

RVR New CBCS II Sem

RVR

MCT 25 units
SCT 17 questions

Department Name: Physics

OE - 3 units
12 questions

Semester - IV

Course Title: Electromagnetics	Course Code: 23PHHCT21
Total Contact Hours: 60 Hours	No. of Credits: 04
Internal Assessment Marks: 30	Duration of SEE : 03 Hours
SEE Marks: 70	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Illustrate the physical concepts of static electric and magnetic fields.
2. Illustrate the physical concepts of varying electric and magnetic fields.
3. Apply potential and field concepts to electromagnetic systems.
4. Analyze the propagation of wave in different media.
5. Identify and apply appropriate theoretical concepts to solve problems in electromagnetism.

Unit	Description	Hours
1	<p>Electrostatics: Introduction, Divergence and curl of electrostatic field, Gauss law in integral and differential forms with applications, Poisson's and Laplace's equations, Boundary conditions and Uniqueness theorems, electrostatic potential and The Potential of a Localized Charge Distribution. Multipole expansion of the potential, the Energy of a Point Charge Distribution, monopole and dipole terms, electric field of a dipole, dipole-dipole interaction. Electrostatic fields in matter, polarization, macroscopic field equations, electrostatic energy in dielectric media. The physical problems in electrostatics. (Ref. Griffiths, Jackson, Laud)</p>	12
2	<p>Magnetostatics: Introduction, Current density, continuity equation, magnetic field of a steady current, the divergence and curl of B, Ampere's law, magnetic vector potential, multipole expansion of vector potential of a localized current distribution, torques and forces on magnetic dipoles, effect of a magnetic field on atomic orbits. Magnetic fields in matter, macroscopic equations, magnetostatic boundary conditions, magnetic scalar potential, Energy in the magnetic field. The physical problems in magnetostatics. (Ref. Kraus and Carver, Griffiths)</p>	12
3	<p>Time-changing Electric and Magnetic Fields: Introduction, Faraday's Law, Maxwell's equations – Maxwell's Equation from Ampere's Law, Maxwell's equations in matter. Stokes' Theorem, Alternating-current Behavior of Ferromagnetic Materials, Eddy Currents, Displacement</p>	12

	Current, Dielectric Hysteresis, Boundary conditions, General Field Relations, Comparison of Electric and Magnetic Field Relations, Problems. (Ref. Griffiths)	
4	<p>Potential and Fields: Vector and scalar potentials, Gauge transformations – Lorentz gauge and Coulomb gauge, Retarded Potentials, Lienard-Wiechert potentials, fields of a moving point charge.</p> <p>Electromagnetic Radiation: Electric dipole radiation, Magnetic dipole radiation, Power radiated by a point charge, Larmor formula, Bremsstrahlung radiation, radiation from a charged particle moving in a circular orbit, cyclotron and synchrotron radiation. (Ref. Griffiths)</p>	12
5	<p>Electromagnetic Waves and Wave Guides: Electromagnetic Waves: Propagation of waves in linear media, reflection and transmission at normal and oblique incidence, Electromagnetic waves in non-conducting and conducting medium, skin depth, reflection at conducting surface. Wave guides: Fields at the surface and within a conductor, modes in rectangular wave guide, TE waves in a rectangular wave guide, Co-axial transmission line and cylindrical cavities. (Ref. Griffiths, Laud)</p>	12
<p>References:</p> <ol style="list-style-type: none"> 1. Introduction to Electrodynamics, D J Griffiths, PHI, Third Edition, 2012. 2. Electromagnetics, B.B. Laud, New Age International PVT. LTD (1987). 3. Classical Electrodynamics, J D Jackson, 4th Edition, John Wiley & Sons, 2005. 4. Electromagnetics, John D Kraus, Keith R Carver, Second Edition, McGraw-Hill Kogakusha Ltd., 1973. 		

Department Name: Physics

Semester - II

Course Title: Elementary Quantum Mechanics	Course Code: 23PHHCT22
Total Contact Hours: 60 Hours	No. of Credits: 04
Internal Assessment Marks: 30	Duration of SEE : 03 Hours
SEE Marks: 70	

Course Outcomes (COs):

At the end of the course students will be able to:

1. Distinguish between phenomena at classical and quantum level.
2. Apply basic formalism of quantum mechanics to simple physical systems.
3. Apply Schrodinger time independent wave equation to subatomic particles.
4. Apply quantum mechanical approximation methods to physical systems.

Unit	Description	Hours
1	Physical basis of quantum mechanics: Experimental background: inadequacy of classical Physics, Planck's quantum hypothesis, Bohr model of Hydrogen spectra, Correspondence principle, experimental observations of quantized orbits, inadequacy of quantum theory. Schrodinger wave equation Development of Schrodinger wave equation: One-dimensional and extension to three dimensions inclusive of forces. Interpretation of wave function: Statistical interpretation, normalization, expectation value and Ehrenfest's theorem. Energy eigen functions: separation of wave equation, boundary and continuity conditions.	12
2	Exactly solvable eigen value problems One dimensional: Square well and rectangular step potentials, Rectangular barrier, Harmonic oscillator. Three dimensional: Particle in a box. Particle in a spherically symmetric potential, rigid rotator, Hydrogen atom	12
3	General formalism	12

	Hilbert space, observables, quantum mechanical operators – definition and properties, eigen values and eigen vectors of an operator; Hermitian operator, unitary and projection operators. Commuting operators and complete set of commuting operators. Bra and ket notation for vectors. The fundamental postulates, General uncertainty relation, Dirac notations.	
4	<p>Representation theory: Matrix representation of an operator, co-ordinate and momentum representations. Expectation values, matrix method solution of linear harmonic oscillator.</p> <p>Approximation methods for stationary states: Time independent perturbation theory– Variation method, eigen values in the first approximation, perturbed harmonic oscillator. Application to an harmonic oscillator and to the ground state of Helium atom. WKB method: Application to barrier penetration, Bohr-Sommerfeld quantum condition.</p>	12
5	<p>Theory of Scattering</p> <p>Scattering cross-section, wave mechanical picture of scattering, scattering amplitude. Born approximation. Partial wave analysis: phase shifts, scattering amplitude in terms of phase shifts, optical theorem; exactly solvable problem-scattering by square well potential.</p>	12
<p>References:</p> <ol style="list-style-type: none"> 1. Quantum Mechanics: L I Schiff [McGraw-Hill, NY, 1968] 2. Quantum Mechanics : G Aruldas, PHI Learning Private Ltd.,(2nd Edn.), 2013. 3. Quantum Mechanics by Satya Prakash and Swati Saluja, KNRN Publishers, 2016. 4. Quantum Mechanics: V K Thankappan [Wiley Eastern, 1980] 5. Quantum Mechanics: Theory and Applications: A K Ghatak&S Loknathan (5th Edn.) [MacMillan India Ltd., 2010] 6. Modern Quantum Mechanics: Sakurai J J and Tuan S F [Addison Wesley 1999] 7. A Text book of Quantum Mechanics: P M Mathews and K Venkateshan [TMH, 1994] 		

Department Name: Physics

Semester - II

Course Title: Elementary Condensed Matter Physics	Course Code: 23PHHCT23
Total Contact Hours: 60 Hours	No. of Credits: 04
Internal Assessment Marks: 30	Duration of SEE : 03 Hours
SEE Marks: 70	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Explain the fundamental concepts of crystal structure.
2. Apply X-ray diffraction technique to analyse crystal structure of materials.
3. Explain bonding and imperfections in crystals.
4. Apply lattice vibrations theory to analyse specific heat of solids.
5. Apply band theory of solids to analyse properties of solids.
6. Explain fundamentals of semiconductors, superconductors and liquid crystals.

Unit	Description	Hours
1	Crystal Structure Fundamentals of Crystal structure – Crystal lattice and Translation vectors, Unit Cell, Concept of Weigner-Seitz cell, Basis; Symmetry Operations, Point groups and Space groups, Types of Lattices – Two dimensional and three dimensional lattices; Lattice directions and planes, Interplanar spacing, Simple crystal structures – Close-packed structures and Loose-packed structures with examples, Crystal structure of diamond and NaCl. (Ref.1 & 4)	12
2	X-ray diffraction and Bonding in Solids X-ray diffraction, Bragg's treatment- Bragg's law, The Von Laue Treatment – Laue's Equations, X-Ray diffraction methods – The Laue's method, Rotating Crystal method and Powder method; Atomic scattering factor, Geometrical scattering factor and Extinction rules for cubic crystals, Qualitative discussion on Neutron and Electron diffraction.(Ref.1, 2 & 4).	12

	Interatomic forces and types of bonding- Ionic, Covalent, Metallic, Van der waal' and Hydrogen bonds: Binding Energy in ionic crystals – Evaluation of Madelung constant and determination of Range; Binding Energy of Crystals of inert gases. (Ref.1 & 4).	
3	<p>Imperfections in Crystals and Lattice vibrations</p> <p>Point imperfections - Schottky and Frenkel defects and their equilibrium concentrations; Line imperfections - Dislocations and their types, Stress fields of dislocations; Planar imperfections - Grain boundary; Colour centers – F Centers and other Centers in alkali halides. (Ref.4 & 5)</p> <p>Vibrations of 1D monoatomic and diatomic lattices, Phonons, Momentum of Phonons, Inelastic scattering of photons by phonons, Specific heat – Classical theory, Einstein's theory and Debye's theory. (Ref.1 & 2)</p>	12
4	<p>Free Electron Theory of Metals and Band theory of Solids</p> <p>Qualitative discussion of Free – Electron Model of metals; Electrical conductivity, Electrical Resistivity versus Temperature, Heat Capacity of Conduction Electrons, Fermi Surface, Electrical Conductivity and Effects of Fermi Surface, Thermal conductivity in Metals (Ref.2)</p> <p>Bloch theorem, Kronig-Penny Model, Brillouin zone and construction in square lattice, Energy versus wave-vector relationship – different representations/zone schemes, Number of wavefunctions in a band, Velocity and Effective mass of electron, Distinction between metals, insulators and semiconductors. (Ref.1)</p>	12
5	<p>Semiconductors, Superconductors and Liquid crystals</p> <p>Types of semiconductors, Conductivity in intrinsic semiconductors and its variation with temperature, Carrier concentration and Fermi level for intrinsic semiconductors, Carrier concentration (quantitative), Fermi level and conductivity in extrinsic semiconductors, Hall Effect and its applications (Ref.1 ,3 & 4)</p> <p>Superconductors, Meissner effect, Supercurrents and penetration depth, Critical field and critical temperature, Type I and Type II superconductors, BCS theory (qualitative), Qualitative discussion on MAGLEV, Superconducting magnet, Josephson effects. (Ref. 1, 2 & 4)</p> <p>Liquid crystals: Classification, Orientational order and inter molecular forces, Optical properties and applications. (Ref. 2)</p>	12

References:

1. Solid State Physics by R. K. Puri & V. K. Babbar, S. Chand Publications.
2. Elementary Solid State Physics by M. Ali Omar, Pearson Education.
3. Solid State Physics by S .O. Pillai, New Age International.
4. Introduction to Solid State Physics by C. Kittel, Wiley Eastern Ltd.
5. Elements of Solid State Physics by J.P Srivastava, PHI Learning Pvt. Ltd.

Department Name: Physics

Semester - II

Course Title: Elementary Nuclear Physics	Course Code: 23PHHCT24
Total Contact Hours: 60 Hours	No. of Credits: 04
Internal Assessment Marks: 30	Duration of SEE : 03 Hours
SEE Marks: 70	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Explain the basic properties of nucleus and nuclear forces.
2. Explain fundamental nuclear reactions and nuclear models.
3. Describe nuclear decay types and fundamental interaction of radiation with matter.
4. Explain the principles and applications of nuclear radiation detectors.
5. Discuss the basics of nuclear energy, fundamental interactions and elementary particles.

Unit	Description	Hours
1	Basic Properties of Nucleus Nuclear constitution. The notion of nuclear radius and its estimation from Rutherford's alpha scattering experiment, Coulomb potential inside the nucleus and the mirror nuclei. The nomenclature of nuclei and nucleon quantum numbers. Nuclear spin and Magnetic dipole moment. Nuclear electric moments and shape of the nucleus. Nuclear Forces General features of nuclear forces. Bound state of Deuteron with Square Well Potential, Binding Energy and size of Deuteron, electric and magnetic moments-evidence for non-central nature of nuclear forces. Yukawa's meson theory of nuclear forces.	12
2	Nuclear Reactions Reaction scheme, types of reactions and conservation laws. Reaction kinematics, threshold energy and Q-value of nuclear reaction. Energetics of exoergic and endoergic reactions. Nuclear Models The Shell Model; Evidence for magic numbers, energy level, scheme for nuclei with	12

	infinite square well potential and the ground state spins. The Liquid Drop Model: Nuclear Binding Energy, Bethe-Weizsacker's Semi Empirical Mass Formula.	
3	<p>Nuclear Decays</p> <p>Alpha decay: Quantum mechanical barrier penetration, Gamow's theory of alpha decay, range and energy of alpha particles and their relations, Half-life systematics.</p> <p>Beta decay: Continuous beta spectrum, Pauli's Neutrino Hypothesis and Fermi's theory of beta decay, Double beta decay, beta comparative half-life systematics.</p> <p>Gamma decay: Qualitative consideration of multipole character of gamma radiation- Selection Rules; Systematics of mean lives for gamma multipole transitions, Gamma ray spectra and nuclear energy levels, Nuclear Isomerism, Internal Conversion (Qualitative).</p>	12
4	<p>Interaction of Radiation with Matter</p> <p>Interaction of Charged Particles with Matter, Ionization Energy Loss, Stopping Power and Range Energy Relations for Charged Particles, Cerenkov Radiation, Synchrotron Radiation, Interaction of Gamma Rays: Photoelectric Absorption, Compton Scattering and Pair Production Processes.</p> <p>Nuclear Detectors</p> <p>Introduction, Ionization Chamber, Semiconductor Detectors: Surface Barrier, Ge(Li) and HP-Ge; Proportional Counter, G M Counter, Scintillation Detector, Solid State Nuclear Track Detectors (SSNTD).</p>	12
5	<p>Nuclear Energy and Elementary Particles</p> <p>Fission Process, Fission Chain Reaction, Four Factor Formula and Controlled Fission Chain Reactions, Energetics of Fission Reactions, Fission Reactor.</p> <p>Fusion Process, Energetics of Fusion Reactions, Controlled Thermonuclear Reactions, Fusion Reactor, Stellar Nucleosynthesis.</p> <p>Basic fundamental interactions and their characteristic features. Elementary particles, Classification of Elementary particles, Conservation laws in elementary particle decays. Quark model of elementary particles.</p>	12
<p>References:</p> <ol style="list-style-type: none"> 1. The Atomic Nucleus: R D Evans, Tata McGraw Hill Edition, 1955. 2. Physics of Nuclei and Particles: P Mermier and E Sheldon, Volume-I, Academic Press, Inc., 		

1970.

3. Physics of Nuclei and Particles: P Mermier and E Sheldon, Volume-II, Academic Press, Inc., 1969.
4. Nuclear Physics: D C Tayal, Himalaya Publishing House, Fifth Edition, 2015.
5. Introduction to Nuclear Physics: S B Patel, New Age International Pvt. Ltd Publishers, Second Edition, 2010.
6. Introductory Nuclear Physics: Kenneth S Krane, John Wiley & Sons, Inc., 1988.
7. Atomic and Nuclear Physics: S N Ghoshal, S. Chand & Company Pvt. Ltd., 2014.
8. Introduction to Nuclear and Particle Physics: V K Mittal, R C Sharma, S C Gupta, PHI Learning, 3rd Edition, 2013.
9. Nuclear and Particle Physics by Satya Prakash, S. Chand & Sons, 2005.

Department Name: Physics

Semester - II

Course Title: Physics in Everyday Life	Course Code: 23PHOET21
Total Contact Hours: 30 Hours	No. of Credits: 02
Internal Assessment Marks: 10	Duration of SEE : 2 Hours
SEE Marks: 40	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Explain phenomenon in everyday life using laws of motion.
2. Explain phenomenon in everyday life using projectile motion, friction, periodic motion and law of forces.
3. Explain phenomenon in everyday life using concept of resistance.
4. Explain phenomenon in everyday life fluid flow and heat transfer.

Unit	Description	Hours
1	The Laws of Motion: Qualitative discussion of Newton's first law of motion, Inertia and types of inertia; Examples in everyday life: Falling backward when a bus moves quickly from rest, Moving forward when driver of a bus suddenly applies break, Getting down from a moving bus or train, Athlete taking a short run before a jump. Qualitative discussion of Newton's second law of motion; Examples in everyday life: Pushing a car and a truck, Pushing a shopping cart, Hitting a ball, Rocket launch, Driving a car and car crash. Qualitative discussion of Newton's third law of motion; Examples in everyday life: Pulling an elastic band, Swimming, Standing on the ground or sitting on a chair, Bouncing of a ball and the recoil of a gun.	10
2	Projectile Motion, Friction, Periodic Motion and Law of Forces: Qualitative discussion of projectile motion – maximum height, time of flight and range of the projectile; Examples in everyday life: Firing a Canon, Javelin throw, Hitting a Cricket Ball, Archery, Car and Bike Stunts, Disc throw. Qualitative discussion of friction and its types; Examples in everyday life: Walking, Writing, Skating, Lighting a matchstick, Driving of a vehicle on the surface, Flight of aeroplanes, Drilling of a nail into the wall. Qualitative discussion on Law of parallelogram of forces: Swimming, Boat movement, Flying of a bird, Shot of an arrow with Bow, Weight lifting. Qualitative discussion of periodic motion; Examples in everyday life: Swing, Hands of a clock, Motion of earth round the Sun, Motion of Moon around the Earth, Heartbeats, Rocking chair.	10

3	<p>Resistance, Fluid flow and Heat transfer:</p> <p>Qualitative discussion of Resistance, Heating effect of electric current; Examples in everyday life: Electric Stove, Iron Box, Electric heater, Electric bulb.</p> <p>Qualitative discussion on Streamline and turbulent flow; Examples in everyday life: flow of water in a pipe, flow of water in a river, waterfalls, Qualitative explanation of Bernoulli's principle, Examples in everyday life: Sprayer, gas burner, Carburetor.</p> <p>Qualitative discussion of heat transfer – conduction, convection & radiation; Examples in everyday life: Copper vessels, Packing of ice in saw dust, Wearing two shirts reduces cold, Bricks for cold storage, Wooden / ebonite handles of utensils, Heating of water in a vessel, Heat energy from the Sun.</p>	10
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References:

1. How Things Work – The Physics of Everyday Life by Louis A. Bloomfield, Wiley, 6th Edition, 2016.
2. NCERT 11th and 12th Standards Text Books.
3. <https://examples.yourdictionary.com/examples-of-inertia.html>
4. <https://byjus.com/physics/newtons-second-law-of-motion-and-momentum/>
5. <https://openstax.org/books/university-physics-volume-1/pages/5-5-newtons-third-law>
6. <https://studiousguy.com/projectile-motion-examples/>
7. <https://byjus.com/questions/give-10-examples-of-friction-in-our-daily-life/>

Department Name: Physics

Semester - II

Course Title: Nanomaterials	Course Code: 23PHOET22
Total Contact Hours: 30 Hours	No. of Credits: 02
Internal Assessment Marks: 10	Duration of SEE : 2 Hours
SEE Marks: 40	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. To get brief introduction about the nanomaterials and nanotechnology. Also understand the size and shape dependent on the physical properties of materials at nanoscale.
2. Analyze the advantages of using nanotechnology for various electronic applications.
3. Gain knowledge about nanomedicine, targeted drug delivery, diagnosis and treatment. Understand bio-inspired, biomimicking and bio-compatible nano-materials.

Unit	Description	Hours
1	Introduction: Introduction to nanoscience: Science of low-dimensional materials, quantum effects, 1D, 2D and 3D confinement, Surface to volume ratio, Density of states, Excitons, Zero-, One-, Two- and Three-dimensional structure, Size control of nanostructures and their properties: optical, electronic, magnetic properties; surface plasmon resonance, change of bandgap; Application: catalysis, electronic devices.	10
2	Synthesis and Characterisation of Nanomaterials: Synthesis: Top Down and Bottom up approaches: Ball Milling and Laser ablation techniques, Sol-gel, hydrothermal and green synthesis methods. Characterisation: XRD, SEM, TEM and DLS methods.	10
3	Nanotechnology for Nanomedicine: Drug deliveries, drug delivery system, nanoparticles in drug deliverable applications, nanotechnology future application understanding for treatment. Manufacture of nanoparticles, nanopowder and nanocrystals, targeting ligands, applications of nanoparticle in drug delivery, cancer treatment, tissue regeneration, growth and repair, impact of drug discovery and development.	10
References: 1. Nanolithography and patterning techniques in microelectronics, David G. Bucknall, Wood head publishing 2005 2. Transport in Nanostructures, D.K. Ferry and S.M. Goodmick, Cambridge university press 1997. 3. Optical properties of solids, F. Wooten, Academic press 1972		

4. Charles P. Poole, Jr., Frank J. Owens, "Introduction to nano technology", Wiley, 2003.
5. Gunter Schmid, "Nanoparticles: From Theory to Applications", WileyVCH Verlag GmbH & Co., 2004.

Department Name: Physics

Semester - II

Course Title: Electromagnetics Lab	Course Code: 23PHHCP21
Total Contact Hours: 64 Hours	No. of Credits: 04
Internal Assessment Marks: 20	Duration of SEE : 04 Hours
SEE Marks: 80	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Design experiments related to electromagnetism.
2. Conduct experiments related to electromagnetism.
3. Analyze and interpret experimental data related to electromagnetism.

List of Experiments

1. Magnetic field in a conductor (solenoid).
2. Dielectric constant measurement.
3. Magnetic field in Helmholtz coil experiment.
4. Ferromagnetic Hysteresis.
5. Magnetic Induction.
6. Measuring velocity by electromagnetic induction.
7. Study of Eddy Current and Lenz's law.
8. Study of Biot-Savart Law.
9. Study of Faraday's laws of Induction.
10. Study of Ohms law.
11. Study of RC Circuits.
12. LCR Series and Parallel circuits.
13. Study of Kirchoff's laws.
14. Magnetic field of coils.

Note:

1. Minimum of EIGHT experiments/computations must be carried out.
2. Experiments/Computations may be added as and when required with the approval of BoS.

References:

1. Physics Laboratory Manual, David H Loyd, Third Edition, Thomson Higher Education, USA.
2. PRACTICAL PHYSICS, J.A. GROWTHER, Sc.D., F.Inst.P, 1922.
3. Practical Physics In S.I., Edward Armitage, John Murray Publishers Ltd., 1972.
4. General Physics II Laboratory Manual, IZMIR Institute of Technology.October, 2020.

Department Name: Physics

Semester - II

Course Title: Elementary Condensed Matter Physics Lab	Course Code: 23PHHCP22
Total Contact Hours: 64 Hours	No. of Credits: 04
Internal Assessment Marks: 20	Duration of SEE : 04 Hours
SEE Marks: 80	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Design experiments to study properties of crystals.
2. Compute parameters of crystalline materials.
3. Design experiments to study electrical and thermal properties of solids.

List of Experiments

1. Determination of inter-planar spacing using X-ray powder pattern.
2. Analysis of X-ray diffraction pattern.
3. Structure factor determination: Computations.
4. Intensity calculations of X-ray powder pattern: Computations.
5. Fermi energy of metals.
6. Temperature variation of resistivity of a semiconductor: four probe method.
7. Measurement of resistivity of a semiconductor by four probe method (fixed temperature)
8. Energy gap of semiconductor by four probe method.
9. Determination of Debye's temperature of Lead or Tin.
10. Study of Lattice Dynamics.
11. Activation energy of point defects in metals: Experiment/Computation.
12. Acoustic waves in solids – Measurement of Ultrasonic velocity in solids.
13. Magneto-resistance of semiconductors.
14. Study of Hall Effect in semiconductors.
15. Energy gap of PN-junction diode/LED.

Note:

1. Minimum of EIGHT experiments must be carried out.
2. Experiments may be added as and when required with the approval of BoS.

References:

1. University Practical Physics by D.C. Tayal, Himalaya Publishing House, First Millenium Edition, 2000.
2. Advanced Practical Physics for students by B.L. Flint and H.T. Worsnop, Asia Publishing House, 1971.
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, Kitab Mahal, 11th Edition, 2011.
4. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, Heinemann Educational Publishers, 4th Edition, 1985.

Department Name: Physics

Semester - II

Course Title: Elementary Nuclear Physics Lab	Course Code: 23PHHCP23
Total Contact Hours: 64 Hours	No. of Credits: 04
Internal Assessment Marks: 20	Duration of SEE : 04 Hours
SEE Marks: 80	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Design experiments to Study properties of nucleus.
2. Determine the physical parameters of nuclear radiations/radioactive sources.
3. Compute the half life of any radioactive materials by various methods.

List of Experiments

1. Nuclear counting statistics: Verification of Poisson Distribution.
2. GM Counter characteristics: Determination of Operating voltage.
3. Determination of dead time of GM Counter – single source.
4. Verification of inverse square law for nuclear radiation.
5. Attenuation of β -rays in Aluminium.
6. Attenuation of γ -rays.
7. Half life of K-40.
8. Semi empirical mass formula and binding energy analysis.
9. Nuclear radius calculation.
10. Analysis of β -spectrum and half life systematics.
11. Study of Scintillation Detector (NaI)
12. α -ray spectrometer
13. β -ray spectrum using scintillation detector
14. γ -ray spectrum using scintillation detector: single channel analyser

Note:

1. Minimum of EIGHT experiments must be carried out.
2. Experiments may be added as and when required with the approval of BoS.

References:

1. Experiments in Nuclear Science, ORTEC Applications Note. ORTEC (1971).
2. Practical Nucleonics by F. J. Pearson and R. R. Dsborne.
3. Experimental Nucleonics by E. Bleuler and G. J. Goldsmith, Rinehart.
