Department of Science

Program: B.Sc. Medical

Course Outcomes

Semester-I

Course: Organic Chemistry

CO1: The main aim of this course is to provide the ground information of the organic chemistry. Learners will be able to understand the structure and bonding of the organic compounds by learning the various effects such as inductive effect, resonance effect, hyper conjucation etc.

CO2: To make students capable of understanding and studying the classification of the organic compounds and impart the students a thorough knowledge about the mechanism of the reactions which determines the completion of the reactions.

Course: Inorganic Chemistry

CO1: This would facilitate students to get the knowledge about the Planck constant and describes that how the wavelength of the particle is calculated. It describes the wave mechanical model of the atom. It helps to know that how many electrons are present in the particular space.

CO2: Students will make understanding with the periodic table and the terms related with that and also describes the trends that how they vary with along the period and downthe group.

CO3: This will provide the knowledge of the noble gas family and their compound formation as well as reactivity.

CO4: It intends the chemical bonding.

Course: Physical Chemistry

CO1: The main outcome of this course is to provide information about Mathematical concepts so that medical students would not face any difficulty in derivations and Students learn to solve differentiation, Integration of different functions which enhance their problem solving ability.

CO2: Students learn to find out errors in their Practical and how to correct them.
Moreover, students learn to find out errors in their Practical and how to correct them .This course aims at knowledge of problems related to standard deviation and applicability of F-test and Q-test.

CO3: This course facilitates how to differentiate between different states of matter. Students also develop an idea of liquid and gaseous states in which they learn the structural differences in solids, liquids and gases.

CO4: This course aims at knowledge of gases and the most important Vander waals equation. The most interesting and useful topic 'Joule-Thomson effect' of this course tells the liquefaction of gases and the concept of Inversion Temperature.

CO5: This course facilitates the learners to grab knowledge about structure of molecules and their magnetic properties.

Semester-II

Course: Organic Chemistry

CO1: To make students capable of understanding and studying the classification of the organic compounds. To impart the students a thorough knowledge about the mechanism of the reactions which determines the completion of the reactions.

CO2: It provides the description of the allyl and aryl halides and their uses in various fields. The seproperties help to describe the melting and boiling points of many compounds and their reactivity towards various reactions.

CO3: It intends the naming reactions with different functional groups. The Concept of isomerism deals with the nature of organic compounds. It gives the knowledge about the Chirality which is the necessary condition for the chirality of the molecules; it deals with the different orientations of the compounds and with different names of the compounds. By using these configurations we can find the nature of compounds.

Course: Inorganic Chemistry

CO1: Students will understand concept of close packing, ionic structures and factors affecting ionic solids which help them to identify and distinguish between differentcrystals.

CO2: students will develop understanding about the properties of alkali and alkaline earth metals.

CO3: it would enable the learner to learn about the structure of diborane, lewis acid nature of borontrihalides, preparation of carbides, nitrides & other relevant block compounds.

CO4: This course helps in understanding preparations and applications of fullerene, fluorocarbons, silicate compounds.

CO5: It makes the students to learn and understand about types of oxides and oxyacids, their structure and reactivity in s block & p block elements, interhalogen compounds, polyhalides compounds.

Course: Physical Chemistry

CO1: The main outcome of this course is to enable the students to understand about solutions used in daily life and methods of expressing their concentration.

CO2: By studying this course learners will be able to think about the nature of solutions and their stability which would be help them about the advantages and applications of various types of solutions.

CO3: This course aims at knowledge of different factors affecting rate of reaction and role of acidand base as a catalyst.

Semester-III

Course: Inorganic Chemistry

CO1: Develop the knowledge of transition metals to understand the trends in properties and reactivity of the first series of d-block elements and to know the typical physical and chemical properties of the transition metals.

CO2: To study the lanthanide elements to understand the trends in properties and reactivity and to develop the understanding of the typical physical and chemicalproperties of the transition metals.

CO3: To explain the typical physical and chemical properties of the transition metals especially from second and third transition series. To identify simple compound classesfor transition metals and describe their chemical properties.

CO4: In order to study transition metals to understand the trends in properties and reactivity of the actinides and its typical physical and chemical properties to understand its applications.

Course: Organic Chemistry

CO1: This course will facilitate the learners to classify the types of these functional groups bynomenclature.

CO2: Through the structure and classification of the compounds containing these functional groups, they would be able to make comparison between the reactivity ofthese compounds.

CO3: This course allows the students to outline the mechanism of various reactions of organic molecules containing the above mentioned functional groups.

CO4: It would help in research work and to develop new chemical reaction with different methods.

CO5: They would be able to grab the knowledge about various naming reactions and they will learn about their applications in field of chemistry.

Course: Physical Chemistry

CO1: They will grab knowledge of the basic concept of

thermodynamics.

CO2: They will learn how to solve exact and inexact functions.

CO3: Students will get information regarding thermo chemistry in daily life activities.

CO4: Students will be able to get knowledge of the conversant processes of steam Dryness.

CO5: They will learn about uses of thermodynamics in daily life like in window A.C and refrigerators.

Semester-IV

Course: Inorganic Chemistry

CO1: Students will be able to understand the applications of various types of complex and their properties.

CO2: Develop the knowledge of various processes which proceed through the oxidation and reduction and they will able to know the applications of these reactions.

CO3: It will develop the understanding of all type of acid and bases and explain the behavior .

CO4: Students will be able to understand the applications of various non aqueous solvents and their properties with chemical behavior.

Course: Organic Chemistry

CO1: Students will learn about the method of preparation, properties and uses of carboxylic acid along with their characteristic test.

CO2: Students will learn about the method of preparation, properties and uses of derivatives of carboxylic acid along with their characteristic test.

CO3: Students will learn about the method of preparation, properties and uses of ether along with epoxides.

CO4: Students will learn about the method of preparation, properties and uses of fats along with their commercial application.

CO5: Students will learn about the method of preparation, properties and uses of Organic compounds containing Nitrogen along with their distinguishable test.

Course: Physical Chemistry

CO1: Phase diagrams are useful because they allow us to understand in what state matter exists under certain conditions. Phase equilibrium has wide range of applications in industries including production of different allotropes of carbon, lowering of freezing point of water by dissolving salt, purification of components by distillation, usage of emulsions in food production, pharmaceutical industry

.

CO2: Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in a solution.

CO3: These articles are depends on the movement of the boundary between two adjacent electrolytes under the influence of an electric field and the speed of the moving boundary can be measured and used to determine the ion transference numbers.

CO4: Nernest equation can be used to find the cell potential at any moment in during a reaction or at conditions other than standard-state, by knowing this students can determine the equilibrium constant or Gibbs free energy .In Concentration Cell students can know about how we can select anode or cathode. Nernest equation can be used to find the cell potential at any moment in during a reaction or at conditions other than standard-state, by knowing these students can determine the equilibrium constant or Gibbs free energy. In Concentration Cell students can know about how we can select anode or cathode and also how e.m.f be calculated from those. Students will also learn about that how we can prevents our metallic things from corrosion.

Semester-V

Course: Inorganic Chemistry

CO1: Students will be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the color) of coordination compounds which facilitatethem to describe the shapes and structures of coordination complexes with coordination numbers 6 and 4.

CO2: Learner will develop the understanding of the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them. They will be able to describe rate of reactions of complexes and type of reactions in complexes.

CO3: Student will be able to describe magnetic properties of complexes, various kind of magnetic materials and effect of temp on magnetic characters. They will also able to describe methods of determining magnetic moments.

CO4: Student will be able to describe quantum numbers, orbital and spin angular moment of electrons. And To understand electronic transition, term symbol andconcept of spectra.

Course: Organic Chemistry

CO1: It will make the learner to develop interest about the Synthesis, Properties and applications of Organo-metallic compounds.

CO2: Students will learn about the Synthesis and Properties Organo-Sulphur compounds and their comparison with analogous compounds.

CO3: Students will learn about the Principle, working and application of UV-Vis spectroscopy which will help them study the conjugation in organic compounds.

CO4: Students will learn about the Principle, working and application of IR spectroscopy which will enable them to detect the various Functional groups in organic compounds.

CO5: Students will get knowledge about Principle, working and application of NMR spectroscopy which will help them in structure elucidation through C13-NMR & PMR.

Course: Physical Chemistry

CO1: The main outcome of this course is to provide information about Quantum Mechanics and Spectroscopy .and Quantum Chemistry enables them to know about Schrodinger equation and its application.

CO2: Students learn about rotation & vibration spectroscopy and the electromagnetic radiations used in these spectra. And Through rotational spectroscopy they will learn the energy level diagrams of rigid & non rigid rotors. This course aims at applications of rotational and vibrational spectroscopy.

Semester- VI

Course: Inorganic Chemistry

CO1: On the completion of course the student will have knowledge of Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness.

CO2: The aim of the course is the teaching and understanding of the basic principles of Biological Inorganic Chemistry - Bioinorganic Chemistry that are considered necessary for the completion of postgraduate students' education. Also, the aim of this course is to present and describe bioinorganic systems through the correlation of the function, structure and activity of inorganic elements within the organisms. In particular, this course will include: a) a systematic study of trace element biosystems; b) the effect of the concentration of trace elements on health and the environment.

CO3: On the completion of course the students have knowledge of Silicones and Phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

CO4: The focus of this course is on the synthesis, structure and bonding, properties and reactivity of main group organometallics (including Grignard reagents, organolithium reagents, organotin compounds, etc), organotransition metal chemistry and organometallic catalysis. And On the completion of course the student have knowledge of metal-ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Course: Organic Chemistry

CO1: Students would have knowledge about the structure, preparation and properties of heterocyclic compounds after completion of this course.

CO2: The main focus of this course is to make the Students familiar with the classification, synthesis and application of various polymers.

CO3: Students will learn the importance of enolates as starting material in organic synthesis.

CO4: Students will get knowledge about the classification, conversion and application of carbohydrates.

CO5: Students will learn about the classification, conversion and application of protein.

Course: Physical Chemistry

CO1: To make them familiar in the study of surfaces and of heter interfaces between constituent's layers.

CO2: On completion of this course they will know about the orbital concept.

CO3: Helpful in determination of the geometrical structure of molecules in triplet state.

CO4: Study is helpful for structure identification.

CO5: Student able to know how laser and masers are work which are used in wide range of field.

CO6: Student would be able to study the structure using X-rays .

CO7: Complete study about structure for the compounds used in daily life.

CO8: laws study helpful in research work.

CO9: Mechanism of different processes is studying.

CO10: Daily used light applications.

CO11: Students able to know how the energy transfers in different processes.

B.Sc. (Non-Medical)

Programme Specific Outcomes

PSO1. B.Sc. Non-Medical student is able to concentrate on Chemistry, Physics, Computer and Mathematics.

PSO 2. A non-medical student will demonstrate a scientific knowledge of the core physics principles in Mechanics, Electromagnetism, Modern Physics, and Optics.

PSO3. He is able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.

PSO4. The student will determine the appropriate level of technology for use in: experimental design and implementation, analysis of experimental data and numerical and mathematical methods in problem solutions.

PSO5. He will be able to apply the underlying unifying structures of mathematics (i.e. sets, relations and functions, logical structure) and the relationships among them.

PSO6. He can investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods.

PSO7. The student will acquire knowledge of Chemical Thermodynamics, Kinetics, Electrochemistry, Atomic Structure, Organic Chemistry, Spectroscopy and Skill in Industrial Chemistry.

PSO8. A non-medical student can join Indian Air Force, Indian Navy and can also go for other competitive exams. He can go for higher studies in Mathematics, Chemistry, and Physics.

PSO9. He can join as a scientist in research institutes of immense knowledge having a great scope for growth and development. He can prove to be an asset for the society by producing something more innovative.

PSO10. He can demonstrate a basic understanding of computer hardware and software.

Course Outcomes

Semester I

Course: Coordinate Geometry

CO1: Understand the graph of vertical and horizontal conic.

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

C03: To graph, use the information that we can determine from its equation and add points to sdha pattern for the curve.

C04: Identify the condition for them to be parallel or perpendicularCO5: Recognize line androtational symmetries.

Course: Differential Equations

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 usecorrect mathematical terminology notation and symbolic processes in order to engage in work, study.

Course: Calculus-I

CO1: Interpret a function from an algebraic, numerical, graphical and verbal perspective.

CO2: Compute derivatives, integrals.

CO3: Analyze a function using derivatives in concavity, convexity, curvature and integrals in rectification, hyperbolic function.

CO4: Recognize the appropriate tools of calculus to solve applied problems.

CO5: Use properties to definite integral to solve graphical net area problems.

Course: Electricity and Magnetism-I

CO1: Read, understand and interpret the mathematical formulation in Physics- verbal, mathematical and graphical and solve numerical problems involving topics covered.

CO2: Differentiate vector fields and determine gradient vector fields to find out potential functions.

CO3: Evaluate line integrals, surface area, surface integrals and its applications on Stokes and divergence theorem.

CO4: To learn the concepts of charge interaction with each other using Coulomb's Law and applies to problems in both one and two dimensions.

CO5: To learn the definition of the electric field, E and derive the electric field due to a point charge using Coulomb's Law.

CO6: 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 at dimensional configuration (charged disk).

CO7: 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.

CO8: To develop an understanding of electric potential by considers electric potential energy,equipotential surfaces and how they relate to electric field lines.

CO9: 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.

CO10: 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.

CO11: To understand where to use Laplace's and Poisson's equations.

CO12: 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.

CO13: Derivation of Uniqueness theorem and where can it use.

CO14: To learn the definition of current in terms of electron flow and learn the definition ofresistance Rand Ohm's law.

CO15: To learn about electrical power and how to calculate the power dissipated by a resistor.

CO16: 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 ofthe electrons in the conductor.

Course: Mechanics-I

CO1: Grasped the fundamentals of Cartesian and spherical polar co-ordinate systems, area, volume, displacement, velocity and acceleration in these systems, Solid angle.

CO2: Learned various forces in Nature, Centre of mass, and Equivalent one body problem.

CO3: Learned the basics of Central forces, Equation of motion under central force,

equation of orbit in inverse square, Force field and turning points, Kepler laws and their derivations.

CO4: Learned the Relationship of conservation laws and symmetries of space and time. Inertial frame of reference. Coriolis force and its applications.

CO5: Learned the Variation of acceleration due to gravity with latitude. Focault pendulum (qualitative).

CO6: Learned the Elastic collision in Laboratory and C.M. system, velocities, angels andenergies, Crosssection of elastic scattering . Rutherford scattering (qualitative).

Course: Vibration and Waves – I

CO1: The main objective of this subject is to aware the students about various phenomenon ofwaves and optics.

CO2: This subject describes the Phenomenon like interference.

CO3: Under the Interference phenomenon students will study the young double slit experiment, Fresnalbiprism , double mirror , Newton rings and fabry perot interferenceexperiments.

CO4: This subject describes the Diffraction Phenomenon.

CO5: In diffraction students will study Fresnal diffraction by half period zones experiment, Zone plate, Fraunhoffer diffraction method, diffraction with single and double slit and Resolving power of grating and telescope.

CO6: This subject provides the basic idea of Phenomenon like Polarization.

CO7: In the polarization students will study the different types of Polaroid like polarization with refraction and reflection phenomenon.

CO8: Understand various phenomenon and the cause or origin of them.

Course: Organic Chemistry

CO1: The main aim of this course is to provide the ground information of the organic chemistry. Learners will be able to understand the structure and bonding of the organic compounds by learning the various effects such as inductive effect, resonance effect, hyper conjucation etc.

CO2: To make students capable of understanding and studying the classification of the organiccompounds and impart the students a thorough knowledge about the mechanism of the reactions which determines the completion of the reactions.

Course: Inorganic Chemistry

CO1: This would facilitate students to get the knowledge about the planck constant and describes that how the wavelength of the particle is calculated. It describes the wave mechanical model of the atom. It helps to know that how many electrons are present inthe particular space.

CO2: students will make understanding with the periodic table and the terms related with that and also describes the trends that how they vary with along the period and down the group.

CO3: This will provide the knowledge of the noble gas family and their compound formation aswell as reactivity.

CO4: It intends the chemical bonding.

Course: Physical Chemistry

CO1: The main outcome of this course is to provide information about Mathematical concepts so that medical students would not face any difficulty in derivations and Students learn to solve differentiation, Integration of different functions which enhance their problem solving ability.

CO2: Students learn to find out errors in their Practical and how to correct them .Moreover, Students learn to find out errors in their Practical and how to correct them .This course aims at knowledge of problems related to standard deviation and applicability of F-test andQ-test.

CO3: This course facilitates how to differentiate between different states of matter. Students also develop an idea of liquid and gaseous states in which they learn the structural differences insolids, liquids and gases.

CO4: This course aims at knowledge of gases and the most important vander waals equation. The most interesting and useful topic 'Joule-Thomson effect' of this course tells the liquefaction of gases and the concept of Inversion Temperature.

CO5: This course facilitates the learners to grab knowledge about structure of molecules and their magnetic properties.

Semester-II

Course: Analytic Geometry

CO1: Learn that Use geometrical result to determine unknown angles and radius, centre and use of example of ball and knife as sphere and cut the plane in 3D form of sphere, cone.

CO2: Identify the condition for the plane and the straight line to be parallel orperpendicular and parameterize curves.

CO3: Applying model real-world situations by using conics For example Architects andengineers frequently use the shape of a conic for support arches in bridges

and buildings.

CO4: Recognize line and rotational symmetries.

Course: Partial Differential Equation

CO1: Classify partial differential equations and transform into canonical form.

CO2: Solve linear partial differential equations of both first and second order.

CO3: Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialization.

CO4: Extract information from partial derivative models in order to interpret reality.

CO5: Identify real phenomena as models of partial derivative equations.

Course: Algebra-I

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

CO2: As the result of studying topics, students will be able to understand in different ways the meaning of multiplications of whole numbers and use this to make sense of complex number multiplication and expansion.

CO3: Recognize a number on an argand diagram in terms of its modulus and argument

CO4: Develop the insight that when numbers are multiplied their moduli are multiplied and Their arguments are added together.

CO5: Use this to discover that when a number is raised to a power its modulus is raised to that power.

Course: Electricity and Magnetism-II

CO1: In this subject students will describe the behavior of various substances in magnetic field.

CO2: Students will be able to define B, M and H .also explain their relation to free and bound currents.

CO3: Students will discuss orbital motion of electrons, diamagnetism, electron spin, and paramagnetism.

CO4: In this subject students will discuss ferromagnetism along with Domain theory of Ferromagnetism.

CO5: Students will be able to state Biot Savart's law, Ampere's Circuital law, Faraday's Law and EM induction. Discuss their applications.

CO6: Students will be able to define and explain divergence, curl of B, Hall effect and vectorpotential.

CO7: Students will be able to define and drive current density, Displacement current, Mutual inductance, reciprocity theorem and Self inductance L along with use of current density incalculation of change in magnetic field at a current sheet.

CO8: Students will list transformation equations for E and B from one frame to another.

CO9: In this subject students will learn to derive the Maxwell's equations.

CO10: In this subject students will discuss the Analysis of LCR series and parallel resonantcircuits along with Q-factor. Power consumed

Course: Mechanics-II

CO1: Describe rigid body motion .Explain Rotational motion, principle moments and axes.

CO2: State and explain Euler's equations for precession and elementary gyroscope.

CO3: Describe Galilean transformation and invariance and Illustrate Non-Inertial frames.

CO4: Outline the concept of stationary universal frame of reference and ether.

CO5: Explain the concept of Michelson-Morley Experiment and its result.

CO6: List the Postulates of special theory of relativity.

CO7: Describe the Lorentz transformations, Observer and viewer in relativity, Relativity of simultaneity along with Length, Time and Velocities.

CO8: Discuss the Relativistic Doppler effect. Variation of mass with velocity, mass-energyequivalence, rest mass in an inelastic collision.

CO9: Describe the Relativistic momentum and energy, their transformation.

CO10: Explain the concepts of Minkowski space, four vectorformulation.

Course: Vibration and waves-II

CO1: In this part of subject students will be able to define Stiffness coupled oscillators alongwith normal co-ordinates and normal modes of vibration.

CO2: Students will learn how to explain the inductance coupling of electricaloscillators.

CO3: Students will be able to list the types of waves and derive the solution of wave equation.

CO4: They will study how to illustrate the string as forced oscillator and find characteristic impedance and impedance matching condition.

CO5: They will study how to illustrate the string as forced oscillator and find characteristic impedance and impedance matching condition.

CO6: Students will discuss Reflection and transmission energy, standing waves, wave and group velocity in case of vibrating string.

CO7: Students will be able to state the Physical interpretation of Maxwell's equations.

CO8: Discuss the electromagnetic waves and wave equation in a medium having finitepermeability and permittivity but with conductivity equal to zero.

CO9: Students will discuss the response of a conducting medium of EM waves and define poynting vector.

CO10: Students will be able to explain the Reflection and transmission of EM waves at a boundary of two dielectric media and for the surface of a conductor at normal incidence.

CO11: In this part of subject students will learn way to describe behavior of EM waves in a conducting medium, skin depth and EM waves velocity in a conductor an anomalous dispersion.

Course: Organic Chemistry

CO1: To make students capable of understanding and studying the classification of the organiccompounds. To impart the students a thorough knowledge about the mechanism of the reactions which determines the completion of the reactions.

CO2: It provides the description of the allyl and aryl halides and their uses in various fields. These properties helps to describes the melting and boiling points of many compounds and their reactivity towards various reactions.

CO3: It intends the naming reactions with different functional groups. The Concept of isomerism deals with the nature of organic compounds. It gives the knowledge about the Chirality which is the necessary condition for the chirality of the molecules, It deals with the different orientations of the compounds and with different names of the compounds. By using these configurations we can find the nature of compounds.

Course: Inorganic Chemistry

CO1: Students will understand concept of close packing, ionic structures and factors affectingionic solids which help them to identify and distinguish between different crystals.

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CO3: it would enable the learner to learn about the structure of diborane, lewis acid nature of borontrihalides, preparation of carbides, nitrides & other relevant block compounds.

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CO5: It makes the students to learn and understand about types of oxides and oxyacids, their structure and reactivity in s block & p block elements, interhalogen compounds, polyhalidescompounds.

Course: Physical Chemistry

CO1: The main outcome of this course is to enable the students to understand about solutionsused in daily life and methods of expressing their concentration.

CO2: By studying this course learners will be able to think about the nature of solutions and their stability which would be help them about the advantages and applications of various types of solutions.

CO3: This course aims at knowledge of different factors affecting rate of reaction and role of acid and base as a catalyst.

Semester III

Course: Analysis-I

CO1: Describe fundamental properties of the real numbers that lead to the formal development of analysis.

CO2: Analysis the process of examining information in order to make conclusions regarding limit and continuity

CO3: Identify the area when break the number of interval.

CO4: Recognize the major things to do question on suppositions such as: uniformly, uniqueness limit.

CO5: Use uniformly and apply it to appropriate depth of required critical thinking.

Course: Statics

CO1: An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.

CO2: Understand the flexible cables in contact with smooth curve, Analyze equilibrium of aparticle, systems of particles and their properties.

CO3: Recognize friction as a force and differentiate statics friction and slidingfriction.

CO4: Understand of the analysis of distributed loads.

CO5: Demonstrate and understand of two force and three force members and analyze momentsdue to a couple.

Course: Advanced Calculus

CO1: Learn about the basic principles of multi-variable calculus with proofs.

CO2: To have full knowledge of calculus involving the fundamental tools such as continuity and differentiability.

CO3: Reason rigorously in mathematical arguments. They can follow abstract mathematical arguments and write their own proofs.

CO4: Effectively communicate mathematics: reading, writing, listening, and speaking. Students make effective use of the library, conduct research and make oral and written presentationof their findings.

CO5: To know relationship between the increasing and decreasing behavior of function.

Course: Optics

CO1: The main objective of this subject is to aware the students about various phenomenon ofwaves and optics.

CO2: This subject describes the Phenomenon like interference.

CO3: Under the Interference phenomenon students will study the young double slit experiment, Fresnalbiprism , double mirror , Newton rings and fabry perot interference experiments.

CO4: This subject describe the Diffraction Phenomenon .

CO5: In diffraction students will study Fresnal diffraction by half period zones experiment, Zone plate, Fraunhoffer diffraction method, diffraction with single and double slit andResolving power of grating and telescope.

CO6: This subject provides the basic idea of Phenomenon like Polarization.

CO7: In the polarization students will study the different types of Polaroid like polarization with refraction and reflection phenomenon.

CO8: Understand various phenomenon and the cause or origin of them.

Course: Quantum Mechanics-I

CO1: To study the basics and principles of quantum mechanics.

CO2: The student will understand the uncertainty relations and applications.

CO3: Student will learn Schrodinger equation and their applications.

CO4: Student will understand the concept of wave function.

CO5: Explain the operator formulation of quantum mechanics.

CO6: Solve Schrodinger equation for simple potentials (Potential Step, Linear HarmonicOscillator etc.)

CO7: Student will study about Hydrogen atom (Energy levels, eigen functions, degeneracy, Angular Momentum)

Course: Statistical physics and thermodynamics-I

CO1: This subject basically provides the basic idea of probability to the students. There areways of calculating probability for various statistical systems of particles.

CO2: The objective is to apply the principles of probability in distribution of particles in various systems and to calculate thermodynamic probability.

CO3: This subject provides the detailed information about the distribution of n distinguishable particles in number of compartments of (i) equal sizes and (ii) unequal sizes.

CO4: In this subject Students will basic ideology of phase space, microstate, macro state.

CO5: The course gives the insight of postulates and applications of statistical physics.

CO6: Students will learn the main three types of statistics distribution (Maxwell Boltzmann, Bose Einstein and Fermi Dirac statistics). Student will learn which particles follow which statistics and why.

CO7: The aim is to apply these statistical distributions in real life problems and understand their problems.

CO8: Students will learn How the many real system are related through such theoretical knowledge to practical one (Example tossing the coins, throwing dice etc.)

Course: Inorganic Chemistry

CO1: Develop the knowledge of transition metals to understand the trends in properties andreactivity of the first series of d-block elements and to know the typical physical and chemical properties of the transition metals.

CO2: To study the lanthanide elements to understand the trends in properties and reactivity andto develop the understanding of the typical physical and chemical properties of the transition metals.

CO3: To explain the typical physical and chemical properties of the transition metals especially from second and third transistion series. To identify simple compound classes for transitionmetals and describe their chemical properties.

CO4: In order to study transition metals to understand the trends in properties and reactivity of the actinides and its typical physical and chemical properties to understand its applications.

Course: Organic Chemistry

CO1: This course will facilitate the learners to classify the types of these functional

groups bynomenclature.

CO2: Through the structure and classification of the compounds containing these functional groups, they would be able to make comparison between the reactivity of these compounds.

CO3: This course allows the students to outline the mechanism of various reactions of organic molecules containing the above mentioned functional groups.

CO4: It would help in research work and to develop new chemical reaction with differentmethods.

CO5: They would be able to grab the knowledge about various naming reactions and they will learn about their applications in field of chemistry.

Course: Physical Chemistry

CO1: They will grab knowledge of the basic concept of thermodynamics.

CO2: They will learn how to solve exact and inexact functions.

CO3: Students will get information regarding thermo chemistry in daily life activities.

CO4: Students will be able to get knowledge of the conversant processes of steam dyes

CO5: They will learn about uses of thermodynamics in daily life like in window A.C and refrigerators.

Semester IV

Course: Analysis-II

CO1: Memorize definition of directional derivatives and gradient and illustrate geometric meanings with the aid of sketches.

CO2: Memorize theorem relating directional derivatives to gradient and reproduce proof.

CO3: Calculate directional derivate and gradients.

CO4: Apply gradient to solve problems involving normal vectors to level surfaces.

CO5: Explain the concept of vector integration a plane and in space.

Course: Dynamics

CO1: Ability to construct free-body diagrams.

CO2: Solve mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance

CO3: Understand of the analysis of distributed loads.

CO4: knowledge of internal forces and moments in members.

CO5: Apply Newton's law to solve the problems.

Course: Numerical Methods

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.

CO4: Derive numerical method for various mathematical operations and tasks, such as interpolation, differentiation , integration , the solution of linear and nonlinear equations and the solutions of differential equations.

CO5: Understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

Course: Lasers

CO1: The students will learn to define and derive Einstein's relations and basics of laser

CO2: The Student can discuss Broadening of spectral lines and identify natural, collision and Doppler broadening

CO3: In this subject Students will able to express the line width, line profile, absorption and amplification of parallel beams of light passing through medium.

CO4: Students will able to explain elementary theory of optical cavity, three and four levellaser and properties of laser.

CO5: This subject will describe the ruby laser and Nd Yag laser

CO6: Students will able to explain types of gas lasers like helium neon and CO2 laser.

CO7: In this subject Students will able to express liquid laser like Dye laser, semi conductorlaser, Q-switching and different types of shutters.

CO8: Students will able to explain mode locking, Holography, and applications of laser.

Course: Quantum Mechanics-II

CO1: This subject describes the interaction of radiation with matter and transition probability.

CO2: This subject explains the fine and hyperfine structure of hydrogen atom.

CO3: This subject states and illustrates the Normal Zeeman Effect and Anomalous Zeeman Effect.

CO4: In this subject Students will learn to define spin orbit interaction and spin orbit coupling.

CO5: The subject helps to identify symmetric and antisymmetric wave functions, state PauliExclusion Principle and electronic structure of an atom.

CO6: This subject describes and explains the various spectra like Absorption spectra, Molecular Spectra, Rotational Spectra and Raman spectra.

CO7: This subject briefly explains the Mosley law and Auger effect.

CO8: The subject explains the coupling schemes and selection rules.

CO9: This subject describes and explains the various spectra like Absorption spectra, Molecular Spectra, Rotational Spectra and Raman spectra

CO10: The student will describe and explain the frank hertz experiment and stern gerlach experiment.

Course: Statistical Mechanics and Thermodynamics-II

CO1: The students will learn to define entropy and explain its laws.

CO2: This subject explains the reversible and irreversible process.

CO3: This subject describes and explains the laws of thermodynamics and their applications.

CO4: The students learn to state and explain Carnot cycle and its working

CO5: The students learn to express Maxwell thermo dynamical relations.

CO6: The students can define and illustrate adiabatic stretching, adiabatic compression and Adiabaticde magnetization.

CO7: The subject provides outline details of Thermo dynamical treatment of Joule-Thomson effect and its use.

Course: Inorganic Chemistry

CO1: Students will be able to understand the applications of various types of complex and their properties.

CO2: Develop the knowledge of various processes which proceed through the oxidation and reduction and they will able to know the applications of these reactions.

CO3: It will develop the understanding of all type of acid and bases and explain the behavior of these.

CO4: Students will be able to understand the applications of various non aqueous solvents and their properties with chemical behavior.

Course: Organic Chemistry

CO1: Students will learn about the method of preparation, properties and uses of carboxylicacid along with their characteristic test.

CO2: Students will learn about the method of preparation, properties and uses of derivatives of carboxylic acid along with their characteristic test.

CO3: Students will learn about the method of preparation, properties and uses of etheralong with epoxides.

CO4: Students will learn about the method of preparation, properties and uses of fats along with their commercial application.

CO5: Students will learn about the method of preparation, properties and uses of Organic compounds containing Nitrogen along with their distinguishable test.

Course: Physical Chemistry

CO1: Phase diagrams are useful because they allow us to understand in what state matter existsunder certain conditions. Phase equilibrium has wide range of applications in

industries including production of different allotropes of carbon, lowering of freezing point of water by dissolving salt, purification of components by distillation, usage of emulsions in food production, pharmaceutical industry.

CO2: Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in asolution.

CO3: These articles are depends on the movement of the boundary between two adjacent electrolytes under the influence of an electric field and the speed of the moving boundarycan be measured and used to determine the ion transference numbers.

CO4: Nernest equation can be used to find the cell potential at any moment in during a reaction or at conditions other than standard-state, by knowing these students can determine the equilibrium constant or Gibbs free energy .In Concentration Cell students can know about how we can select anode or cathode. Nernest equation can be used to find the cell potentialat any moment in during a reaction or at conditions other than standard-state, by knowing these students can determine the equilibrium constant or Gibbs free energy. In Concentration Cell students can know about how we can select anode or cathode and also how e.m.f be calculated from those. Students will also learn about that how we can prevents our metallic things from corrosion.

Semester-V

Course: Algebra-I

CO1: Recognize the mathematical objects called groups, matrix, quaternions, symmetric,cyclic groups, even and odd permutations.

CO2: Extend group structure to finite permutation groups.

CO3: Explain the significance of the notions of cosets, normal subgroups, and factor groups, Homomorphisms, Isomorphism and Cayley's Theorem.

CO4: Analyze consequences of Lagrange's theorem including Fermat's Little theorem.

CO5: Familiarize with the concept of Rings, Sub-rings, Homomorphism, ideals and Quotient Rings, Field of Quotient of Integral domain, division rings.

Course: Number Theory-I

CO1: Understand about divisibility, g.c.d, Fundamental Theorem of arithmetic, congruences, residue and reduced residue classes.

CO2: Recognize about Euler-Fermat, Wilsons's, Chinese Remainder theorem.

CO3: learn the definition of congruences, primitive roots, indices, quadratic residues, Legendre

Symbol.

CO4: Familiarize with Euler's criterion, Gauss Lemma., Quadratic reciprocity Law, Jacobi Symbol.

CO5: Apply Arithmetic functions and Mobius inversion Formula.

Course: Discrete Mathematics-I

CO1: Understand the concept of Pigeonhole principle, Basic counting principles, permutations and combinations of sets and multi sets, Binomial and multinomialtheorems.

CO2: Analyze the concept of inclusion and exclusion principle.

CO3: Applying the concept of Graph Theory, Eulerian and Hamiltonian trails and cycles. Bipartite multigraphs.

CO4: Familiarize with Trees, Algorithms for BFS and DFS trees weighted Graphs, Greedy and Prim's Algorithm.

CO5: Determine the concept of Digraphs, Planar graphs, Euler formula and Chromatic numbers.

Course: Condensed Matter Physics-I

CO1: Distinguish between various types of crystal structures and crystal systems for their best use in various technological applications.

CO2: Relationship between atomic radius (R) and lattice parameter (a) that helps to study thestructure of various crystal systems.

CO3: Calculation of Atomic Packing Factor (APF) and Volume density (ρ) that interpreted as a measure of the stability of the nucleus.

CO: 4Determination the Indices for 'Directions' and 'Planes' in a crystal structure.

CO5: Study of Bragg's Law of Diffraction to find the interplaner spacing (d-spacing) of acrystal that used for identification and characterization purposes.

CO6: Determination of Reciprocal lattice to understand the important properties and behaviorof the various crystal systems.

CO7: Study of the Brillion Zones for the theoretical understanding of the elementary ideas of electronic energy bands in solids.

CO8: Study of structure factor and form factor which is a mathematical description of how a material scatters incident radiation.

Course: Electronics-I (Electronics and Solid State Devices)

CO1: Distinguish between P-N junction and Zener diode and Practical applications of thesesdiode in daily life.

CO2: Distinguish between half and full wave rectifier and where they can be used or using in present time in electronics industry.

CO3: Study of different configuration of transistor and their characteristics.

CO4: Practical utilization of transistor for development of various other electronics equipment.

CO5: Study of the JFET and MOSFET and how they are different from BJT.

CO6: Study of various photoconductive devices like LED, Photo diode and Solar celland their applications.

Course: Nuclear and Radiation Physics

CO1: This is a branch of Physics which deals with the phenomena taking place in the nuclear domain. Students will be given an insight into the invention and dimensions of a nucleus.

CO2: Students are able to determine the charge, mass of any nucleus by using various Spectrographs.

CO3: Students will learn the methods to find the mass and charge of any nucleus. The aim is totell them about the stability of nucleus and various other properties.

CO4: In this subject students will study various nuclear models (Shell model, Liquid drop model etc.).

CO5: The students will learn about various types of radiations and their interaction with matter.

CO6: The subject is able to teach students about various types of nuclear reactions, propertiesand their energetic.

CO7: In this subject students will be able to study artificial radioactivity.

CO8: They will study various ways to calculate different kinds of decay.

CO9: This course has led the students to understand interaction of various types of radiation with matter which they observe in their daily life. It's easy for them now to relate the theory to practical.

Course: Inorganic Chemistry

CO1: Students will be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds which facilitate them to

describe the shapes and structures of coordination complexes with coordination numbers6 and 4.

CO2: Learner will develop the understanding of the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them. They will be able to describe rate of reactions of complexes and type of reactions in complexes.

CO3: Student will be able to describe magnetic properties of complexes, various kind of magnetic materials and effect of temp on magnetic characters. They will also able to describe methods of determining magnetic magnetic moments.

CO4: Student will be able to describe quantum numbers, orbital and spin angular momenta of electrons and to understand electronic transition, term symbol and concept of spectra.

Course: Organic Chemistry

CO1: It will make the learner to develop interest about the Synthesis, Properties and applications of Organo-metallic compounds.

CO2: Students will learn about the Synthesis and Properties Organo-Sulphur compounds and their comparison with analogous compounds.

CO3: Students will learn about the Principle, working and application of UV-Vis spectroscopy which will help them study the conjugation in organic compounds.

CO4: Students will learn about the Principle, working and application of IR spectroscopy which will enable them to detect the various Functional group in organic compounds.

CO5: Students will get knowledge about Principle, working and application of NMR spectroscopy which will help them in structure elucidation through C13-NMR & PMR.

Course: Physical Chemistry

CO1: The main outcome of this course is to provide information about Quantum Mechanics and Spectroscopy .and Quantum Chemistry enables them to know about Schrodinger equation and its application.

CO2: Students learn about rotation & vibration spectroscopy and the electromagnetic radiations used in these spectra. And Through rotational spectroscopy they will learn the energy level diagrams of rigid & non rigid rotors. This course aims at applications of rotational and vibrational spectroscopy.

Semester VI

Course: Algebra-II

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: Number Theory-II

CO1: Understand the concept of Diophantine equations, Farey sequences, continued Fractions, Approximation of reals by rationals, Pell's equations.

CO2: Analyze the concept of Minkowski's theorem in Geometry of Numbers and its application to Diophantine inequalities.

CO3: Familiarize with Hermite's theorem on minima of positive definite quadratic forms and its applications to representation of a number.

CO4: Apply the euler summation formula, abel's Identity, elementary results on distribution of primes.

Course: Discrete Mathematics-II

CO1: Write and interpret mathematical notation and mathematical definitions.

CO2: Analyze the concept of Generating function solution of recurrence relations using difference equations and generating functions.

CO3: Recognize Boolean AIgebras-Lattices and Algebraic Structures. Duality. Distributive and Complemented Lattices.

CO4: Computing Boolean Functions and Expressions. Prepositional Calculus.

CO5: Gain an historical perspective of the development of modern discrete mathematics.

Course: Nuclear and Particle Physics

CO1:-Students can list out some Energy loss Phenomenon due to ionization (Bethe's formula),Energy loss of electrons, Bremsstrahlung

CO2:-Student can explain Interactions of gamma rays with matter.

CO3:-The students are expected to learn about the principles and basic constructions of particle accelerators such as the Van-de-Graff generator, cyclotron, betatron and synchrotron. They should know about the accelerator facilities in India.

CO4:-Students can illustrate detectors of nuclear radiations- the Geiger-Mueller counter, the scintillation counter, the photo-multiplier tube, the solid state and semiconductor detectors.

CO5:-Gain knowledge on the basic aspects of particle Physics – the fundamental interactions, elementary and composite particles.

CO6:-Students can list out Categories of particles: leptons, hadrons (baryons and mesons), quarks, gaugebosons.

CO7:-The students should know about the quantum numbers of particles: energy, linear momentum, angular momentum, isospin, electric charge, colour charge.

CO8:-Learn about the strangeness, lepton numbers, baryon number and the conservation laws associated with them.

Course: Condensed Matter Physics-II

CO1: In this subject, students come to know How to define harmonic nature of Lattice vibrations. Lattice vibrations have a basic concept of understanding the momentum transfer inlattice.

CO2: In this subject, students come to know about the Concepts of phonons, Scattering ofprotons by phonons.

CO3: In this Subject students can understand the phenomenon of Vibration of mono-atomic, di-atomic, linear chains. In this subject students can easily describe the concept of Density of modes.

CO4: This chapter deals with the specific heat capacity of solid, Einstein and Debye models of specific heat.

CO5: This chapter deals with movement of electrons in solid, free electron model of metals. Free electron, they will be able to state Fermi gas and Fermi energy.

CO6: In this chapter students identify about Metals and insulators, Conductivity and its variation with temperature in semiconductors with the help of Kronig-Penney Model.

CO7: This chapter discuss about the Fermi levels in intrinsic and extrinsic semiconductors,Qualitative discussion of band gap in semiconductors.

CO8: Nowadays superconductivity has the great importance in many physical areas. In this chapter students can state the Magnetic field effect in superconductors, BCS theory, and Thermal properties of super conductors.

Course: Electronics-II

CO1: Student can discuss various power electronics devices like Thyristor, SCR, TRIAC, DIAC.

CO2: In this chapter students comes to learn about Construction, Characteristics and Operation; Comparison between transistors and thyristors; Difference between SCR and TRIAC.

CO3: Student can describe UJT: its construction, Equivalent circuit, Characteristics and parameters, uses.

CO4: Students can outline some properties about Thermistor: Types, Construction, Characteristics, Uses, Advantages over other temperature sensing devices.

CO5: By completing this chapter students can learn about IMPATT and TRAPATT devices, PIN diode: Construction, Charatersitics, Applications.

CO6: Study of Gunn effect and diodes: Mechanism, Characteristic, Negative differentialresistivity and Domain formation.

CO7: Tunnel diode is a topic of great importance, students learn about Tunneling Phenomenon, Operation, and Applications. Merits and Drawbacks.

CO8: The primary need of all electronic devices is Transistor. Here students can list out some important uses of transistor. In this, students can learn about Transistor biasing: Stabilization of operating point, fixed bias, Collector to base bias, Bias circuit with emitter resistor, Voltage divider biasing circuit.

CO9: Describe CE amplifier: Working and analysis using h-parameters, Equivalent circuits,Determination of current gain, Power gain, Input impedance, FET amplifier: Voltage, Current and Power gain.

Course: Nuclear and Particle Physics

CO1: Students can list out some Energy loss Phenomenon due to ionization (Bethe's formula), Energy loss of electrons, Bremsstrahlung.

CO2: Student can explain Interactions of gamma rays with matter.

CO3: The students are expected to learn about the principles and basic constructions of particle accelerators such as the Van-de-Graff generator, cyclotron, betatron and synchrotron.They should know about the accelerator facilities in India.

CO4: Students can illustrate detectors of nuclear radiations- the Geiger-Mueller counter, the scintillationcounter, the photo-multiplier tube, the solid state and semiconductor detectors.

CO5: Gain knowledge on the basic aspects of particle Physics – the fundamental interactions,elementary and composite particles.

CO6: Students can list out Categories of particles: leptons, hadrons (baryons and mesons), quarks,gaugebosons.

CO7: The students should know about the quantum numbers of particles: energy, linearmomentum, angular momentum, isospin, electric charge, colour charge.

CO8: Learn about the strangeness, lepton numbers, baryon number and the conservation laws associated with them.

Course: Inorganic Chemistry

CO1: On the completion of course the student will have knowledge of Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness.

CO2: The aim of the course is the teaching and understanding of the basic principles of Biological Inorganic Chemistry - Bioinorganic Chemistry that are considered necessary for the completion of postgraduate students' education. Also, the aim of this course is to present and describe bioinorganic systems through the correlation of the function, structure and activity of inorganic elements within the organisms. In particular, this coursewill include: a) a systematic study of trace element bio systems; b) the effect of the concentration of trace elements on health and the environment

CO3: On the completion of course the student have knowledge of Silicones and Phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

CO4: The focus of this course is on the synthesis, structure and bonding, properties and reactivity of main group organometallics (including Grignard reagents, organolithium reagents, organotin compounds,etc), organotransition metal chemistry and organometallic catalysis. And On the completion of course the student have knowledge of metal-ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Course: Organic Chemistry

CO1: Students would have knowledge about the structure, preparation and properties of heterocyclic compounds after completion of this course.

CO2: The main focus of this course is to make the Students familiar with the classification,synthesis and application of various polymers.

CO3: Students will learn the importance of enolates as starting material in organic synthesis

CO4: Students will get knowledge about the classification, conversion and application of carbohydrates.

CO5: Students will learn about the classification, conversion and application of protein

Course: Physical Chemistry

CO1: To make them familiar in the study of surfaces and of heterinterfaces between constituents layers.

CO2: On completion of this course they will know about the orbital concept.

CO3: Helpful in determination of the geometrical structure of molecules in triplet state.

CO4: Study is helpful for structure identification.

CO5: Student able to know how laser and masers are work which are used in wide range of field.

CO6: Student would be able to study the structure using X-rays.

CO7: Complete study about structure for the compounds used in daily life.

CO8: Students would be able to know the reactions occurrence in which state.

CO9: laws study helpful in research work.

CO10: Mechanism of different processes is studying.

CO11: Daily used light applications.

CO12: Students able to know how the energy transfers in different processes.

CO13: Student able to know how laser and masers are work which are used in wide range of field.

M.Sc. Chemistry

Program Specific Outcomes

PSO1 Gain complete knowledge about all fundamental aspects of all the elements of chemistry.

PSO2 Understand the background of organic reactions, techniques used for analysis of mechanism, complex chemical structures, various intermediates with their detailed discussion and Stereochemistry involved in organic reactions.

PSO3 Appreciate the importance of various elements present in the periodic table, coordination chemistry, structure of molecules, properties of compounds, theoretical understanding of various topics like Formation of Covalent bond, Hybridization, Organometallic, Bioinorganic Chemistry, Group Theory and Character tables to identify the all features of the particular compounds.

PSO4 Gather attention about the physical aspects of atomic structure, dual behavior; quantum Chemistry, Chemical Kinetics; reaction pathways with respect to time, various energy transformations; significance of electrochemistry & thermodynamics.

PSO5 Students from Biology background learn about vectors and Matrix Algebra, Coordinate Geometry, Trigonometry, Calculus, Elementary Differential Equations and Permutation and Probability.

PSO6 Students from Mathematics background get awareness for Bio molecules i.e Proteins, Carbohydrates, Amino acids and their Properties to familiarize with the both living and non-living Organisms.

PSO7 Knowledge of theoretical and experimental concepts of C language, Decision & ControlStructure.

Course Outcomes:

Semester-I

Course: Physical Chemistry

CO1 Students will know the Basic concepts of Ist, IInd laws of thermodynamic andentropy.

CO2 Students will develop understanding of activity and fugacity

CO3 Students will learn Concept of absolute entropy.

CO4 Students will relate Thermodynamics with living system.

CO5 Students will be provided with basic knowledge of statistical thermodynamics at microscopic level.

CO6 Students will be cleared with basics of electrochemistry, ion -solvent interactions.

CO7 Students will develop interest for fundamentals of electrochemistry, activity and activity coefficient, Debye Onsager theory.

CO8 Students will take keen interest for basic concept of electrical

double layer.

CO9 Students will understand various applications of electrochemistry.

Course: Inorganic Chemistry

CO1 Students would know quantum mechanical approach to different types of molecule and ions and its application to find the energy of the system.

CO2 Students will gather information about various types of complexes containing different types of ligands having different nature through the theories of bonding in transition metal complexes.

CO3: Students would learn magnetic behavior of various transition complexes with orbital

splitting.

CO4: Students would collect detailed information of the spectral properties of the

complexes and application in determining the nature and shapes of metal complexes.

CO5: Students will be able to get the information about the various types of biological enzymes and their chemistry with appropriate structures and Uses of various metals in body functioning.

Course: Organic Chemistry

CO1: Students will be getting brief idea about various intermediates like carbocation, carbanion, carbane, nitrene, benzyne and free radicals involve during chemical reaction.

CO2: students able to explain various reactions like polymerisation, halogenation, addition reaction and auto oxidation in which free radical involved as intermediate.

CO3: students will be acquainted with nature of bonding in organic molecules and they will get familiar with various techniques used for determination of reaction mechanism.

CO4: Students will be able to explain various elimination reactions, their mechanism, stereo chemistry and their orientation.

CO5: Students will learn various types of pericyclic reactions like Cycloaddition, Electrocyclic reactionand Sigmatropic rearrangement with their mechanism and stereochemistry.

Course: Mathematics for Chemists

CO1. Use the concepts of permutations, combinations and probability to understand the statistical nature of entropy.

CO2. Use algebra and calculus to support the study of statistical thermodynamics.

CO3. Use trigonometric functions to understand the concept of diffraction.

CO4. Use matrix and vector methods, as well as complex numbers to help inunderstanding diffraction patterns from crystal structures.

Course: Biology for Chemists

CO1: Students would be provided with the structural and functional description of cells and its organelles along with the concept of fertilization and metabolism.

CO2: Students would study the formation of bio molecules like carbohydrates and proteins andhow they play major roles in the body.

CO3: Students would understand the formation, types and functioning of lipids in the body andwould be able to describe how they are derived from their precursors.

CO4: Students would deal with various biocatalysts of body ie enzymes which enhance the biochemical reactions.

CO5: Students would be able to draw & understand the structure of the nucleic acids like DNAand RNA ie genetic material which help in the Inheritance.

Semester-II

Course: Inorganic Chemistry

CO1: Students will be able to develop the understanding of various complexes containing different types of metals and ligands with their properties and also will be able to find out nature of these types of compounds by spectroscopic study.

CO2: Students would be able to explain symmetry of a plane figure and some bounded three-dimensional figures and would also determine whether a given set and binary operation form a group by checking group axioms

CO3: Students will be able to understand the various concepts of group theory and will developthe imaginative power. Moreover, they will be able to apply this concept in field of spectroscopy.

Course: Physical Chemistry

CO1: Students would know basics of Quantum mechanics which is critically important for understanding how individual atoms combine covalently to form molecules

CO2: Students would be able to correlate quantum numbers with Spherical Coordinates and further they would understand concept of orbital and shapes of orbital

CO3: Students would get idea about both perturbation theory and variation method which provide good results in approximating the energy and wave functions of multi-electron atoms.

CO4: Students would know about eigen values and eigen functions

CO5: Students would understand the reaction mechanisms and transition states by studying Chemical kinetics.

Course: Organic Chemistry

CO1: Students will be getting idea regarding Configurations, their representations & conversions

CO2: Students will be made familiar with Confirmations, Neighboring group participation, pyrolysis of acetate, xanthates and amine oxide

CO3: Students will be able to explain geometrical isomerism (E&Z Nomenclature), Determination of curtin-Hammet principle, study of physical properties of isomers, addition to C-C multiple bonds

CO4: Students will get information regarding various types of reduction like wolf kishner reduction, clemmenson reduction, Meerwein Pondroff Varley reduction, Wittig's Reaction, Mechanism of condensation reaction involving enolates (Aldol, Knoevengel, Mannich, perkin and stobbe reactions

Program: M.Sc. Physical Chemistry

Program Specific Outcomes

The master's specialization, Physical Chemistry, will give student in-depth knowledge about macroscopic, atomic, subatomic and particulate phenomena in chemical systems in terms of the principles, practices and concepts of physics such as motion, energy, force, time, thermodynamics, quantum chemistry, statistical mechanics, analytical dynamics and chemical equilibrium.

PSO1: Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics

PSO2: Gain knowledge of various spectroscopic techniques which are the key instruments of research life to find and study the structure of various molecules in all science streams

PSO3: Improve the Skill in physical research area

PSO4: Relate the concepts of how solar light act as incredible source for life survival and various concepts which build up future in research to save environment by using new techniques toutilize natural energy.

PSO5: Develop understanding of the range and theories of instrumental methods available in analytical chemistry, an understanding of the role of the chemist in measurement and problem solving in chemical analysis

PSO6: Identify the crucial building materials viz Polymers and catalysts which are very important in everyone’s daily life and industry life

PSO7: Familiarize the skill of identifying crystalline phases of various materials even at atomic level qualitatively and quantitatively

PSO8: Explain the concepts of physics and physical chemistry for various phenomena occurring in- biological systems and the supra-molecular structure of these systems

PSO9: Understand the professional and safety responsibilities residing in working on environmental problems

Program: M.Sc. Organic Chemistry

Program Specific Outcome

The master's specialization, Organic Chemistry, will give student in-depth knowledge about Organic reactions which are used in a vast way in nature and with a focus on principles for effective synthesis strategies, stereos electivity, catalysis, as well as metal organic chemistry. This course gives the student the theoretical basis of organic reaction and also helps them to find a way to carry out these types of reaction. It gives the quantitative ideas about the synthesis, properties and uses of organic compounds.

PSO1: Understand chemical and molecular processes that take place in organic reactions, Study of photochemistry & Learn Pericyclic reaction

PSO2: Improve the Skill in organic research area

PSO3: Use modern .methods when planning strategies for synthesis of new substances and characterization of products.

PSO4: Master and use modern methods of synthesis and conduct sometimes extremely advanced experiments, the synthesis of complex molecular structures and handling sensitive chemicals.

PSO5: Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

PSO6: Synthesis of Natural products and drugs by using proper mechanisms.

PSO7: Develop understanding of the range and theories of instrumental methods available in analytical chemistry, an understanding of the role of the chemist in measurement and problem solving in chemical analysis

PSO8: Familiarize with heterocyclic chemistry and realizing the importance of heterocyclic compounds.

PSO9: Understanding of the professional and safety responsibilities residing in working on environmental problems.

M.Sc. Chemistry II Physical Specialization

Course Outcomes

Semester III

Course: Fundamentals of Spectroscopy

CO1: The main outcome of this course is to provide knowledge of interaction of radiation with matter, solution of schrodinger wave equation

CO2: Through this outcome, students are able to get knowledge of rigid rotator & non rigid rotator and application of this spectra to find moment of inertia of molecules

CO3: Students grab the knowledge of vibrational spectra which is used for the detection of various functional groups

Course: Fundamental & Atmospheric Photochemistry

CO1: Students will learn about the different laws of photochemistry and there importance in calculation of quantum yield

CO2: Students will learn the ways to find term symbols for gound and excited state, and various photo physical and photochemical processes

CO3: To understand photop hysical processes of sulphur, oxygen and halogens

CO4: Students will learn various electronic transitions and the selection rules

CO5: Students also learn the coupling of rotational vibrational spectra and intensities of spectrallines.

CO6: Students go through raman spectra which is used for structure elucidation of those compounds for which other spectros copies don't work.

CO7: Students tend to know the various electronic transitions occurred in electronic spectra of molecules and application of this part for structure elucidation of molecules.

CO8: The outcome of this course is the study of NMR spectra which gives detailed information of electronsin particular atom in a molecule.

CO9: Students learn about ESR spectra which is also responsible for structure elucidation by showing lines that occurs due to splitting by neighbouring electrons.

Course: Statistical Thermodynamics

CO1: The primary objective of this course is to develop familiarity with the physical concepts and facility with the mathematical methods of quantum mechanics. The aim of statistical mechanics is the evaluation of the laws of classical thermodynamics for macroscopic systems using the properties of its atomic particles. In addition to the classical thermodynamic the statistical approach provides information on the nature of statistical errors and variations of thermodynamic parameters.

CO2: In this students will compare Quantum mechanics and Classical Mechanics that quantum mechanics is about the physics of very small things, molecules and smaller. Classical mechanics is about macroscopic things. Also they go through the concept of Stability and Force of Interaction, Like the bonding potential energy, the stability of an arrangement of atoms is a function of the Lennard-Jonesseparation distance.

CO3: Debye postulated that there is a continuous range of frequencies that cuts off at a maximum frequency, which is characteristic of a particular solid. They will find out the relation of entropy with temperature and other parameters. Students will be able to discuss and explain evidence for the movement of molecules.

CO4: The objective of thermoelectric phenomenon is that it is used to create a heat flux between the junction of two different types of materials and by studying the relative current density and thermoelectric

potential, students will understand that minimum entropy production can be obtained when the thermoelectric potential is a specific, optimal value them

CO5: Students will learn various photo oxygenation reactions

CO6: Students will get knowledge about the application part of photochemistry

CO7: Students will understand the structure of atmosphere, various pollutants present in it and the various ways to control and monitor those pollutants

M. Sc. Chemistry II Organic Specialization

Course Outcomes

Semester III

Course: Analytical Chemistry

CO1: Students will learn different scale of operation of chemical analysis and various steps involved in quantitative analysis

CO2: Students will get to know what is the importance of selecting a representative sample and different criterion of a good sampling plan, Stratified sampling Vs. random sampling. How variance is minimized in stratified sampling, what are the sampling plan for solids, liquids and gases

CO3: Students will understand What are different Errors in chemical analysis, how Minimizationof errors occur, Difference b/w accuracy and precision.

CO4: Students will be familiarized with Statistical terms viz Q test, t test, F test, mean, std deviation, variance correlation and Regression, linear regression. Analysis of variance

CO5: Students will know what is Polarography, Different types of currents residual, Migration, diffusion, polarographic maximum, Dropping Mercury Electrode, polar graphic wave and Ilkovic equation & deviations, Amperometric titrations & Biampometric titrations

CO6: Students will be able to explain Alternating current, Square Wave, pulse (normal and Differential), Tensometry, radio frequency and computer controlled polarograph.

CO7: Students will be familiarize with Chronoptentiometry.

CO8: Students will acquire knowledge of Thermogravimetric analysis.

CO9: Students will be able to differentiate b/w Differential Thermal analysis and differential scanning calorimetry on line analysis.

CO10: Students will learn Thermometric titrations.

CO11: Students will understand basics of Spectrophotometry and Colorimetry, Beer's law, Photometric accuracy.

CO12: Students will know basic principles of Solvent extraction, synergistic extraction, Ion pair formation Methods of extraction and their applications in analytical chemistry.

CO13: Students will learn to apply uses of Ion Exchange Resins and Ion exchange chromatography in analytical chemistry (a) Total cartion Conc in tap water (b) Cu (II) from a brine solution U (VI) by liquid ion exchanger (d) use of mixed solvents.

Course: Photochemistry and Pericyclic Reactions

CO1: This course aims at providing acquire knowledge on Pericyclic reactions, organic photochemistry and their further applications in organic synthesis.

CO2: On the completion of the course students will have the understanding of basics of organicphotochemistry and pericyclic reactions.

CO3: Various theories governing these pericyclic reactions will help them to predict the productswith stereochemistry involved in these reactions.

Course: Chemistry of Natural Products

CO1: Students will learn about the use of dehydrogenation technique for structure determinationof natural products.

CO2: Students will acquire knowledge about the use of various degradation techniques for structure determination of natural products.

CO3: Students will acquire knowledge about the use of oxidation technique for structure determination of natural products.

CO4: Students will learn about the chemical synthesis of natural products using various reagents.

CO5: They will learn how we synthesize natural products biosynthetically using acetate pathwayand mevalonic acid path way.

CO6: Students will learn about the chemical synthesis of natural products using various reagents.

Course: Heterocyclic Chemistry

CO1: This course gives the quantitative ideas about the synthesis, properties and uses of such heterocyclic compounds like Oxirane, Aziridine and thirane

CO2: Students will be able to explain the Methods of formation, physical and chemical properties and applications of four membered heterocyclics with one hetero atom

CO3: Students will be familiar with the Methods of formation, physical and chemical properties and applications of five membered heterocyclics with two hetero atom

CO4: Students will be able to explain the Methods of formation, physical and chemical properties and applications of six membered heterocyclics with two hetero atom

CO5: Students will be able to explain molecular rearrangement in some heterocyclic compounds like ringcontraction1, 2 rearrangements in heterocyclic system and aromatic rearrangements

Course Outcomes

Semester-IV

Course: Applications of Organic Molecular Spectroscopy

CO1: Provide the basic knowledge of orbitals & electronic transitions involved in UV spectra.

CO2: Students grab the knowledge of solvent effect & conjugation effect and structure elucidation of organic compound through UV.

CO3: Students also get to know about modes of vibration & factors affecting vibrational frequency in IR spectra.

CO4: Through IR spectroscopy, students learn to identify functional groups in organic compounds.

CO5: Students are able to find molecular mass & molecular formula of organic compounds.

CO6: Students learn various fragmentations associated with functional groups.

CO7: The study of NMR spectra which is used for structure elucidation of compounds.

CO8: Students learn 13C NMR spectra which deals with DEPT, proton decoupled resonance whichare also used for structure elucidation of compounds.

CO9: Study of 2-D spectra which includes NOSY, COSY, HETCOR is also a part of course outcomes.

Course: Organic Synthesis

CO1: Students will learn about disconnection approach. How to proceed for disconnection of certain molecules involving carbon hetero atom bond. They will also learn about the terms like umpolung and protection of various functional groups.

CO2: Students will be able to understand the C-C disconection in alcohols ,1,3 -difunctional compounds , 1,5 -dicarbonyl compounds, natural products.

CO3: Students will get knowledge about the types of pericycllic reactions specially diels-alderreaction

CO4: This topic will aware students about the formation of C-Cbond. They will learn about the alkylation of enmines.

CO5: They will learn about the various methods of formation of alkenes.

CO6: They will learn about what type of reactions are shown by carbonyl compounds.

Course: Modern Synthetic Reactions and Rearrangements

CO1: Students will get brief idea regarding various reactions, mechanism and applications used for fictionalization of non activated carbon.

CO2: Students will be familiar with the new applications of organosilicon compounds in synthesis.

Course: X-Ray Diffraction and Other Techniques

CO1: students will know about the structural parameters like unit dimensions.

CO2: student will be able to know about the distance between the different compounds.

CO3: Students will be able to identify the structure of different compounds used in daily life.

CO4: Students will acquire the knowledge of charge on compounds when their ions move.

CO5: student will be able to know the colour of the compounds.

CO6: student will be able to explain the use of X-rays in daily life.

CO7: Students will learn different method used to identify the structure which is useful in research work.

CO8: Students will be able to determine the bulk composition.

CO9: students will be made able for accurate measurements .

CO10: Students will learn to use phase identification of a crystalline material.

CO11: Students will study the variation in optical rotation of a substance means with their rotation.

CO12: Students will be able to find the absolute configuration of metal complexes means like in proteins storage complexes.

CO13: Students will be able to explain use of X-Rays in solids for observing the signals.

CO14: Students will be able to use extraction process and check the water detergents ration in pump.

CO15: Students will apply the concepts in geology for identifying the composition of Fe containing specimens.

CO16: Students will be able to use this concept for improving catalytic activity.

CO17: Students will be able to observe the Doppler Effect by using theory of relativity.

Course: Biophysical Chemistry and Advanced Spectroscopy

CO1: In this students will analyze about folding transition and the functional transitions between useful states are encoded in the linear sequence of amino acids, and a long- term goal of structural biology is to be able to predict both the structure and function of molecules from the information in the sequence.

CO2: Students will learn about the basic principle of laser operation that is to create conditions so that the population at a higher level is more than that in the ground state, they will also learn about main difference between a maser and a laser.

CO3: Mass spectrometry is an analytical tool useful for measuring the mass-to-charge ratio (m/z)

of one or more molecules present in a sample. These measurements can often be used to calculate the exact molecular weight of the sample components as well. While studying Mass spectrometry students will learn about this powerful technique with a myriad of different applications in biology, chemistry, and physics, but also in clinical medicine and even space exploration.

CO4: Photoelectron spectroscopy is a useful analytical tool used by chemists to determine the electronic structure of atoms and molecules, student will also learn that it is used to measures the elemental composition at the parts per thousand range, chemical state and electronic state of the elements that exist within a material.

Course: Polymers and Surface Chemistry

CO1: Students will be able to explain classification, kinetic study and mechanism involved in step polymerisation

CO2: Students will be familiar with kinetics and mechanism of radical chain polymerisation , Copolymersation and theories of emulsion polymerisation

CO3: Students will be get idea how to calculate number average and weight average molecular weight and various methods used to calculate that

CO4: Students will be able to explain adsorption and various theories like Langmuir adsorptionisotherm, BET adsorption isotherm for unimolecular and multimolecular layers

CO5: Students will be familiar with kinetics of heterogenous reaction at solid surface, catalyst, its types, salt effects and spectroscopic methods like PES, AES, LEED to determine surface structure

M.Sc. 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 public service, 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 courses including the essentials of mechanics, electromagnetic theory, quantum mechanics, and statistical mechanics (single, multivariable, and vector) calculus, ordinary differential equations, linear partial differential equations, linear algebra, and complex analysis

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

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

Course Outcome

Semester- Ist

Course: Mathematical Methods of Physics-I

CO1: This subject provides knowledge about various mathematical tools employed to study physics problems.

CO2: Student will study beta and gamma functions, their evaluation andrelations.

CO3: The students will study Legendre Polynomial and their properties.

CO4: This subject describes the special functions (Bessel functions of first and second kind,)and their recurrence relations.

CO5: The students will be able to use complex numbers and variables, Cauchy-Riemann conditions, Cauchy's Integral formula, Laurent expansion, Taylor's series Singularities,Calculus of residues.

CO6: This subject provides information about tensor and its basic operations

CO7: Under Tensors student will study different types of tensors (Contra variant and covariant) tensors, Application of tensors in coordinate transformations.

CO8: Student will study numerical methods (bisection method, Newton method etc) tosolve set of equations.

Course: Classical Mechanics

CO1: Define and understand basic mechanical concepts related to the momentum of system of particles; angular momentum of system of particles; energy of the particles; the work of internal forces and internal potential energy; work of external forces and external potentialenergy; motion relative to the center of mass (momentum, angular momentum, kinetic energy) discrete and continuous mechanical systems.

CO2: Describe and understand Virtual work and D'Alembert's principle.

CO3: The Lagrange equations for holonomic and nonholonomic systems and Hamiltonian approaches in classical mechanics.

CO4: Describe and understand Hamilton's equations of motion equations for system like simple and compound pendulum, Harmonic oscillator, Motion of particle in centralforce field etc.

CO5: Describe and understand the statics of rigid bodies; tensor of inertia; principal moments ofinertia; Euler equations of motion; motion of the Earth; precession; Euler angles.

CO6: Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations ofmotion.

CO7: Poisson brackets; canonical transformation, Poisson bracket relations between componentsof linear and angular momenta and relative problems.

Course: Classical Electrodynamics

CO1: Understand basic about the Electrostatics problems

CO2: Develop the Ability to solve the problems regarding electric field.

CO3: Observe the effect of boundary conditions like Dirichlet and Neumann boundary conditions, Uniqueness theorem

CO 4: Observe the effect of Boundary value problems in electrostatics and its

applications.

CO 5: Understand the operation of Green's function and solution of Poisson equation

CO 6: Understand the problem of Dirac delta function in spherical polar coordinates

CO 7: Formulate and employ the Equations of electrostatic field in a dielectric, Bound chargedensities.

CO 8: Acquire knowledge on Magnetostatics and solve the problems like Bio savart law and amperes law.

CO 9: Develop knowledge on Time varying fields.

Course: Nuclear and Particle Physics

CO 1: This course has led the students to understand interaction of various types of radiation with matter which they observe in their daily life. It's easy for them now to relate the theory to practical.

Students are also able to understand the detecting methods and instruments for different types of charged and neutral particles.

CO 2: This gives the detail study of alpha decay process and shows how alpha spectroscopy can help us to understand nuclear structure.

CO 3: This gives the detail study of beta decay process and various selection rules for process.

CO 4: In this students will learn the gamma decay process and their energetic and also the selection rules.

CO 5: Students will learn about the classification and properties of elementary particles. Also learn about the properties of fundamental forces.

CO 6: This gives the information about types of interactions and conservation of charge, parity and time reversal in these processes.

CO 7: In this students learn about discovery and properties of Pions and their exchange interactions.

CO 8: In this students learn about k-mesons about their discovery and decay modes and also about hyperons.

CO 9: This gives the study of quark model and multiplets and theories of fundamental interactions

Course: Electronics-I

CO1: Understand basic construction, equivalent circuits and characteristics of basic electronicsdevices.

CO2: Develop the Ability to understand the design and working of BJT / FET amplifiers.

CO3: Observe the effect of negative feedback on different parameters of an Amplifier anddifferent types of negative feedback topologies.

CO4: Observe the effect of positive feedback and able to design and working of different Oscillators using Transistors

CO5: Understand the operation and design of multistage amplifier for a given specification.

CO6: Understand number representation and conversion between different representation in digital electronic circuits

CO7: Formulate and employ a Karnaugh Map to reduce Boolean expressions and logiccircuits to their simplest forms.

CO8: Acquire knowledge on basic digital electronic gates

CO9: Develop knowledge on design trade-offs in various digital electronic families with a view towards reduced power consumption

CO10: Design and Analyse various combinational and Sequential logic circuits.

CO11: Learn about Counters and Shift Registers

Semester II

Course: Mathematical Methods of Physics– II

CO1: To analyze the exponential orders functions, Laplace transform, Inverse Laplace transformsand its properties.

CO2: Use of Laplace transforms for the solution of differential equations.

CO3: Distinguish the Hermite polynomials, Rodrigue's formula and solution of Hermite differential equation.

CO4: Analyze the different series (Fourier, Sine and cosine series).

CO5: Examine the Fourier integral theorem, Fourier transform and Parseveall's identity forFourier series and transforms.

CO6: To analyze the Laguerre differential equation, solution and their properties.

CO7: Study of the D'Alembert and Fourier series solutions, Vibrations of a freely hanging chain and rectangular membrane.

CO8: Compare the discrete groups, Permutation groups, Lie group and group postulates.

Course: Advanced Classical Mechanics and Electrodynamics

CO 1: This subject extrapolates the knowledge about Hamilton-Jacoby theory which includes Hamilton-Jacobi equations for Hamilton principal and characteristic functions.
Problems: Harmonic oscillator using Hamilton-Jacobi formulation and through action-angle variables

CO2: Student will study Special theory of relativity which helps to apply the space time correlation.

CO3: The students will study covariant formulation of four spaces and representation of various vectors in four-space and will study how it apply on covariant formulation of Force, momentum and energy equation in Minkowski space. By this students will able to solve the Applications of relativistic formulation in the study of motion under constant force and relativistic one dimensional harmonic oscillator.

CO4: This subject describes Small oscillations which include Formulation of problem, Eigen value equation, Frequencies of free vibration and normal modes. By this students apply this to solve the problem Normal mode frequencies and eigen vectors of diatomic and linear tri-atomic molecule

CO5: The students will study Continuous systems and fields. By this students will able to examine the CO concept Stress-energy tensor and conservation laws, Hamiltonian formulation

CO6: This subject provides information about Maxwell inhomogeneous equations and conservation laws

CO7: Student will study Electromagnetic waves and wave propagation. By this students will able to recognize the concept of Electric and Magnetic field.

CO8: Student will study the Polarization concept by this they will understand the concept of reflection of light and use this knowledge how Waves in a conducting medium and skin depth.

Course: Quantum Mechanics

CO 1: Solution of the Schrodinger equation for the hydrogen atom that used for solve to finding the Eigen value also find the Spherical harmonics, Radial solutions

CO 2: Interpret of Rigid rotator for hydrogen atom that understands the behavior of a particle in free and fixed state.

CO 3: Solution for three dimensional square well potential to Generalize the important properties of tunneling effect and Study of Linear vector spaces to understand the analysis ability

CO 4: Study of Hermitian, unitary and projection operators and commentators to conclude how the wave function changed when operator operated on wave function.

CO 5: Study the Change of basis-Representation theory to examine the different representations of wave function

CO 6: Study Generalized uncertainty principle to examine the position and momentum of particle.

CO 7: Study Density matrix. Schrodinger, Heisenberg and interaction pictures to test the knowledge of time dependant and time independent wave functions and wave operators.

CO 8: Study the Symmetry and conservation laws to generalize the principle of conservation in space and wave function

CO 9: Examine the Solution of Simple harmonic oscillator and its properties in three dimensional.

CO 10: Matrix mechanical treatment of linear harmonic oscillator and its representations and solution in terms of matrix to examine the concept of energy Eigen values.

CO 11: Interpret creation and annihilation operators to understand how to increase or decrease in wave function.

CO 12: Interpret Matrix representations of J2,J-z, J+,J-; to understand the concept of spin of particle.

CO 13: Analyze Clebsch-Gordon coefficients and their properties and how to find the solution

CO 14: Addition of spin and orbital momentum to conclude the different concept of momentum.

CO 15: Determination of C.G. coefficients for ½+1/2 and ½+1 and Wigner-Eckart theorem to understand the addition of coefficients.

Course: Statistical Mechanics

CO 1: Students will get an idea for the macroscopic and microscopic states so that they will able to examine the connection between statistics and thermodynamics

CO 2: Students will analyze the methods of Ensemble and their representation.

CO 3: They will learn about Phase space so that they conclude the Liouville's theorem

CO 4: Students will analyze about the various methods of Micro canonical ensemble, Gibb's micro canonical distribution

CO 5: Students will test methods for Entropy of an ideal gas, Gibb's paradox, Sackur-Tetrode equation to conclude the concept of Entropy.

CO 6: Students will study methods to find the Partition function in phase space and how it willbe helpful to evaluate on canonical ensembles

CO 7: Students will study about Grand canonical ensemble and its thermodynamics anapply it on Energy and Density fluctuations

CO 8: Generalize the Postulates of Quantum Statistical Mechanics and Density matrix

CO 9: Students will study Different ensembles in quantum statistical mechanics for different Ideal gases and apply it on ideal Fermi Gas, Ideal Bose Gas and Boltzman Gas

CO 10: Distribution functions for different ideal gases and density of states for an ideal gas.

CO 11: Equation of state of an Ideal Fermi Gas and Degeneracy and analyze what is the Fermi energy at T=0 and at low temperatures

CO 12: Thermodynamics of an ideal Fermi gas and free electron gas in metal

CO 13: Student will study about Bose Gas so that they extrapolate the concept of Equation of state of an Ideal Bose gas, Bose-Einstein condensation, Thermodynamics of an Ideal Bose gas and Black body radiation (The photon gas)

CO 14: Students will study about Phase transition so that they will able to interpret first and second order phase transition: the Clausius Claperyon equation

CO 15: Students will study the Ising model in zeroth approximation, random walk and brownian motion and how it apply on Fick's diffusion formula, Fick law and Einstein relation.

Course: Electronics – II

CO1: Compare the tuned primary and secondary circuits and how they are helpful in making amplifiers.

CO2: Differentiate between various power amplifiers (Class A, Class B and theirPush pull configurations).

CO3: Analyze the need of Modulation and generation of AM, FM and SSB.

CO4: To study the operational amplifier, its classification and lay out of practical operationalamplifiers

CO5: To study DC and AC characteristics of op-amp and how CMRR is calculate.

CO6: Demonstrate the various applications of op-amp (Adder, subtractor, Instrumentationamplifier, Log, antilog amplifier, Differentiator and integrator).

CO7: Distinguish the Square wave, Triangular wave and Sine wave generator.

CO8: To study the use of regulator and design of series regulator, IC regulators and 723 general purpose regulator.

CO9: To study about 555 timer circuit and compare its monostable and astable mode.

Semester III

Course: Condensed Matter Physics-I

CO1: Study of Bragg's Law of Diffraction to examine the interplaner spacing (d-spacing) of acrystal that used for identification and characterization purposes.

CO2: Determination of Reciprocal lattice and study of Brillion Zones to understand the important properties and behavior of the various crystal systems.

CO3: Analyze of structure factor and form factor which is a mathematical description of how a material scatters incident radiation.

CO4: Study of lattice vibrations of mono-atomic and diatomic linear lattices to examinethe role of Phonon in many of the physical properties of solids, such as the thermal conductivity and theelectrical conductivity.

CO5: Study of free electron gas model in one dimension and three dimensions to interpret thebehavior ofcharge carriers in a metallic solid.

CO6: Use of the static properties of metals that are useful in various technological applications.

CO7: Study of the transport properties of metals such as Sommerfeld theory, Hall Effect and thermal conductivity.

CO8: Study of the synthesis, types and properties and classify various types of nano materials which offers the potential for new and faster kinds of computers, more efficient power sources and life-saving medical treatments.

CO9: Study of the various optical properties of crystals to determination the phenomenon ofinteraction of light with these materials.

CO10: Have knowledge about the physics of semiconductor materials.

CO11: Analyze the characteristics and theories in semiconductor materials in terms of crystal structures, charge carriers and energy bands.

CO12: Describe band structures of semiconductors.

CO13: Demonstrate the physical characteristics such as electronic structure and optical and transport properties, and current-voltage characteristics of semiconductors.

CO14: Explain how to find the Fermi energy level and carrier density in n-type and p-type semiconductors.

Course: Nuclear Physics

CO1. In this students will analyze the nuclear properties like nuclear radius, mass and abundance of nuclides, binding energy and semi-empirical formula and relation between angular momentum and parity. Also the methods of calculating such properties.

CO2. The students learn about the spin and orbital contribution to magnetic moment andmethods of measuring these terms.

CO3. This tells about the properties of nuclear force and use of various models that tells about theinteraction between nucleons.

CO4. In this students will study the various models that examine the detailed informationabout the nuclear structure.

CO5. The course is such designed to teach students about various types of nuclear reactions and classify their energetic.

CO6. Students will learn about the neutron sources and detectors and also the methods ofslowing down the neutrons.

CO7. This discusses the various types of nuclear reactions and their properties.

CO8. Students analyze various methods of accelerating various types of particles to perform scattering experiments.

Course: Advanced Quantum Mechanics

CO1:- Understand Indistinguishability principle, Symmetry and antisymmetry of wave functions, Exchange operators,

CO2: Develop the Ability to solve Scattering problems of identical particles. Example to solve the: Hydrogen molecule, Spin statistic theorem, Slater determinant

CO3: Obtained the solution of wave function like Rayleigh Ritz variational method for ground & excited States, for example:- Ground state energy of hydrogen, helium and harmonic oscillator,

CO4: To solve the problems of Time Independent Perturbation Theory. First order and second order perturbation theory for non degenerate case; Problems: Anharmonic oscillator, He- atom; Degenerate perturbation theory, Problems: Stark effect, Zeeman effect.

CO5: To solve the problems of Transition probability for constant and harmonic perturbation, Golden rule, Induced absorption and emission, Einstein coefficients;Problems: Radiative transitions.

CO6: Understand WKB Method for solve the problems of potentialbarrier

CO7: Formulate and implement of Collision Theory

CO8: Acquire knowledge on Partial wave analysis

CO9: Develop knowledge on different solutions related to Relativistic Quantum Mechanics:

Course: Computer Simulation in Physics

CO1: Students will get an idea for the Evaluation of polynomials and Root finding:Evaluation of truncated series: Fundamental iterative scheme.

CO2: Students will use the methods to find Solution of nonlinear equations (Newton-Raphson method, Secant method, Newton method for two dimensions).

CO3: They will solve Iterative methods for systems of Linear equations (Jacobi method,Gauss Seidal Iteration.)

CO4: Students will differentiate about Interpolation and Approximation.

CO5: Students will analyse methods for Linear and nonlinear curve fitting: Least squares approximation, Data linearization, and Piecewise and Cubic Spline interpolation.

CO6: Students will use mathematical tools like Differentiation and Integration using forward, backward and central difference operators; Error analysis, Trapezoidal and Simpson rules;two and three dimensional integration for various problems

CO7: Students will study methods to solve solutions of Ordinary Differential equation (Taylormethod, Runge-Kutta method and Predictor-Corrector method).

CO8: Students will study about Pseudo random numbers and their generation, Monte-Carlointegration.

CO9: They will examine Simulation of Physics Problems and Algorithm development.

Semester: IV

Course: Condensed Matter Physics-I

CO 1: Analyze various properties of different types of magnetic materials.

CO 2: Compare the behavior of Magnetization at absolute zero and its temperature dependence.

CO 3: Differentiate Hard and soft magnetic materials.

CO 4: Determine magnetic resonance and dielectric absorption of ferroelectric materials

CO 5: Examine traditional and high Tc superconductors, Meissner effect, Heat capacity, Energygap and Isotope effect.

CO 6: Extrapolate the knowledge about basic ideas of BCS theory.

CO 7: Analyze macroscopic quantum interference, SQUIDS and its applications.

CO 8: Differentiate Plasmons, polaritons, polarons and Lattice defects

Course: Advanced Electronics

CO 1: To study the need of Analog to digital and digital to analog converter.

CO 2:-Discuss various methods of generation of (A to D) and (D to A) signal and evaluatetheir performance.

CO 3: To study the use of Micro-Processor in daily life and block diagram of 8085microprocessor.

CO 4: To categories the various memory in term of RAM and ROM and compare (BipolarROM, MOS, ROM, Static RAM, Dynamic RAM).

CO 5: To study the interfacing concept and demonstrate the interfacing of Input device, output devices and Memory segment with 8085.

CO 6: To classify various types of instructions (Data transfer, Arithmetic, Logic, Branch, Rotote and compare) and their format in 8085.

CO 7: To study the Looping, Counting; and indexing concept and differentiate higher bit addition and data transfer instruction from lower bit instruction.

CO 8: To study about the Stack, Subroutine, conditional Call and Return Instructionsof 8085.

CO 9: Classify various higher bits processors.

Course: Radiation Physics

CO1: Demonstrate knowledge of fundamental aspects of Energy distribution of thermal neutrons, Effective cross section of thermal neutron and slowing down of reactor neutrons.

CO2: Calculate transport mean free path and scattering cross-section and Slowing down time, Resonanceescape probability

CO3: Examine Neutron cycle and multiplication factor Neutron leakage and critical size, Nuclear reactors and their classification

CO4: Evaluate thermal Neutron diffusion, Neutron diffusion equation, Thermal diffusion length, Exponential pile, Diffusion length of a fuel-moderator mixture, Fast neutron diffusion and Fermiage equation, Correction for neutron capture

CO5: Analyze nuclear spectrometric data, Measurements of nuclear energy levels, spins, parities and moments

CO6: Calculation of g-factors and hyperfine fields.

CO7: Categorize experimental techniques used (or developed) for nuclear physics purposes and discuss their influence on development of new technologies

CO8: Apply radiation physics applications in medical diagnostics and therapy, energetic, geology, archaeology.

Course: Electronics Communication System

CO1: What is the use of modulation during communication and various types of Noisepresent during transmission.

CO2: To study the AM, its frequency spectrum and calculate its power relations. Design of AM generation and receiver circuit.

CO3: To study various generation and receiver circuit of (SSB, DSBSC, Pilot carrier, ISB andVSB) and compare their output

CO4: To study the use of FM and evaluate its mathematical representation and frequencyspectrum.

CO5: Demonstrate the transmission and receiver circuit of FM.

CO6: To study the basic principle of Radar and compare different Radar system (Pulsed radar,Moving target indication, CW Doppler radar, frequency modulated CW radar and phasedarray radars.

CO7: To study about various pulse communication modulation and compare the (Pulse amplitude modulation (PAM), pulse width modulation (PWM), pulse position modulation (PPM) and pulse code modulation (PCM).

CO8: Differentiate between Frequency division multiplexing and Time division multiplexing and design of different Communication link system (Fiber optics, microwave, tropospheric and, submarine cables.

CO9: Demonstrate the Frequency modulated microwave radio system and examine path [illegible] and system gain

CO10: Study of optical fibers, optical sources, light detectors and their classification. Calculate losses occur in optical fiber cables.