ACHARYA INSTITUTE OF GRADUATE STUDIES

(NAAC Re-Accredited 'A' Grade & Affiliated to Bengaluru City University)

Soladevanahalli, Bengaluru-560107

DEPARTMENT OF SCIENCE

NAME OF THE PROGRAM: BACHELOR OF SCIENCE

(Physics , Mathematics, Chemistry)

COURSE OUTCOMES (CO'S)

BSc – I SEM

Paper –I: Phy-T101:

MECHANICS – 1, HEAT AND THERMODYNAMICS – 1

After going through the course, the students are able to

- Understand the concepts of planetary and satellite motion in space.

- Describe the concepts of motion and friction of body under different conditions.

- Describe the concepts of Work, energy relations, laws of conservation energy and momentum during collision and their applications.

- Describe the motion of rigid body and calculation of moment of inertia using parallel and perpendicular axis theorem.

- Describe the molecular interpretation of surface tension and understand the factors affecting the surface tension.

- Understand the concept of black body radiation.

- Understand the concepts of kinetic theory of gases, viscosity and thermal conduction in gases.

- Describe the concept of Macroscopic and microscopic descriptions of a system; with the application of thermodynamics laws

Mathematics – I

Matrix, Differential Calculus, Integral Calculus

After going through the course, the students are able to

- Students will learn understand finding rank of matrix , using the row & column operations , solving linear homogeneous and non homogeneous equations.
- Students will learn to apply different ion techniques for finding nth derivatives of various standard functions.
- Students will be able to find the nth integrals of some standard functions.

General Chemistry-I

- Describe the structure of atoms in terms of protons, neutrons and electrons and Understand that the wave function can be used to find a radial distribution function that describes the probability of an electron as a function of distance away from the nucleus.

- List, define, and describe the three quantum numbers for the H-atom wave functions and know what possible combinations of quantum numbers are allowed and State the atomic orbital names based on quantum numbers.

- Understand bonding fundamentals for both ionic and covalent compounds, including electro negativities, bond distances and bond energies using MO diagrams and thermodynamic data. Predicting geometries of simple molecules.

- Understand the Criteria for aromaticity, Hackel's rule and antiaromaticity and be able to write the mechanism of electrophilic aromatic substitution with energy profile diagram.

- Discuss Preparations & rectivity of alkanes ,alkenes & alkynes by applying rules : zaitsevs & markonikovs.

BSc –II Sem

Paper II-Phy-T201:

MECHANICS – 2, HEAT AND THERMODYNAMICS – 2

After going through the course, the students are able to

- Understand the concepts of oscillations simple and compound pendulum.

- Describe the Elasticity property observed in stretching and bending wire with stress and strain diagram.

- Understand the concept and postulates of special theory of relativity.

- Describe the wave equation, Speed of transverse waves on a uniform string, Speed of longitudinal waves in a fluid.

Mathematics –II

Groups, Differential Calculus, Integral Calculus , Differential equation

After going through the course, the students are able to

- Acquire the knowledge and the structure of infinite and finite Groups
- Acquire the knowledge on tangents, Normal, pedal equations and Derivative of an arc in Cartesian, parametric and polar forms
- Acquire the knowledge on solutions to first order separable, linear and Exact differential equations
- Acquire the knowledge on solving first order and higher degree differential equations

Chemistry-II

- Understand the role of internal energy,entropy,enthalpy,work&heat.
- Describe concept of P^H, P^k values, ionization concepts and applications of buffer solutions,
- Distinguish between SN_1,SN_2 and SN_i mechanisms
- Describe addition, substitution and elimination reactions

BSc –III Sem

(Physics) Paper III-Phy-T301:

ELECTRICITY and MAGNETISM

After going through the course, the students are able to

Apply Kirchhoff's rules to analyze AC and DC circuits consisting of voltage sources and resistors networks.

- Apply various network theorems such as Superposition, Thevenin's, Norton, Reciprocity, Maximum Power Transfer, etc. and their applications in solving electrical circuits.

- Explain and differentiate the vector and scalar formalisms of electrostatics.

- Describe the magnetic field produced by magnetic dipoles and electric currents.

- Understand the relationship between electrical charge, electrical field, electrical potential and magnetism.

- Apply the electromagnetic theory and principles in a wide range of applications.

Mathematics - III
Groups –II, Sequence and Series of Real Numbers and Differential Calculus

After going through the course, the students are able to

- Acquire the basic knowledge and the structure of Group, Subgroup and Cyclic Groups
- Acquire the knowledge of nature of sequence and series
- Apply the knowledge of convergence of sequence and series and the various theorems on convergence, absolute convergence and non-absolute convergence
- Acquire the knowledge of continuity and discontinuity of various functions in different contexts and L' Hospital Rule and evaluation of limits

General Chemistry-III

To learn depth knowledge about solutions.

- Defines phase, equilibrium, component, degree of freedom and phase rule concepts.
- Understand Kohlrausch's law and its applications and Construct an electrochemical cell diagram, including identifying the anode, cathode, direction of electron flow, sign of the electrodes, direction of ion flow in salt bridge from a redox reaction.
- Describe the Standard cell, Primary and secondary reference electrodes.
- Learn the mechanisms ofnaming reactions in organic chemistry.
- Discuss the nomenclature and Classification of Carboxylic acids and their derivatives.
- Understand the classification of carbohydrates

BSc –IV Sem

(Physics) Paper IV - PhyT401:

OPTICS and FOURIER SERIES

After going through the course, the students are able to

- Apply basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.

- Use the principles of wave motion and superposition to explain the Physics of polarization, interference and diffraction.

- Understand concept of Fourier series and their application to periodic sine, cosine, triangular, square wave and saw tooth wave.

Mathematics – IV

Groups-IV, Fourier Series, Mathematical Methods –I, Differential Equations -II

After going through the course, the students are able to

- Analyze and demonstrate examples of subgroups, normal subgroups, quotient groups, Isomorphism, homomorphism and automorphism
- Understand the basic knowledge of complimentary function and particular integral
- Determine solutions to second order linear homogeneous differential equations with constant coefficients

General Chemistry-IV
- Identify the reducing agents from Ellingham diagrams.
- Understand Chemistry of d and f-block elements, lanthanides and actinides.
- Explanation of valence bond and Crystal field theory by taking example.
- Symmetry of elements, Miller indices, Bravais lattices and X-ray diffraction studies and numerical problems.
- Understand rate of reaction, theories of reaction kinetics and Derive integrated rate expressions.
- Explain the Maxwell Boltzmann distribution laws of molecular velocities and molecular energies & their importance.

BSc –V Sem

(Physics) Paper V – Phy T501:

STATISTICAL PHYSICS, QUANTUM MECHANICS – I, ATMOSPHERIC PHYSICS AND NANOMATERIALS

After going through the course, the students are able to

- Understand the adequacies of classical mechanics and historical development of quantum mechanics.

- Understand the concepts of Maxwell Boltzmann statistics, Bose-Einstein statistics, Fermi Dirac statistics. .

- Understand the concepts of De Broglie's hypothesis of matter waves.

- Understand the concept of Thomson's experiment; Davisson and Germer's experiment – normal incidence method;

- Describe the wave packet and the relation between group velocity and particle velocity.

- Understand the atmosphere system, Greenhouse effect

- Understand the Nanomaterial Synthesis techniques (Top down- Explanation of Milling & bottom up - Sol gel process).

- Understand the characterization techniques like SEM, TEM.

Mathematics – V
Rigs,Integral Domians, Fields, Differential Calculus of Sclar and Vector Fields , Numerical Methods – I

After going through the course, the students are able to

- Familiarize with the concepts of Ideals and factor rings and homeomorphisms and factor rings
- Derive numerical methods for various mathematical operations and tasks, such as interpolation , integration, the solution of linear and nonlinear equations, and the solution of differential equations

General Chemistry-V
- Achieved knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy.
- Learn rotational, vibrational, Raman and Electronic Spectroscopy.
- Understand fundamentals of photochemistry and laws governing it such as Beer-Lambert law.
- Explain the classification & Qualitative and quantitative aspects of chromatographic methods of analysis.
- Explain the techniques used for the determination of equivalence points & pK_a values.
- Know the different analytical techniques.

(Physics) Paper VI – Phy T503:

ASTROPHYSICS, SOLID STATE PHYSICS AND SEMICONDUCTOR PHYSICS

After going through the course, the students are able to

- Understand the concepts Parallax and distance, Luminosity of stars, stellar classification and evolution of stars.

- Understand the concepts of crystal system, X-rays and free electron behaviour in metals.

- Describe the thermal conductivity, electrical conductivity property due to free electrons in metals.

- Understand the concept of Superconductivity and its applications.

- Describe the formation, operation and applications of PN junctions, special diodes and transistors.

Mathematics -VI

Calculus of Variation , Line and Multiple Integrals

After going through the course, the students are able to

- Apply the techniques of double and triple integral to various problems of finding length of plane curves, surface areas and volumes of surfaces of revolution
- Evaluate line, surface, double and triple integrals and use these integrals to verify the seminal integral theorems (Green's theorem in the plane, Gauss' divergence theorem and Stokes' theorem)

Chemistry-VI

- Through this course the students are exposed to importance of biological macromolecules
- They acquire knowledge in the quantitative and qualitative estimation of biomolecules
- They study the influence and role of structure in reactivity of biomolecules
- At the end of the course, the students have a thorough understanding on the role of Bimolecular and their functions

BSc –VI Sem

(Physics) Paper VII – Phy T601:

ATOMIC, MOLECULAR AND NUCLEAR PHYSICS

After going through the course, the students are able to

- Understand the concept of Vector Model of the Atom, Pauli's Exclusion Principle, and Zeeman Effect.

- Understand the concept of Alpha particle scattering Rutherford's theory of alpha scattering

- Understand the concept of Radioactive Decay, Laws of radioactive decay and theory of successive disintegration

- Understand the concept of Detectors and Particle accelerators.

- Describe the Types of nuclear reactions, Conservation laws in nuclear reactions with examples

Mathematics –VII
Linear Algebra , Orthogonal Curvilinear Coordinates, Partial Differential Equations

After going through the course, the students are able to

- Describe the origin of partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals
- Acquire the idea of Lagrange's method for solving the first order linear partial differential equations

Chemistry-VII

- Describe the general characteristics and properties of Alloys, Industrial materials.
- Understand the applications of different types of surface coatings
- Deduce the study of applications of Nanomaterials
- Deduce the study of Inorganic solids and Chemicals

(Physics) Paper VIII – Phy T603:

ELECTRONICS, MAGNETIC MATERIALS, DIELECTRICS AND QUNTUM MECHANICS – II

After going through the course, the students are able to

- Understand the features, operation and feedback applications of Op-amp.

- Design and construct the linear applications of op-amp like low pass filter, High pass filter, Band pass filters, voltage summers, Differentiator and integrators.

- Understand the dielectric properties, magnetic properties of materials and the phenomena of electromagnetic induction.

- Understand the wave packet nature and the relation between group velocity and particle velocity.

Mathematics – VIII
Complex Analysis, Numerical Analysis

After going through the course, the students are able to

- Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem
- Evaluate complex contour integrals directly and by the fundamental theorem and applying the Cauchy integral formula

- Solve an algebraic or transcendental equation and linear system of equations by using an appropriate numerical method

Chemistry-VIII
ORGANIC CHEMISTRY CONCEPTS

- Understand the applications of spectroscopy to simple Organic compounds
- Define the principles and applications of stereochemistry
- Know the various Pharmaceutical drugs, synthesis and their applications
- Describe the principles of Green Chemistry and study the fundamentals of terpenoids, alkaloids