Course Outcomes

Semester -1

PHYSICS

PHY- 101- MECHANICS

After completion of the course-

1. Students will get the knowledge of Motion and related laws along with the constraints of motion and degree of freedom.

2. The basic laws of physics, their corollaries, and comprehension of how they can be applied to explain specific natural phenomena.

3. Students will be able to formulate conditions in terms of generalised coordinated. Moreover, get to know about variational principles which are applicable in Harmonic oscillator and simple pendulum etc.

4. Along with the knowledge of linear motion, rotational motion with its principle is also dealt which helps the student to understand the daily phenomena related to rotational motion.

PHY- 102- ELECTRICITY AND MAGNETISM

After completion of the course-

1. Students will demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

2. The basic laws of physics, their corollaries related to Electrostatics, Magnetism, and comprehension of how they can be applied to explain specific natural phenomena.

3. They will understand the Maxwell's equations which lead to the understanding of Electromagnetic Waves.

PHY-103- PRACTICAL

After completion of the practical-

1. Students will show that they have learned laboratory skills, enabling them to take measurements in a physics laboratory and analyze the measurements to draw valid conclusions.

2. They get to understand the mechanics in practical form.

3. Students will be capable of oral and written scientific communication, and will prove that they can think critically and work independently.

4. Laboratory skills and exposure to a variety of important experiments at appropriate levels that illustrate phenomena discussed in the lecture classes. Instrumentation and experimental techniques; methods for quantitative analysis of data and measurement uncertainty.

CHEMISTRY

Inorganic Chemistry (CH101)

Student should be able to:

- Get an Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals.
- Understand general principles of periodic table: Aufbau and Pauli exclusion principles, Hund's multiplicity rule.
- Calculate electronic configurations of the elements, effective nuclear charge, Slater's rules. Atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, methods of determination or evaluation, trends in periodic table (in s &p block elements).
- Explain Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, VSEPR theory, MO theory of heteronuclear (CO and NO) diatomic.molecules, bond strength bond energy, and percentage ionic character from dipole moment and electronegativity difference.
- Explain Ionic structures (NaCl,CsCl, ZnS(Zinc Blende), CaF2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (mathematical derivation excluded) and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Physical Chemistry (CH102)

Student should be able to:

- Explain Maxwell's distribution of velocities and energies.
- Calculate root mean square velocity, average velocity and most probable velocity.
- Explain collision diameter, collision number, collision frequency and mean free path.
- Explain deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature. Behaviour of real gases using Vander Waal's equation.
- Explain critical Phenomenon: Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship between critical constants and Vander Waal"s constants. Critical compressibility factor. The Law of corresponding states.
- Explain structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their determination.
- Classify solids and understand various laws of crystallography and Symmetry elements of crystals.
- Define unit cell, space lattice, Bravais lattices, crystal system.
- Explain X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl.
- Define Liquid crystals and difference between solids, liquids and liquid crystals. Types of liquid crystals. Applications of liquid crystals.

Organic Chemistry (CH103)

Student should be able to:

- Explain localized and delocalized chemical bond, van der Waals interactions, resonance conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison.
- Understand the concept of isomerism, types of isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.
- Explain relative and absolute configuration, sequence rules, R & S systems of nomenclature.
- Explain geometric isomerism determination of configuration of geometric isomers. E & Z system of nomenclature, Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds.
- Draw Newman projection and Sawhorse formulae and difference between configuration and conformation.
- Draw curved arrow notation, electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking.
- Explain types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes , arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.
- Explain IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. Cycloalkanes nomenclature, synthesis of cycloalkanes and their derivatives – photochemical (2+2) cycloaddition reactions, dehalogenation of -dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations, theory of strainless rings.

(Practicals) CH-104

(Inorganic Chemistry)

Student should be able to:

1. Perform redox titrations and determine the concentration of iron or oxalate ion in a solution.
2. Perform iodometic titrations and determin the concentration of copper ion.
3. Perform complexometric titrations and determine Magnesium or Zinc ion using by EDTA.

(Physical Chemistry)

Student should be able to:

1. Determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetatecatalyzed by hydrogen ions at room temperature.
2. Prepare arsenious sulphide sol and compare the precipitating power of mono-, bi – and trivalent anions.
3. Determine the surface tension of a given liquid by drop number method.
4. Determine the viscosity of a given liquid.
5. Determine the specific refractivity of a given liquid.

MATHEMATICS

Math 12BSM 111

Upon successful completion of Math BM -111 **Algebra** a student will be able to:

1. recognize symmetric, skew symmetric , Hermitian and invert orthogonal matrices;
2. understand the basic ideas of linear dependence and independence of rows and columns of matrices.
3. find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial and will know how to diagonalize a matrix .
4. understand the concept of Cayley Hamilton theoremand use it to find inverse of matrices.
5. understand the application of matricesto a system of linear equations.
6. find the Bilinear and Quadratic form.
7. understand the relation between the roots and coffiecient of polynomial and solution of polynomialequation having condition on roots.
8. find nature of rootsof an equation, solution of cubic equation and their solutions.

Math 12BSM 112

Upon successful completion of Math BM -112 **Calculus** a student will be able to:

1. find limits of functions and determine continuity of functions.
2. understand the significance of differentiability,Succesive Differentiation, Leibnitz theorem.
3. Compute Taylor and Maclaurin series expansion.
4. find the asymptotes ,curvature and radious of curvature, multiple points.
5. determine whether the curve is concave up or concave down.
6. obtain the points of inflexion of a curves.
7. identify and draw the graphs of some significant curves.
8. find the areas bounded by closed curve.

Math 12BSM 113

Upon successful completion of Math BM-113 **Solid Geometry** a student will be able to

1. find the genral equation of second degree.
2. trace the curves & study Reduction formulae , Rectification.

3. find the area and Volumes of curves.
4. understand the concept of sphere , cylinder and cone.

ENGLISH

1) Student will become accomplished and active reader who can effectively interpret with awareness.
2) Student will write effectively as they explore other writer's ideas and develop their own.
3) Students will able to demonstrate the skills needed to participate in conversation. Student will able to prepare and deliver an engaging oral presentation.
4) Students will able to gain the knowledge of major tradition of our societies, about our cultures through the essays.
5) Student will learn the grammar in which student will gain the knowledge of tenses, verbs etc. which help students in learning the translation from Hindi to English. It enhances the writing skills: students learn to write formal letters, notices, speech, etc.

Semester - 2
PHYSICS

PHY- 201- PROPERTIES OF MATTER, KINETIC THEORY & RELATIVITY

After completion of the course students will be able to know-

1. The basic laws of physics, their corollaries related to Kinetic theory of Gases, Theory of Relativity, and comprehension of how they can be applied to explain specific natural phenomena.

2. Student will understand the Elastic nature of the substances and why the how cylinder are more stronger than the solid cylinders. Moreover, they get to know about bending of beams and cantilever under various loads which is also applicable in daily life.

3. Furthermore, students will understand the concept of relativity with Newtonian Approach and Lorentz transformation space.

PHY- 202- ELECTROMAGNETIC INDUCTION AND ELECTRONIC DEVICES

After completion of the course students will be able to-

1. Understand the Alternating circuits and related electromagnetic induction for various resonant circuits along with their quality factor.

2. They will understand the diodes and their application in various devices such as LED, Photodiode, solar cell etc. This makes the student aware of the working of these devices which are used in our daily routine.

3. They also get the knowledge of other semiconductor devices such as transistors which are used to in various configurations so as to make processes simple and the also get to know about the CRO which is used in Practical.

4. Furthermore, they will get to know about the applications of transistors as amplifier.

PHY- 203- PRACTICAL

After completion of the practical students will be able to

1. Students will show that they have learned laboratory skills, enabling them to take measurements in a physics laboratory and analyse the measurements to draw valid conclusions.

2. They get to know about the practical application of diodes which leads to the conclusions and results which can be used in daily life.

3. Laboratory skills and exposure to a variety of important experiments at appropriate levels that illustrate phenomena discussed in the lecture classes. Instrumentation and experimental techniques; methods for quantitative analysis of data and measurement uncertainty.

4. Students will be capable of oral and written scientific communication, and will prove that they can think critically and work independently.

CHEMISTRY

Inorganic Chemistry (CH201)

Student should be able to:

1. Define Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances.
2. Discuss various types of Vander Waals Forces. Metallic Bond, Band theory of metallic bond, Semiconductors, its types and applications.
3. Comparatively study s-block elements including, diagonal relationships, hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in bio systems.
4. Explain chemistry of Noble Gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.
5. Comparatively study properties of p-block elements (including diagonal relationship and excluding methods of preparation).
6. Explain diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure Trihalides of Boron – Trends in fewis acid character structure of aluminium (III) chloride.
7. Explain carbon family, including catenation, pπ– dπ bonding, carbides, fluorocarbons, silicates structural aspects, silicons – general methods of preparations, properties and uses.
8. Explain nitrogen Family, its oxides – structures of oxides of N,P. Oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus. Oxyacids of sulphur – structures and acidic strength H2O2 –structure, properties and uses.
9. Explain basic properties of halogen, interhalogens types properties, hydro and oxyacids of chlorine – structure and comparison of acid strength.

Physical Chemistry (CH202)

Student should be able to:

1. Explain rate of reaction, rate equation, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction.
2. Understand the effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision. Transition state theory of Bimolecular reactions.
3. Understand electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their vartion with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye- Huckel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included).

4. Explain Kohlarausch's Law, calculation of molar ionic conductance and effect of viscosity, temperature & pressure on it. Application of Kohlarausch's Law in calculation of conductance of weak electrolytes at infinite diloution. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product of spa ringly soluble salts, conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.

Organic Chemistry (CH203)

Student should be able to:

1. Explain nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides.
2. Explain Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration–oxidation, oxymercurationreduction, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$
3. Explain nomenclature of benzene derivatives: Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, anti - aromatic and non – aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction.
4. Derive concludion from energy profile diagrams. Activating, deactivating substituents and orientation.
5. Explain nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene. Chemical reactions 1,2 and 1,4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes
6. Explain nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The addition elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

(Practicals) CH-204

Inorganic Chemistry

Student should be able to:

1. Qualitatively analysis any one of the following Inorganic cations and anions by paper chromatography (Pb2+ , Cu2+ , Ca2+ , Ni2+ , Cl- , Br- , I- and PO43- and NO3-).

2. Prepare and purify through crystallization or distillation and ascertaining their purity through melting point or boiling point:
    (i) Iodoform from ethanol (or acetone)
    (ii) m-Dinitrobenzne from nitrobenzene (use 1:2 conc. HNO3 -H2SO4 mixture if fuming HNO3 is not available)
    (iii) iii) p-Bromoacetanilide from acetanilide
    (iv) iv) Dibenzalacetone from acetone and benzaldehyde
    (v) v) Aspirin from salicylic acid
3. To study the process of sublimation of camphor and phthalic acid.

MATHEMATICS

Math 12BSM 121

Upon successful completion of **Math BM -121 Number theory and Trigonometry**, a student will be able to:

1. Use number-theory arguments to justify relationships involving divisors, multiples and factoring.
2. Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization
3. Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residue.
4. Formulate and prove conjectures about numeric patterns.
5. Define De Moivers theorem, expansion of trigonometric function, circular and hyperbolic function.

Math 12BSM 122

Upon successful completion of **Math BM -122 Ordinary Differential Equations**, a student will be able to:

1. Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems
2. Solve differential equations of first order using graphical, numerical, and analytical methods
3. Solve and apply linear differential equations with constant coefficient, Homogeneous linear differential equation and equation reducible to Homogeneous.
4. Solve and apply linear differential equations of second order, and Transformation of the equation by changing dependent and independent variable.
5. Solve and apply ordinary simultaneous differential equation with different methods.

Math 12BSM 123

Upon successful completion of **Math BM-123 Vector Calculus**, a student will be able to compute and analyze:

1. Scalar and cross product of vectors in 2 and 3 dimensions represented as differential forms or tensors
2. The vector-valued functions of a real variable and their curves and in turn the geometry of such curves including curvature, torsion and the Frenet-Serre frame and intrinsic geometry
3. Scalar and vector valued functions of 2 and 3 variables and surfaces, and in turn the geometry of surfaces
4. Gradient vector fields and constructing potentials
5. Integral curves of vector fields and solving differential equations to find such curves
6. The differential ideas of divergence, curl, and the Laplacian along with their physical interpretations, using differential forms or tensors to represent derivative operations
7. The integral ideas of the functions defined including line, surface and volume integrals - both derivation and calculation in rectangular, cylindrical and spherical coordinate systems

COMPUTER AWARENESS

After completion of the course, student will be able to:

1. Demonstrate basic understanding of computer application, characteristics, output &input devices, hardware and software.

2. Demonstrate basic understanding of operating system, basic component of windows and exploring computer.
3. Help in learning the usage of productivity software effectively like Microsoft word.

4. Demonstrate basic understanding of computer communication, Internet, E-mail & Chatting.

5. Enhance the writing and the reading skills.

6. Help in utilizing web technologies.