Course outcome and Programme Outcome

Department of Physics

Course Outcome

Semester I

PAPER CC - I

Mathematical Physics

Course Outcome

CO1 :Students are able to learn limit, continuity and elementary idea about the differential calculas.

CO2 : Students learn to solve differential equations first and second order and maximum and minimum of single and multiple variables using Lagrange's undetermined multiplier.

CO3 : Students learn vector calculus and able to solve the vector problem

CO4 : Students learn the vector integration including ordinary integration , surface and volume integration.

CO5 : Students learn curvilinear coordinates and gradient, divergence and curl of a vector in different coordinate system.

CO6 :Students learn probability theory, Binomial distribution function, Bayes' theorem and conditional probability and to solve different problems.

CO7 : Students learn Dirac Delta function and able to solve simple problems using Dirac Delta function.

Program Outcome

PO 1 : Elementary idea on differential calculas and its application in physical problems.

PO2 : Solution to differential equations and its application in physical problems.

PO3 : Application of vector calculas in physical problems.

PO4 ; Vector integration for line, surface and volume.

PO5 : Curvilinear coordinates and its application to physical problems.

PO6 : Probability theory and its application to physical system.

PO7: Learn Dirac delta function and its application to physics.

Paper : CC - II

Mechanics

Course Outcome

CO1: Students learn fundamental of dynamics, review Newton's laws of motion, Gallilean invariance principle and related problems.

CO2: Students learn work energy theorem, conservative system its physical applications and related problems.

CO3: Students learn collisions of particles, elastic and non-elastic collisions in lab system and centre of mass system and related problems.

CO4: Students study rotational dynamics problems, moment of inertia and able to find the moment of inertia of different symmetrical bodies.

CO5: Students learn elastic properties of matter and relation between different elastic coefficients.

CO6: Students learn fluid dynamics, Poiseuille's equation and its applications.

CO7: Students learn central force, law of gravitation and gravitational field and potential of gravitating objects.

CO8: Students learn planetary motion, Kepler's law, satellites, geosynchronous orbits and their

related problems.

CO9: Students learn Wave and oscillations, damped motion and forced oscillations, resonance and its applications.

CO10: Students learn non-inertial frames and physical problems in non-inertial frames.

CO11: Students learn special theory of relativity, Lorentz transformation and its applications, mass energy relation, relativistic dynamic and its applications.

Program Outcome

PO1: Study of dynamics of particles and application of Newton's laws of motion.

PO2: Conservative system and its physical applications.

PO3 : Collision of particles, conservation of linear momentum in centre of mass and lab system.

PO4: Rotational dynamics, moment of inertia and its application to physical system.

PO5: Elastic properties of matter.

PO6: Fluid dynamics and its applications.

PO7 :Gravity and Newton's laws of gravitation.

PO8: Planetary motion, satellites and geosynchronous orbits.

PO 9 : Waves and oscillations of different system, free, damped and force vibrations.

PO10: Rotating coordinates and physical problems in rotating coordinate system.

PO11: Special theory of relativity and its applications.

SEMESTER - II

PARER CC : III

Electricity and Magnetism

CO1 : Students learn electric field, potential and law in electrostatics and solve various problems relating to electrostatic fields and potentials.

CO2: Students learn to find the electrostatics energy of system, capacitance, conductors and able to solve the problems of conductors by method of image.

CO3: Students learn dielectric properties of matter and able to solve the problems of dielectrics.

CO4: Students learn various problems in magnetostatics like magentis field due to a current carrying conductor and learn technique to solve the problems in magentostatics.

CO5 Students learn magnetic properties of magnetic materials and study hysteresis curve for ferromagnetic materials.

CO6: Students learn Faraday's laws of electromagnetic induction, Maxwell's equations and self inductance, mutual inductance of various systems..

CO7: Students learn A.C circuits and behaviour of AC in LCR circuits and able to solve the problems.

CO8 Students study Network Theorems and its applications to DC circuits.

CO 9 : Students learn the construction of Ballistic Galvanometer and able to measure charge and currents using Ballistic Galvanometer.

Programme Outcome

PO1: Electric field and potential and its application

PO2: Conductors, capacitance and method of image.

PO3: Dielectric behaviour of the matter.

PO4: Magnetostatics and its applications.

PO5: Magnetic materials and study of dia ,para and ferromagnetic materials.

PO6: Faraday's laws of electromagnetic induction and its applications.

PO7: Study on AC circuits and its applications.

PO8: Study of Network theorem and its applications.

PO9: Study of different kind of galvanometers and applications.

PAPER : CC IV

Waves and Optics

CO 1 : Students learn linear superposition two simple harmonic oscillations and their behavior and acquire knowledge of Lissajous figures.

CO 2 : Students learn transverse vibration of strings, propagation of travelling wave and behavior of standing wave in strings. They learn normal modes and of a string vibration, group and phase velocity.

CO 3 : Students learn surface tension and properties of liquid surface. They learn fluid dynamics, viscosity and production of low pressure. They acquire knowledge of reverberation and building acoustics.

CO 4 : Students learn electromagnetic nature of light. They learn interference of light and its properties in optical devices like biprism and LLyod mirrors, Newton's rings.

CO 5 : Students Michelson and Fabry Perrot interferometers and their applications.

CO 6 : Students Fraunhofer and Fresnel's diffraction , zone plate and diffraction gratings and its applications to study diffraction.

Programme Outcome

PO 1 : Study of superposition of two simple harmonic motion helps to study and determination of unknown frequency of simple harmonic motion.

PO 2 : The study of string vibrations help to acquire knowledge of different musical string instruments.

PO 3 : The knowledge of fluid dynamics helps to find the flow of fluid through a narrow tube.

PO 4 : The knowledge of sound wave propagation and study of building acoustic aware students about the criterion of a good auditorium.

PO 5 : The knowledge of propagation of electromagnetic wave in medium helps to study the properties of electromagnetic wave and optical phenomena.

PO 6 : The knowledge of interferometers helps to study the phenomena of interference in laboratory.

PO 7 : The knowledge of diffraction gratings and its accessories help students to study diffraction phenomena.

Semester – V

SEMESTER – III

PAPER : CC V

Mathematical Physics - II

CO1: Students learn Fourier series analysis and its application in an infinite series.

CO2: Students learn to solve the second order differential equations in an ordinary point and regular singular point, Bessel functions, Legendre polynomials and their recurrence relations.

CO3: Students learn some special integral like Beta and Gamma function, Error function and their applications in different physical problems.

CO4: Students learn partial differential equations (PDE) and its applications in rectangular, spherical and cylindrical coordinates.

Programme Outcome

PO1: Study on Fourier series and application to Physical systems in sine and cosine form

PO2: The solution to second order differential equations and application to series solutions.

PO3: Application of Beta and Gamma functions in physical problems.

PO4: Partial differential equations and its application in physical problems like heat flow and string vibrations.

PAPER : CC – VI

Thermal Physics

CO1 : Students study the Zeroth, First law of thermodynamics , concept of work and heat developed and able to solve the problems following first law.

CO2 :Students study second law of thermodynamics, reversible and irreversible process with examples, Carnot cycle, Carnot engine and its efficiency, refrigerator and its performance.

CO3: Students study entropy and entropy principle and its applications in various physical problems.

CO4 : Students study thermodynamic potentials, enthalpy, Helmholtz free energy, Gibb's free energy and phase transitions relating to physical systems.

CO5: Students study Maxwell relations and its applications, adiabatic demagnetisation and low temperature physics.

CO6 : Students study Maxwell's law of distribution of velocities, mean free path, transport phenomena and learn to solve the problems.

CO7: Students study real gasses and behaviour of real gases, Vander Waal's equation of state, Low temperature physics and its related applications.

Programme Outcome

PO1: Zeroth law of thermodynamics and first law of thermodynamics and applications.

PO2: Second law of thermodynamics and different processes and its applications.

PO3: Study and entropy and its principle and its applications.

PO4: Study on thermodynamic potentials, enthalpy and free energy and its applications.

PO5: Adiabatic demagnetization and third law of thermodynamics.

PO6: Maxwell's equations and its applications to gasess.

PO7 : Behaviour of real gases and its applications.

PAPER : CC - VII

Digital Systems and its Applications

CO1: Students learn to study different Lissajous figures to study waveforms and voltages, frequency and phases.

CO2 :Students learn integrated circuits, SSI, VLSI, linear and digital ICs and its applications

CO3 : Students learn Digital circuits and study of different gates and its applications.

CO4: Students learn Arithmetic Logics circuits including adders, subtractors and their applications.

CO5: Students learn sequential logic circuits and its applications.

CO6: Students learn Registers, Counters and their applications

CO7: Students learn computer organization and architecture.

CO8 : Students learn computer programming in 8085 microprocessor and its applications.

Programme Outcome

PO1: Study on different Lissajous figures and finding unknown frequency of A.C signal.

PO2 : Integrated circuits and its applications.

PO3: Study on digital circuits and its applications.

PO4: Adders, subtractors and its applications to Digital circuits.

PO5: Sequential logic circuits, Flip flops and its applications.

PO6: Registers, Counters and its applications.

PO7: Computer organization and study on 8085 microprocessor.

PO 8 : Study on 8085 microprocessor and its basic structure.

SKILL ENHANCEMENT COURSE

PAPER : SEC – 1

Renewable Energy and Energy Harvesting

CO 1 : Students learn alternative sources of energy of fossil fuels and develop knowledge Solar Energy, Wave Energy, Wind Energy and Tidal Energy.

CO 2 : Students learn the solar cell and solar pond and solar heater and their applications.

CO 3 : Students learn wind energy and energy harvesting and wind turbines and its working principle.

CO 4 : Students learn Ocean energy and sources of ocean energy harvesting.

CO 5 : Students learn geothermal energy and its applications.

CO 6 : Students learn Geothermal energy and energy harvesting.

CO 7 : Students learn Hydro energy and its working principle.

CO 8 : Students learn piezeoelectricity and its applications.

CO 9 : Students learn electromagnetic energy harvesting.

Programme Outcome

The aim of this course is to learn the alternative sources of energy both conventional and non-conventional and their applications by hand experiments.

Semester IV

PAPER CC : VIII

Mathematical Physics – III

CO 1 : Complex Variables is one of the most useful branches of Mathematical Physics which was led foundation by Cauchy, Riemann, Gauss and others in the 19^{th} Century. The students learn complex variables which have many applications in Physical problems in heat flow, potential theory, electrodynamics, fluid dynamics and elasticity.

CO 2 : The topic covered under includes complex algebra and geometry. They learn differentiation of complex function and condition for analytic function i.e Cauchy and Riemann conditions. They learn also complex integration and path integration of complex function.

CO 3: The course include infinite series namely Taylor and Laurent series, The evaluation of definite integral is learnt by students. They also learn residue theorem and learn evaluation of integration using residue theorem.

CO 4 : The integral transform Fourier and Laplace transforms find several applications in physical problems. The students learn Fourier transform and its application in physical problems especially in quantum mechanics.

CO 5 : The students learn Laplace transform and its applications to different physical systems. Students learn to solve the differential equations for damped oscillations and coupled differential equations.

Programme Outcome

PO1 : The knowledge on complex variables and its applications in physical problems help students to understand the importance and applications of complex variables and complex functions in physical problems.

PO2 : The knowledge of Fourier transform is important in physics, optics and quantum mechanics. The students learn Fourier transform and its application in physics enable them to apply theit knowledge in physical systems.

PO 3 : The students learn Laplace transform which has a wide application in electrical circuit theory and transmission line. The knowledge of Laplace transform and solving different problems in physics.

Paper CC - IX

Elements of modern Physics

Course Outcome

CO1: Students study the black body radiation and some historical scientific experiments which gave birth of quantum mechanics.

CO2: Students study the Heisenberg uncertainty principle and its importance.

CO3: Students study about the matter wave and get familiar with concept of wave function. They also study Schrodinger equation as the basic equation of quantum mechanics.

CO 4: Students study nucleus and its different properties and various types of measurements.

CO 5 : Students learn radioactivity α, β γ decay and nuclear fission and fusion.

CO 6 : Students learn Laser its formation and properties of different types of Lasers.

Programme Outcome

PO1: Students learn that Newtonian mechanics fails to describe the phenomena in the atomic and subatomic particles and new formulation is needed to describe them.

PO2: Students learn to estimate different physical quantities by applying Heisenberg uncertainty principle.

PO3: Students understand the wave nature of subatomic particles

PO 4 : General properties of nuclei and different nuclear models are studied.

PO 5 : Radioactivity and nuclear fission and fusion are studied.

PO 6 : Laser properties and different types of lasers are studied.

Paper : CC - X

Analog Systems and applications

CO-1 :- semiconductor basics, energy level diagram, doping, formation of P-N junction and phenomena at the junction

CO-2:- P-N junction diode applications, different types of rectifiers, Zener diode, LEDs, photodiode and solar cell

CO-3:- Bipolar junction transistors, characteristics and different modes of connection, load line analysis,physical mechanism of current flow.

CO-4:- Trasistor biasing and bias stabilization, fixed and voltage divider bias. Transistor as a twoport network and h-parameter equivalent circuits. Analysis of single stage CE amplifier ,input output impedances, current, voltage, power gain .

CO-5:- two stage RC coupled amplifier and its frequency response.

CO-6:- Feedback in amplifiers, effect of positive and negative feedback on input/output impedance, gain , stability, distortion, noise.

CO-7:- Sinusoidal oscillators, Barkhausen criterion for self sustained oscillations, RC phase shift oscillator, determination of frequency, Hartley&Colpitt's oscillators.

CO-8:- Operational amplifier black box approach, characteristics of ideal and practical opamp, virtual ground concept, CMRR, open and closed loop gain

C0-9:- Application of opamp, inverting, non inverting amplifier, adder, subtractor, differentiator, integrator, log amplifier, zero crossing detector, wien bridge oscillator

CO-10:- Conversion, resistive network, weighted and R-2R ladder, accuracy and resolution, A/D conversion

Program outcome

After the completion of the courses students learned about the semiconductor basics, the Physics behind it, different and very important applications of semiconductors in modern electronics and achieved proficiency in problem solving.

SKILL ENHANCEMENT COURSE

PAPER : SEC – 2

Electrical Circuits and Network Skills

CO 1 : Students develop concept of electrical circuits and purpose of use of circuits in energy saving.

CO 2 : Students are acquainted with electrical drawings and schematic diagrams of electrical circuits.

CO 3 : Students learn construction and DC and AC generators and motors.

CO 4 : Students learn solid state devices like rectifier and develop knowledge on rectifier performances.

CO 5 : Students are acquainted with working of relays and its applications.

Programme Outcome

The aim of this course is to learn the alternative sources of energy both conventional and non-conventional and their applications by hand experiments.

Semester V

Paper CC-XI

Quantum mechanics and application

CO-1:- Time dependent Schroedinger equation, properties of wave function, probability and probability current density, normalization, linearity and superposition principle. Eigen value, Eigenfunction, position, momentum, energy operator, expectation value of position and momentum, wave function of a free particle.

CO-2:- Time independent Schroedinger equation-Hamiltonian, stationary states and energy eigen values, expansion of an arbitrary wave function as a linear combination of energy eigen functions. General solution of the time dependent Schroedinger equation in terms of linear combinations of stationary states, application to spread of Gaussian wave packet for a free particle in one dimension, Fourier transforms and momentum space wave function, position momentum uncertainty principle.

CO-3:- General discussion on bound states in an arbitrary potential , continuity of wave function, boundary condition and emergence of discrete energy levels, application to one dimensional problem-square well potential, simple harmonic oscillator energy levels and energy eigen functions using Frobenius method, Hermite polynomials, ground state, zero point energy and uncertainty principle.

CO-4:- Hydrogen like atoms, time independent Schroedinger equation in spherical polar coordinates, separation of variables of second order partial differential equation, angular momentum operator & quantum numbers; radial wave function using Frobenius method, shapes of probability densities for ground and excited states, l&m; s,p,d,f shells.

CO-5:- Atoms in electric and magnetic fields, electron angular momentum, space quantization, electron spin and spin angular momentum, Larmor's theorem. Spin magnetic moment. Stern -Gerlach experiment. Zeeman effect , gyromagnetic ratio and Bohr magneton. Normal and anomalous Zeeman effect, Paschen Back & Stark effect(qualitative discussion).

CO-6:- Many electron atoms, Pauli's exclusion principle, symmetric and antisymmetric wave functions, periodic table, spinorbit coupling. Spectral notations for atomic states. Total angular momentum, vector atom model, L-S & J-J coupling. Hund's rule. Spectra of hydrogen and alkali atoms.

Programme outcome

PO1: Computational problem to solve the s-wave schrodinger equation and plote the corresponding wave function

PO2: Computational problem to solve thes-wave radial Schrodinger equation for an atom and find the energy of the ground state and plotting the corresponding wave functions.

PO3: Computational problem to solve thes-wave radial Schrodinger equation fora particle of mass mFor the anharmonic oscillator potential.

PO4:Computational problem to solve thes-wave radial Schrodinger equationfor the vibrations of hydrogen molecule and Find the lowest vibrational energy and corresponding wave function plotting.

Paper CC - XII

Solid state physics

CO1: Students studies the crystal structure, idea of unit cell, lattice vectors, existance of different lattice planes and representation of the lattice planes by Miller indices. They also study about reciprocal lattice, X-ray diffraction by the crystal and representation of X-ray diffraction in reciprocal lattice.

CO2: Students study the lattice vibration, different theory to calculate specific heat of solids.

CO3: Students study about classification of mater on the basis of magnetic nature, their properties, theoretical explanation of different magnetic nature of matter and magnetic hysteresis.

CO4: Students study the dielectric properties of materials, electrical polarization and theory of refractive indices.

CO5: Students study the ferroelectric properties of materials and piezoelectricity.

CO6: Students study the band theory of solids, conductivity of semiconductors, Hall effect.

CO7: Students study the superconductivity and different theoretical explanation of superconductivity.

PO1: Students get the knowledge about different crystal structures and get the idea how to obtain the structures of different crystals experimentally by X-ray diffraction.

PO2: Students learn about discrete nature of lattice vibration energy, gradual theoretical development to match the experimental values of specific heat.

PO3: Students learn the magnetic nature of different materials and get the idea how to choose suitable magnetic substance for a particular purpose.

PO4: Students learn how electromagnetic wave interacts with mater and get the idea why different materials transmit and absorb different wavelengths of electromagnetic wave.

PO5: Students get the idea about different applications of ferroelectricity and piezoelectricity in our daily life.

PO6: Students learn to differentiate among conductors, semiconductors and insulators. They also learn how to measure conductivity and detect p-type and n-type semiconductors by measuring Hall coefficient.

PO7: Students learn the importance of superconducting materials and their uses in the practical field.

Paper - DSE 1

Advanced Mathematical Physics

CO 1 : Linear vector space is the branch of mathematics which has grown from a careful study of the physical problems involving quantum mechanics. Students can develop knowledge of n – dimensional vector space. Students learn how linear transformation and their related problems.

CO 2 : The matrices have a wide applications in physical problems such as quantum mechanics, electrodynamics, special theory relativity. Students find the eigen values and eigen vectors for the Hermitian and Unitary matrices. They learn how to digonalise a matrix and also to find the power of matrices.

CO3 : The tensor analysis is useful for undergraduate students who likes to master on the subject. They learn covariant and contravariant vectors by using tensor algebra. They learn the gradient and divergence in notation.

CO 4 : The application of tensor in physical problems like moment of inertia, generalized Hooke's law and stress and strain tensors are learnt by students.

CO 5 : Students learn general transformation of coordinates in Minkowski space and mixed tensors. They learn sum , difference and product of tensors and metric tensors.

Programme Outcome

PO 1 : The knowledge of vectors space enables students to have an idea about the development of n – dimensional vector space which has application in Quantum Mechanics.

PO 2 : The knowledge of matrices very useful in undergraduate level in solving different physical problems using matrix method.

PO3 : The knowledge of tensor analysis is useful for students in dealing the physical problems like fluid dynamics, special theory of relativity.

Paper ; DSE – 2

Classical Dynamics

CO 1 : Students learn Lagrangian and Hamiltonian and hence Lagrange and Hamilton's equation of motion and their application in different cases.

CO 2 : Students learn small oscillations and its applications to different cases and hence determination of normal modes and normal frequencies.

CO 3 : Students learn special theory of relativity, four vector, relativistic kinematics and their applications.

CO 4 : Students study fluid dynamics, equation of continuity and Poiseuille's for streamline flow of a liquid through a capillary tube and its applications.

Programme Outcome

PO 1 : Lagrangian and Hamiltonian mechanics and their applications.

PO 2 : Small Oscillations and its applications.

PO 3 : Special theory of relativity, four vectors and their applications.

PO 4 : Fluid dynamics, Poiseuille's equation and its application.

Semester VI

Paper CC – XIII

Electromagnetic theory

CO1: Students study the Maxwell's electromagnetic equations, electromagnetic wave equation from Maxwell's equations and propagation of electromagnetic wave in dielectric medium.

CO2: Students study about the propagation of light through conducting media and plasma.

CO3: Students study the reflection and refraction of light when fall on the interface of different dielectric medium.

CO4: Students study the polarization of light, different types of polarization, optic axis and double refraction in anisotropic crystals.

CO5: Students study the phenomenon of optical rotation and its theory.

CO6: Students study theory of wave guides.

CO7: Students study different types of optical fibres and propagation of light through optical fibres.

Programme Outcome

PO1: Students get the idea about the nature of light waves, its energy density and velocity of light in different dielectric medium.

PO2: Students learn how ionosphere is used for communication using radio wave.

PO3: Students learn about what kind of dielectric materials are suitable for different optical instruments which work on reflection and refraction.

PO4: Students learn different applications of polarization of light in our daily life as well as in medical field and scientific experiments.

PO5: Students learn how to determine density of optically active solution by measuring rotation of plane of polarization.

PO6: Students get the idea about communication through waveguides and which modes can be transmitted through different types of wave guides.

PO7: Students learn the advantage of using light signal in communication technology and how optical fibres play an important role in modern day communication.

Paper : CC-XIV

Statistical Mechanics

CO-1:- Classical statistics, micro and macro states, concept of ensemble, phase space, thermodynamic probability. M.B distribution law, partition function, thermodynamic functions in terms of partition function, gibb's paradox, sackur tetrode formula, equipartition of energy with proof, thermodynamic functions of a two level system , negative temperature.

CO-2:- Classical theory of radiation, properties of thermal radiation, black body radiation, pure temperature dependence, Stefan -Boltzmann law, Rayleigh-Jeans law, ultraviolet catastrophe.

CO-3:- Quantum theory of radiationspectral distribution of blackbody radiation, Planck's quantum postulate, planck's law, verification of Wien's distribution law, R-J law, S-B law and Wien's displacement law from Planck's law.

CO-4:- B.E distribution law, thermodynamic functions of a strongly degenerate Bose Gas, B.E condensation, properties of liquid helium,, radiation as a photon gas, bose derivation of planck's law.

CO-5:- Fermi-Dirac statistics, F.D distribution law, thermodynamic functions of a completely and strongly degenerate gas, electron gas in a metal, specific heat of metals, relativistic Fermi gas, white dwarfs, Chandrashekhar mass limit.

PO1: Computational analysis of the behavior of a collection of particles in a box that satisfy Newtonian mechanics.

PO2:Computation of the partition function and study of how partition function , average energy, energy fluctuation, specific heat at constant volume depend upon the temperature.

PO3:Planck's law for Black Body radiation and compare it with Raleigh-Jeans Law

PO4:Dulong-Petit law, Einstein distribution function, Debye distribution function plotting for high and low temp and compare.
PO5:Maxwell-Boltzmann distribution, Fermi-Dirac distribution, Bose-Einstein distribution plotting with energy at different temperatures.

Paper : DSE – 3

Nuclear and Particle Physics

CO 1 : Students learn general properties of nuclei, different types of nuclear models and their applications.

CO 2 : Students learn radioactivity, α, β, γ decay and their kinematics.

CO 3 : Students learn different types of nuclear reactions and the kinematics of nuclear reactions.

CO 4 : Students learn different types nuclear detectors and their applications.

CO 5 : Students learn various types of particle accelerators and their applications.

CO 6 : Students learn particle interactions, different types of particles and their symmetries, concept of quark model and colour quantum number.

Programme Outcome

PO 1 : General properties of nucleus and different nuclear models.

PO2 : Radioactivity, α, β, γ decay and their kinematics.

PO3 : Nuclear reaction and its kinematics.

PO 4 : Nuclear Detectors and their applications.

PO 5 : Particle accelerators and their applications.

PO 6 : Different types of particle and their symmetries, concept of quark model and colour quantum number,

Paper CC – DSE 4

Astronomy and Astrophysics

CO 1 : Astronomy usually considered as the oldest observational science and Astrophysics on the other hand seems to be youngest of modern scientific disciplines. In the course curriculum the students learn astronomical parameters like distance, stellar radius, stars, stellar temperature. They also learn positional astronomy and different astronomical coordinates. Herzsprung - Russel diagram and classification of stars.

CO 2 : Students learn different astronomical technique, telescopes and detectors They learn the basic thermodynamics in Gravitation .

CO 3 : Students learn solar parameters, solar atmosphere and solar mageto hydrodynamics and origin of the solar system. They learn about stellar spectra and classification of stars on the basis of surface temperature of the star.

CO 4 : Students learn the basic structure of Milkiway galaxy and its properties such as stars and star clusters, rotation of galaxy and galactic nucleus.

CO 5 : They learn the morphology of the galaxies, Hubble law and large scale structure of the universe. They find the age of the universe my knowing the Hubble constant at present.

PO 1 : The knowledge of positional astronomy help students to develop basic idea of the position of stars in the night sky.

PO 2 : The knowledge of astronomical technique helps to make telescope and detectors and different technical gadgets applied in modern astronomy.

PO 3; The knowledge of the Sun develop the idea of the activity of the sun and make interest location and sun spots.

PO 4 : The knowledge of the basic structure of Milkiway galaxy helps students to know the formation of stars in our galaxy and the properties of galaxy.

PO 5 : The knowledge of expanding universe helps students to acquire knowledge about the modern trends and research in astronomy and astrophysics.

B.Sc Physics Honours

(1 +1 +1) Pattern 2014 – 2015 onward

Paper – IX

Group - A

Special Theory of Relativity

CO1 : Students learn Galilean transformation and Newtonian Relativity. The Michelson's experiment and its relevance in foundation of Special theory of Relativity are discussed. Einstein postulate and Lorentz transformation are learnt by the students.

CO2 : Students learn invariance principle of conservation of linear momentum, mass energy equivalence. The force and mass and their transformation are learnt by the students.

CO 3 : Students learn four vector formalism, geometrical interpretation of Lorentz transformation, light cone and Minkowski four dimensional representation.

CO 4 : Students learn interdependence of electric and magnetic field and invariance of Maxwell equations.

PO 1 : The knowledge of Galliaean invariance principle and Loerntz transformation equations helps students to the invariance of law of physics.

PO2 : The mass energy equivalence and its applications help students to understand the conversion of mass into energy and the source of nuclear energy.

PO 3 : The mathematical theory of four vector formalism and geometrical approach help students to understand more better of special theory of relativity.

PO 4 : The transformation of electric and magnetic field and invariance of Maxwell equations make students to understand the invariance of laws of electrodynamics.

Group – B

Statistical Mechanics

CO 1: Students learn probability, binomial and Poisson's distribution and standard deviation.

CO 2 : Students learn aim and scope of Statistical Mechanics. Phase space, Ensemble and Ensemble average, statistical definition entropy and entropy of a perfect gas. They learn Sackur Tetrode formula, Gibb's paradox and specific heat of hydrogen.

CO 3 : Students learn quantum statistics, Bose Einstein statistics and Fermi Dirac statistics. They also learn thermodynamic behavior of ideal Bose gas and Fermi gas.

CO 4 : Students learn classical theory of Black body radiation and Planck's radiation formula. They learn thermodynamic behavior of photon gas.

CO 5 : Students learn Fermi Dirac distribution and behavior of non degenerate Fermi gas. They learn free electron gas in metals and Richardson Dushman equation.

CO 6 : Students learn one dimensional random walk problem and Langevein theory of Brownian motion,

PO 1 : The aim of statistical mechanics is to develop a good description of classical statistics and their various applications.

PO 2 : The ensemble and ensemble average helps students to look into deeper of many particle systems.

PO 3: The applications of quantum statistics make students to solve the problem of black body radiation and basic law of thermodynamics.

PO 4 : The cavity resonator problem is learnt and helps the students to solve its related problems/

PO 5 : The application of Fermi Dirac statistics for metals make students to understand in emission of electrons from metal surface on application of heat.

Group – C

Solid State Physics

CO 1 : Students learn crystal structure, lattice and basis, reciprocal lattice and Miller indices. They learn Bragg's law and importance of Bragg's equation.

CO 2 : Students learn interatomic binding in solids, ionic crystal and cohesive energy calculations of ionic crystals. They learn importance Clausius Mossotti relation and its application.

CO 3 : Students learn free electron theory of metals, Sommerfield model, Wiedeman Franz law and its applications. They learn band theory and explanation of metals, semiconductor and insulators on the basis of band theory.

CO 4 : Students learn dia, para and ferro magnetism and also Langevein theory of dia and para magnetism. They learn Curie and Weiss law of ferromagnetism and hysteresis properties of ferro magnetism.

PO 1 : The crystal structure and its applications helps students to solve the problems in different crystal structure.

PO 2: The crystal binding is gives the idea of formation of solids in different form and develop an idea about the stability of structures.

PO 3 : The free electron theory of matter helps to understand the students different properties of solid like conductivity both heat and electrical.

PO 4 : The idea of magnetic materials helps to develop idea for the different magnetic properties of matter and their applications in practical fields.

Paper – X

CO 1 : Students learn how to measure charge (e) and specific charge of electrom (e/m).They also learn photoelectric effect and its characteristics and Compton effect,

CO 2 : Students learn Bohr's theory and Wilson Sommerfield quantization rule and its application. X – rays spectra Mosley law.

CO 3 : Students learn Stern Gerlach experiment. Electron spin and spin angular momentum. Zeeman effect and Paschen Bach effect.

CO 4 : LS anf JJ coupling and Hund's rule.

CO 5 : Students learn molecular spectra and Raman effect.

CO 6 : Students learn wave particle duality, Davisson Germer experiment and Heisenberg uncertainty principle.

CO 7 : Students learn operators specially Hermitian operator, eigen values and eigen vectors of it.

CO 8 : Students learn Schrodinger's equation and its applications.

CO 9 : Students learn orbital angular momentum operators and its commutation relations.

CO 10 : Students learn general properties of nucleus and different nuclear models and their applications.

CO 11 : Students learn Bethe Weisacher semi empirical mass formula and its application.

CO 12 Students learn artificial radioactivity, α,β , γ and their kinematics.

CO 13 : Students learn different type of detectors and accelerators and their applications,

CO 14 : Students learn nuclear fission and fusion reactions and Q value of nuclear reaction.

CO 15 : Students learn nuclear reaction and kinematics, Q value of nuclear reaction.

CO 16 : Students learn different types of elementary particles and their interactions and quarks.

PAPER XI

CO-1 :- semiconductor basics, energy level diagram, doping, formation of P-N junction and phenomena at the junction

CO-2:- P-N junction diode applications, different types of rectifiers, Zener diode, LEDs, photodiode and solar cell

CO-3:- Bipolar junction transistors, characteristics and different modes of connection, load line analysis,physical mechanism of current flow.

CO-4:- Transistor biasing and bias stabilization, fixed and voltage divider bias. Transistor as a twoport network and h-parameter equivalent circuits. Analysis of single stage CE amplifier ,input output impedances, current, voltage, power gain .

CO-5:- two stage RC coupled amplifier and its frequency response.

CO-6:- Feedback in amplifiers, effect of positive and negative feedback on input/output impedance, gain , stability, distortion, noise.

CO-7:- Sinusoidal oscillators, Barkhausen criterion for self sustained oscillations, RC phase shift oscillator, determination of frequency, Hartley&Colpitt's oscillators.

CO-8:- Operational amplifier black box approach, characteristics of ideal and practical opamp, virtual ground concept, CMRR, open and closed loop gain

CO6: Students learn Simple harmonic motion. Differential equation of SHM and its solutions.

CO7: Students learn Hooke's law, Poisson's Ratio, Rigidity modulus and moment of inertia.

CO8: Students learn Special Theory of Relativity, Length contraction, Time dilation, Relativistic

OVERALL PROGRAMME OUTCOME IN PHYSICS AS MAJOR SUBJECT

After completion of B.Sc,. Course in Physics as major subjects students learn various topics like classical mechanics, electromagnetic theory, mathematical methods, digital and analog and digital electronics, quantum mechanics, nuclear physics, statistical mechanics and thermodynamics. Stuednts also perform different practical work related to their syllabus and gather sufficient knowledge in hands on experiments. Students are well equipped with recent developments in Physical Science and may have sufficient knowledge in pursuing Physics in Post Graduate level and able to continue their study and step forward to research works.