- Digital Principles and Applications, A.P.Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Electronics G K Kharate ,2010, Oxford University Press
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Communication System **Paper code: PHY – 305**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Electronic communication: *Introduction to communication – means and modes. Needfor modulation. Block diagram of an electronic communication system. Electromagnetic communication spectrum, band designations and usage*

Unit – II Analog Modulation*: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector),Qualitative idea of Super heterodyne receiver.*

Unit – III Analog Pulse Modulation*: Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing.*

Unit – IV Digital Pulse Modulation*: Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying(PSK), and Binary Phase Shift Keying (BPSK).*

Reference Books:

- *Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.*
- *Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.*
- *Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.*
- *Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.*
- *Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill*
- *Communication Systems, S. Haykin, 2006, Wiley India*
- *Electronic Communication system, Blake, Cengage, 5th edition.*
- *Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press*

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Atomic Molecular and Laser Physics **Paper code: PHY – 302**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Brief review of early models of atomic structure. Hydrogen atom spectrum and the Bohr model. FranckHertz experiment. The reduced mass and the discovery of the hydrogen isotopes. Correspondence
principle, spectra of hydrogen-like atoms, magnetic moment due to orbital motion, normal Zeeman effect and limits of Bohr Sommerfield theory.

UNIT-II

Quantum mechanics applied to the hydrogen atom problem:Stern-Gerlach experiment and electron spin, spin orbit coupling, Fine structure of the hydrogen atom spectrum.

UNIT-III

Many-electron atoms: Hund's rule and the periodic table, spectral terms, doublet structure of alkali spectra. The effective quantum number and quantum defect, penetrating and non-penetrating orbits.

Anomalous Zeeman effect, Paschen- Bach effect, Stark effect in hydrogen.

UNIT-IV

Rotational and Vibrational Spectroscopy: diatomic molecule as a rigid rotator, effect of isotopic substitution, non-rigid rotator. Vibrational energy of a molecule, diatomic molecule as a simple harmonic oscillator. The anharmonic rotator, Rotational- Vibrational Spectra, population of energy levels. Electronic spectra of molecules, dissociation, Frank-Condon principle. Raman effect: Lasers: Brief
introduction to the principle of lasers. Energy level diagram of Laser (He-Ne). Relation of Einstein's coefficient. Threshold condition of laser formation.

Reference Books:

1. Introduction of atomic spectra: white
2. Atomic molecular physics by Rajkumar.
3. Lasers – Theory and Applications" by K. Thyagrajan and A.K. Ghatak
4. Physics of Atoms and Molecules" by Bransden and Joachain

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Mathematical Physics **Paper code: PHY – 304**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Transformation properties of vectors; scalar and vector products; Differentiation and integration of vectors; Concept of tensors; Line integral, volume integral and surface integral involving vector fields; Gradient, divergence and curl of a vector field; Gauss's divergence theorem, Stokes' theorem, Green's theorem - application to simple problems.

UNIT-II

Orthogonal curvilinear coordinates; concept of a metric, spherical and cylindrical coordinates and their unit vectors. Hermitian, orthogonal and unitary matrices, inverse of a matrix, similarity transformations, Eigenvalue problems and diagonalization of matrices

UNIT-III

Infinite sequences and series - convergence and divergence, conditional and absolute convergence, ratio test for convergence. Complex-valued functions - analytic functions defined in terms of Taylor series expansion. Functions of several real variables - partial differentiation.

UNIT-IV

Solution of second order linear differential equation with constant coefficients and variable coefficients by Frobenius' method; Solution of Legendre and Hermite equations about x = 0; Legendre and Hermite polynomials - orthonormality properties.

Books Recommended:

1. Matrices and Tensors in Physics by A.W.Joshi.(New Age Int.Pub., 1995).

2. Linear Algebra Theory and Applications by Ward Cheney and David Kincaid (Jones & Bartlett)

3. Vector Spaces and Matrices in Physics by M. C. Jain (Alpha Science International Ltd, 2007).

4. Partial Differential Equations for Scientists and Engineers By Stanley J. Farlow (Dover Publishers, 1993).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Quantum Mechanics **Paper code: PHY – 306**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Origin quantum physics (Experimental basis): Review of History of Origin of Quantum Mechanics-Plank's Quantum Hypothesis, black body radiation. Nature of Light, de Broglie Waves and Wave- Particle Duality, Heisenberg's Uncertainty Principle. Compton Effect. Phase velocity, group velocity and their relation.

UNIT-II

Operators: Linear Operators. Momentum operator, Energy operator, Hamiltonian operator, Eigen value problem. Eigen value of a Hermition and Unitary Operators. Property of Hermition operator. Expectation Values. Commutator bracket and Uncertainty relations.

UNIT III

Postulates of Quantum Mechanics: Derivation of 1-D, 2-D,3-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, Expectation values of dynamical quantities, probability current density.

UNIT-IV

Application of Schrodinger wave equation:

1. Free particle in 1-D, 2-D,3-D box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy).
2. One dimensional step potential E > VO (Reflection and Transmission coefficient)
3. One dimensional step potential E < VO (Penetration depth calculation).
4. One dimensional potential barrier, E > VO (Reflection and Transmission coefficient)

5. One-dimensional potential barrier, E < VO (penetration or tunneling coefficient).
6. Brief idea of energy and eigen function of Harmonic oscillator .

Reference Books:

1. Bransden B H and Joachain C J, Quantum Mechanics (2000), Pearson Education, New Delhi
2. Liboff R L, Introductory Quantum Mechanics
3. Eisberg R M and Resnick R, Quantum Physics of Atoms Molecules, Solids, Nuclei and Particles, Wiley Eastern Ltd, New Delhi
4. Verdeyen J T, Laser Electronics PHI, New Delhi
5. Thorenton S T and Rex A, Modern Physics, (2007) Cengage Learning, New Delhi
6. Taylor J R, Zafiratos C D and Dubson M A, Modern Physics, 2nd Ed (2004), PHI, New Delhi.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (I Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - I **Paper Code - PHY - 107**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

List of Experiments

Note: Students are required to perform minimum five experiments from given list.

1. To determine the height of terrestrial object using sextant.
2. Determination of Stefan's Constant.
3. To study the variation of semiconductor resistance with temperature and hence to Determine the Band Gap of semiconductor in the form of reverse biased P-N junction.
4. Moment of Inertia of a fly-wheel.
5. 'g' by Bar pendulum.
6. M.I. of an irregular body using a torsion pendulum.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (II Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - II **Paper Code - PHY – 108**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct* *the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks.* *These external examiners will verify the record randomly.*

Note: Students are required to perform minimum five experiments from given list.

(1) To study and plot V-I characteristics of PN junction diode.

(2) To Study and plot V-I characteristics Zener Diode.

(3) To draw common emitter characteristics of a transistor and calculate transistor characteristics parameters.

(4) To draw common base characteristics of a transistor and calculate transistor characteristics parameters.

(5) To plot the waveform of the half wave rectifier and find the ripple factor for H.W.R.

(6) To plot the waveform of the full wave bridge rectifier and analyze its output.

(7) To study Cathode Ray Oscilloscope (CRO).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (III Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - III **Paper Code - PHY – 207**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

List of Experiments

Note: Students are required to perform minimum five experiments from given list.

1. To determine Earth's magnetic field using tangent Galvanometer.
2. Viscosity of water by its flow through a uniform capillary tube.
3. Verify the Faraday Law using magnetic induction.
4. Conversion of galvanometer into ammeter.
5. Conversion of galvanometer into voltmeter.
6. Calibration of a thermocouple by Potentiometer.
7. To determine specific resistance of a metallic wire using potentiometer

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (IV Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - IV **Paper Code - PHY – 208**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Note: Students are required to perform minimum five experiments from given list.

1. Verification of Newton's Ring formula and determination of wavelength of sodium light.
2. Determination of Magnifying and Resolving power of a telescope.
3. Refractive Index and Dispersive Power of a Prism using spectrometer.
4. Determine wavelength of light using plane transmission diffraction grating.
5. Determine resolving power of a grating.
6. Specific Rotation of Sugar solution by Laurent's half-Shade Polarimeter.
7. To determine numerical aperture of the optical fiber
8. Wavelength of Sodium light by Fresnel's Biprism.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (V Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - V **Paper Code - PHY – 307**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks.* *These external examiners will verify the record randomly.*

Note: Students are required to perform minimum six experiments from given list.

1. Moment of Inertia of a fly-wheel.
2. M.I. of an irregular body using a torsion pendulum.
3. Surface tension by Jeager's Method.
4. Young's Modulus of steel bar using tensile
5. Modulus of rigidity by torsion method
6. Elastic constant by Scarle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. 'g' by Bar pendulum.
9. To verify the Bernoulies theorem.
10. To determine viscosity of a given fluid.
11. To calibrate the orificemeter.

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)

B.Sc. (PCM) I Year (VI Semester)

Practical per Week : 4 Hrs **Maximum Marks : 50 (20 + 30)**

Subject : Physics Lab - VI **Paper Code - PHY – 306**

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Students need to perform minimum two experiments from each section and in total eight experiments.

Activities:

1. Demonstrations

(Any four demonstrations equivalent to two experiments)

(i) Electromagnetic induction by using two coils

(ii) Magnet –magnet interaction

(iii) Study of Collision by using balls

(iv) Study of Signal generator using CRO (Sine, square wave signal, measurement of AC voltage, frequency)

(v) Demonstration of action potential

(vi) Moment of inertia effect on rotation

2. Computer aided demonstrations (Using computer simulations or animations)

(Any two demonstrations equivalent to two experiments)

(i) Coulomb's law

(ii) Vectors: visualization of vectors

(iii) Bohr's model

(iv) Carnot engine, diesel engine

(v) Graphs and their slopes, and Kinematics graphs (using computer simulations)

(vi) Model of SC, BCC, FCC, and HCP crystals.

3. **Mini projects/Hand on activities**

(Any one equivalent to two experiments)