Program: B.Sc. (Hons.) Physics

Programme Specific Outcomes

PSO1: Understand the depth knowledge of various subjects of Physics.

PSO2: Demonstrate skills and competencies to conduct wide range of scientific experiments.

PSO3: Identify their area of interest in academic and R&D.

PSO4: Perform job in various fields' viz. science, engineering, education, banking, business and publicservice, etc. with precision, analytical mind, innovative thinking, clarity of thought and expression,systematic approach.

PSO5: Integrate and utilize concepts and techniques learned in Physics, Mathematics, and Chemistry coursesincluding the essentials of mechanics, electromagnetic theory, quantum mechanics, and statisticalmechanics (single, multivariable, and vector) calculus, ordinary differential equations, linear partialdifferential equations, linear algebra, and complex analysis

PSO6: Apply physical and mathematical principles to describe and explain phenomena in the fundamentaland applied sciences.

PSO7: Obtain necessary and desired information from research books, journals, and people to solve problems.

Course Outcome

Semester-1st

Course: Mechanics-I

CO1: Students will study different Mathematical Tools like Differentiation and integration

CO2: Students will learn about Basic ideas, the chain rule, implicit differentiation, special points of a function. Differential Equations, complementary solutions and particular integral.

CO3: In the Integration students will learn about how integration is inverse of differentiation and properties of integration.

CO4: In this subject students will be able to study the basics of Vectors, mathematical operations vector addition, products of vectors (Scalar and Vector), reciprocal vectors, vector derivatives, circular motion, vectors and spherical polar coordinates, invariants.

CO5: Students will study about Conservation of Energy and Angular Momentum, linear momentum, Internal torques, Conservative forces, Internal forces .

CO6: In this part of the Syllabus students will study about Elastic and Inelastic Scattering which includes the topics like types of scattering and conservation laws,General elastic collision of particles of different mass, Cross-section of elastic scattering and Rutherford scattering.

CO7: This part of the syllabus will provide students the knowledge about Equation of motion, angular momentum and kinetic energy of a Rotating Body, Moment of Inertia and Radius of Gyration,

Rotation of about fixed axes – time dependence of motion, cylinder on an accelerated rough plane, Principal axes and Euler's equations. Elementary Gyroscope, Symmetrical Top.

CO8: In this part of Syllabus students will study about Force between a Point Mass and Spherical shell/ Solid Sphere, Gravitational and Electrostatic self-energy of Galaxy and of uniform sphere; Orbits and their eccentricity, Two body problem - reduced mass.

Course: Electricity and Magnetism-I

CO 1: Read, understand and interpret the mathematical formulation in Physics- verbal, mathematical and graphical and solve numerical problems involving topics covered.

CO 2: Differentiate vector fields and determine gradient vector fields to find out potential functions.

CO 3: Evaluate line integrals, surface area, surface integrals and its applications on Stokes and divergence theorem.

CO 4: To learn the concepts of charge interaction with each other using Coulomb's Law and apply to problems in both one and two dimensions.

CO 5: To learn the definition of the electric field, E and derive the electric field due to a point charge using Coulomb's Law.

CO 6: Derive the electric field for continuous charge distributions using an integral approach. Configurations should include one dimensional configuration (ring of charge, line of charge) and a two dimensional configuration (charged disk).

CO 7: To introduce Gauss' Law and clearly understand how to apply it and its use to calculate the electric field due to various configurations including: point charge, line of charge, uniformly charged sphere and sheet of charge.

CO 8: To develop an understanding of electric potential by considers electric potential energy, equipotential surfaces and how they relate to electric field lines.

CO 9: To derive a relationship between electric potential and the electric field calculate the electric potential and its use to calculate electric potential around a single point charge.

CO 10: To learn how to apply the above formula in order to calculate electric potential due to various charge distributions including multiple point charges and a line of continuous charge.

CO 11: To understand where to use Laplace's and Poisson's equations.

CO 12: To know what the electric field and electric potential in, and around, a conductor and Insulator and how electrical energy is stored in capacitors and to learn the formula for calculating this energy.

CO 13: Derivation of Uniqueness theorem and where can it use.

CO 14: To learn the definition of current in terms of electron flow and learn the definition of resistance R and Ohm's law.

CO 15: To learn about electrical power and how to calculate the power dissipated by a resistor.

CO 16: To learn the definitions of, and relations between, the following quantities: the current density J, the electric field, E, within the conductor, the resistivity, and the drift velocity of the electrons in the conductor.

Course: Advance Calculus and Geometry

CO1:Understand the graph of vertical and horizontal conic

CO2:Model real-world situations by using conics For example Architects and engineers frequently use the shape of a parabola for support arches in bridges and buildings

CO3:Memorize definition of directional derivatives and gradient and illustrate geometric meanings with the aid of sketches.

CO4:Calculate directional derivate and gradients.

CO5:Apply gradient to solve problems involving normal vectors to level surfaces.

Course: General Chemistry-I

CO1: Students will learn fundamental chemical thermodynamics and be able to use this in experimental and theoretical work with chemical systems

CO2: They will understand the principles of kinetics and thermodynamics as applied to rates and equilibrium positions of chemical reactions.

CO3: Students will know about the compounds of carbon and aromaticity of organic compounds.

CO4: Students will know daily and industrial applications of hydrocarbons and their utility in daily life for medicine, clothing and shelter.

CO5: This enable the students to understand and study stereo isomers of organic compounds and to understand terms such as diastereomers, enantiomers, meso compounds and centre of symmetry

CO6: Students will learn to predict major and minor products of variety of organic reactions with appropriate stereochemistry

CO7: They will gain knowledge to understand and interpret spectra (IR,1H NMR,13C NMR, Mass Spectroscopy and UV-Vis) of organic molecules.

CO8: Students will understand and know how to determine the structure of organic molecules using IR and NMR spectroscopic techniques.

Semester II

Course: Special Theory of Relativity

CO1: Student will able to explain the general equation of motion and force during the motion, how electric and magnetic field effect the motion of the body.

CO2: This section will describe the inertial and non inertialfram of reference, motion of the body under these frames and galilean transformation.

CO3: To illustrate the fictitious force concept and michelsonmorley experiment towardsmedium of velocity of light.

CO4: To explain the effect of Lorentz transformation on length, time and causality in relativity to explain the doppler effect and conservative laws in theory of relativity

CO5: How four vector used to explain the realitivity theory, equivalence mass energy concept

CO6: To describe the motion of charged particle under the influence of electric and magnetic field

CO7: Student will able to explain the concept of centre of mass, threshold energy for mesons and other particles.

CO8: To explain the concept of inertial and gravitational mass and red shift condition

Course: Electricity and Magnetism-II

CO1: Students will able to explain the concept of dielectrics, what is dipole and dipole moment.

CO2: To define the polarization, its type and its applications in different medium.

CO3: Students will be able to easily describe the moment of charge under the influence of magnetic and electric force, effect of force on moving charges.

CO4: Students will able to define the magnetic field, its properties like magnetic field lines, magnetic fliux etc., its applications along charged wire, solenoid, charged sheet.

CO5: Students will able to understand the Transformations of electric and magnetic fields.

CO6: Students will able to describe the maxwell equations in electromagnetic system, inductance and its types, reciprocity theorem.

CO7: This section will illustrate the Alternating current, its applications in circuits liksanderson bridge, its impedance, admittance.

CO8: Students will get the brief idea about magnetic field response of various substances, their spin and susceptibility.

Course: Linear Algebra

CO1: Analyze vector spaces and subspaces over a field and their properties

CO2:Understand span of a set and its properties

CO3: Analyze linear dependence and independence odd sets

CO4:Determine matrix associated with a linear map and analyze linear transformations

CO5: Understand factorization, associates elements, irreducible elements, euclidean domain, principal ideal domain, unique factorization domain, polynomial rings and their properties.

Course:General Chemistry-II

CO1: Students get to know about the kinetics of a reaction or order of reaction. It also covers what would be the effect of temperature on the reaction rate.

CO2: Students get to know about catalysis which is a very important topic.It includes Homogeneous; Heterogeneous; Acid -base and enzyme catalysis(Michaelis and Menton equation).

CO3: Students also acquire knowledge about Electrochemistry i.e. what electrochemistry is? It also includes Debye Huckel Theory and various types of conductances.

CO4: It includes conductometric titrations & students get knowledge of acid base indicators.

CO5: Students get to know about different types of electrodes. This also includes electrolytic & electrochemical cells and potentiometric titrations.

CO6: Students acquire knowledge of hybridisation. It also includes shapes of simple inorganic molecules & ions and MOT of homonuclear molecules.

CO7: Students will know about the basic knowledge about ionic solids, factors affecting their formation and limiting radius ratio.

CO8: Through this course, students are able to acquire knowledge of various properties of s & p block elements

CO9: Students acquire knowledge of coordination chemistry which is a trending topic of research for chemists.

CO10: Students will acquire knowledge about various theories like VBT & CFT of bonding in coordination complexes.

CO11: Students will become familiar to the relative physical and chemical properties of d & f block elements.

Semester III

Course: Quantum Mechanics and Statistical Physics

CO1:Grasped the fundamentals of Partial differentiation like Definition of partial derivative, total differentiation, exact and inexact differentials, useful theorems, the chain rule, change of variables, stationary values under constraints, Lagrange multipliers, differentiation of integrals.

CO2:Blackbody radiation, the photoelectric effect, the Franck- Hertz experiment, the correspondence principle, the Bohr atom, quantization of the phase integral, the particle in a box, the rigid rotator, the harmonic oscillator.

CO3:Learned why Photons behaves as particles with the help of the Compton effect, particle diffraction. Also Study about elements of Fourier Analysis, Parseval's formula and the Fourier integral theorem, examples of Fourier transforms, superposition of plane waves and time dependence,

wavepackets and the Einstein-de Broglie relations, wave functions for a free particle and the Schrödinger equation, physical interpretation of the Schrödinger wave function.

CO4:Learned about basic ideas of probability and their applications, Macrostates and microstates, Effect of constraints on the system. Distribution of n particles in two compartments, deviation from the state of maximum probability, Equilibrium state of a dynamic system, distribution of N distinguishable particles in unequal compartments, Division into cells.

CO5:Elementary idea of Phase space and its division into cells. Three kinds of statistics and their basic approach. Maxwell-Boltzmann Statistics for an ideal gas: Volume in phase space, values of α and β. Experimental verification and graphical depiction of Maxwell- Boltzmann distribution of molecular speeds.

CO6:Learned about need for quantum statistics, Bose-Einstein statistics and its application to photon gas, deductions from Planck's law, Fermi-Dirac statistics and its application to electron gas, Fermi energy and comparison of M.B., B.E. and F.D. statistics.

Course: Vibrations and Wave

CO1:Understand simple harmonic motion (SHM), be able to derive and solve the equations of motions for physical systems that undergo SHM and to adapt the general SHM solution for specific initial conditions.

CO2:Be able to use the complex notation for analyzing vibrations and waves and understand why small oscillations are harmonic and the general consequences of non-linear restoring forces.

CO 3: Be able to derive the velocity and acceleration of SHM and the kinetic, potential and total energy of a mechanical system undergoing SHM

CO 4: To understand and be able to derive and solve the equations for the damped oscillator in the over damped, critically-damped and under damped regimes.

CO 5:To understand and be able to derive and solve the equations for a forced oscillator for the concept of resonance and the response of a system (amplitude and phase, power dissipation) as a function of driving frequency and the effects of transients.

CO 6:To understand and be able to calculate the quality factor Q for damped and driven oscillators and Electrical, nuclear and nuclear magnetic resonances derivations.

CO 7:To understand the concept of coupled oscillators, be able to derive and solve the equations of motion for simple systems and describe motion of coupled oscillators in terms of normal mode solutions.

CO 8:To understand a wave as a travelling oscillation; understand the concepts of, and the differences between, transverse and longitudinal waves; know the non-dispersive wave equation and be able to derive it for transverse waves on a string; understand superposition of waves, wave groups and harmonic waves.

CO 9:To understand and be able to calculate reflection and transmission coefficients of travelling waves.

CO 10: To understand the concepts of phase and group velocities and be able to calculate these quantities.

CO 11:Travelling and standing waves; Reflection and transmission; Bandwidth Theorem and relative coefficients.

Course:Electronics and Network Theory-I

CO1:To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.

CO2:To learnabout conductor, semi-conductor,insulator, cause of conductivity and where they can be used.

CO3:To learn P-N diode and Zener diode and their Practical applications in daily life.

CO4:Study of different configuration of BJT (CB, CC and CE), JFET and their characteristics.

CO5:Practical utilization of transistor for development of various other electronics equipment.

CO6:To study what is need of biasing and how it can be provided in transistor.

CO7:Study of different type of clipping and clamping circuits.

CO8:Distinguish between half and full wave rectifier and where they can be used or using in present time in electronics industry.

CO9:What is power supply and how it can be designed using rectifier and filter circuit.

CO10: To study different types of regulator circuit.

Course: Differential Equations and Fourier Series

CO1: Learn and explain the concept of differential equation

CO2:Classify the differential equation with respect to their order and linearity

CO3: Recognize and solve a homogeneous, non-homogeneous and an exact differential equation

CO4: Identify ordinary and singular points

CO5: Work with ordinary differential equation and system of ODE in various situations and use correct mathematical terminology notation and symbolic processes in order to engage in work.

Course Name: General Chemistry-III

CO1: Students will learn Organometallics which include Grignard Reagent and its formation and be able to use this in experimental and theoretical work with chemical systems.

CO2: To understand the Heterocyclic Compounds, its molecular orbital picture of Pyrrole,Furan,Pyridine and its derivatives.

CO3: Polymer Chemistry is also the main part of this course which deals with various polymeric compounds.

CO4: Gaseous state is one main topic which includes the Kinetic theory of gas molecules,it also relates with the speed of the gas molecules along with the kinetic energy.

CO5: Students will know the relation of the energy and speed of chemical reactions and the thermodynamic and kinetic forces involved in chemical reactions.

CO6: To know about the compounds of carbon and metals of organic compound.

CO7: To know daily and industrial applications of Organometallic compounds and their utility in daily life for medicines.

CO8: To enable the students to understand and study of the gas molecules.

CO9: Students will learn to predict the major and minor products of a variety of organic reactions with appropriate stereochemistry.

CO10: Students will gain an understanding of the aromaticity of compounds, stereochemistry and use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure elucidation and identification.

Semester IV

Course: Electromagnetic Theory

CO1: Learned about the maxwell equations, plane waves,Electromagnetic waves and various phenomenon that involved emwaves

CO2:Learned polarization, its types, natural light and the processesthat involves polarization

CO3:Learned light vector, coherence, interference, conditions ofinterference, Biprism, fringes and stokes law

CO4:Learned about newton's rings and its applications.

CO5:Learned the Michelson's interferometer and FabryPerotinterferometer with their applications

CO6:Learned diffraction, resolving power, half period plates, zoneplate, rectilinear propagation and define various terms related todiffraction

Course:Thermodynamics

CO1: In this section students will able to know about the entropy of system and its various characteristics. They can also explain the reversible and irreversible processes and their examples.

CO2: Students will learn about the Carnot's engine, the various processes involved in it and applications of Carnot's cycle.

CO3: They will able to describe the Thermoelectric effect, itsthermo dynamical analysis and Heat death of Universe.

CO4:To explain the Maxwell Relationships, adiabatic expansion, compression and adiabatic stretching of wires and thin films.

CO5:Learn about the phase transitions, its types and various parameters involved. To explain the internal energy effect and Clapeyron's equation.

CO6: Students will able to know about the Joule-Thomson effect under different conditions.

CO7:They will able to define the specific heat, its types like Cp, Cv, energy variation due to rotational and vibrational motion.

Course: Electronics and network theory-II

The successful completion of course enable the students to

CO1: Learn the use of maximum power transfer theorem in electric circuits.

CO2: Differentiate between Series and parallel connection of mutually coupled coil.

CO3: Learn about impedence transformer and their power relationship.

CO4: Learn the use of transistor in various configuration i.e. CE, CB and CC.

CO5: Derive the effect of –ve feedback on various parameters like Gain, Bandwidth etc.

CO6: Differentiate voltage and various power Amplifiers like A,B,C,D& AB.

CO7: Learn the characteristics and various biasing techniques of JFET and its use as Common Drainand Common Gate Circuits.

CO8: Learn the working of different types of RC,LC and Crystal Oscillators using Transistors

CO9: Differentiate various number systems and their use in arithmetics.

CO10: Learn the circuits for OR, AND and NOT gates

CO11: Learn the generation and detection of Amplitude and Frequency Modulation.

Course: Numerical Methods and Programming In C++

CO1: learn an algebraic or transcendental equation using an appropriate numerical method.

CO2:proficient in implementing numerical methods for a variety of multidisciplinary applications.

CO3: Perform an error analysis for a given numerical method.

Course: Integral Transforms and complex analysis

CO1:Understand and express a complex numbers both in rectangular form and in terms of its modulus and argument, analytic function

CO2:ApplyCauchy Riemann conditions, harmonic function andtheir conjugates

CO3:Familiarize with Laplace transformation, periodic functions, convolution theorem

CO4: Calculate singularities and residues using Cauchy residue theorem.