Govt. Navin College Hasoud

Dist – Janjgir Champa (C.G.)

Department of Physics

PROGRAM	PROGRAM OUTCOMES (POs)	PROGRAM SPECIFIC OUTCOMES (PSOs)
B.Sc. PHYSICS (ANNUAL)	**POs 1.** The students should be able to solve the problem. **POs 2.** The students are made aware to improve the importance of energy and water, food, fuels. **POs 3.** The students are aware to basic concept related practical instruments and also including the basic project. **POs 4.** The faces the basic problem of physical laws, describing the motion of bodies, under the influence of system of forces	**PSOs 1.** To provide the basic principles of all branches of physics. **PSOs 2.** To provide basic knowledge of conservation of energy to make the students self sufficient in understanding and handling the various issues that may arise related to physics. **PSOs 3.** To provide the basic knowledge of practical labotary and practical instruments and project. **PSOs 4.** To students provide the basic knowledge of newton mechanics and motion law.
M.Sc. PHYSICS (SEMESTER)	**POs 1.** The students should be able to solve the problem and scientifically, independent and draw the rational conclusions. **POs 2.** English (medium language) being the language of world students became habitual to communicate in English using language of physics. **POs 3.** The students are made aware to improve the importance of energy and water. **POs 4.**the students are make self directed and learning becomes a continuous throughout the life. **POs 5.** The students aware to the electronics word and their uses and applications in daily life with different technologies.	**PSOs 1.** To provide the basic principles of all branches of physics, and also provide the new knowledge of scientific research field to related subject. **PSOs 2.** To provide the basic communication skills to the related subject. And this then interpreted using theoretical principles. **PSOs 3.** To provide basic knowledge of conservation of energy to make the the students self sufficient in understanding and handling the various issues that may arise related to physics. **PSOs 4.** To students provide the basic knowledge of life learning concept. **PSOs 5.** To provide the basic knowledge of electronics part and also provide the its uses and applications.
CLASS	COURSE	COURSE OUTCOMES (COs)
B.Sc. - I YEAR	PAPER – I MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER	1. Understand Newton's laws and apply them in calculations of the motion of simple systems. 2. Use the free body diagrams to analyse the forces on the object. 3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them. 4. Explain the Motion under a central force, Kepler's laws. Effect of Centrifugal and Coriolis forces due to earth’s rotation 5.To explain the Rigid body motion, rotational motion, moments of inertia and their products, principal moments & axes.

		6. To explain the Elasticity: Strain and stress, elastic limit, Hooke's law, Modulus of rigidity, Poisson's ratio, Bulk modulus, relation connecting different elastic- constants, twisting couple of a cylinder (solid and hallow), Bending moment, Cantilever, Young modulus by bending of beam.
	PAPER – II ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY	1. Learn the Concepts as definition of a double and triple integral. Gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, and their geometrical interpretation, Gauss's divergence theorem, Green's theorem and Stoke's theorem and their physical significance. 2. To demonstrate the relation between Electric potential and Electric field, torque on a dipole in a uniform electric field and its energy, flux of the electric field. Gauss's law and its application. 3. to explain the Dielectric constant, Polar and Non Polar dielectrics, Dielectrics and Gauss's Law, Dielectric Polarization, Polarizability and mechanism of Polarization, Lorentz local field, ClausiusMossotti equation, Ferroelectric and Paraelectric dielectrics, rise and decay of current in LR, CR and LCR circuits. 4. Magnetization Current and magnetization vector, Diamagnetic, paramagnetic and ferromagnetic substances and Biot-Savart's Law and its applications 5. Electromagnetic induction, Faraday's law, Maxwell's displacement current, Maxwell's equations.

BSc. - II YEAR	Paper – I THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS	1. To explain the law of thermodynamics and concept of entropy . 2. To explain the function of thermodynamics quantity and also Maxwell's equation, black body radiation with plank quantum theory. 3. To demonstrate the basic statistical of thermodynamics including with probability, concept of phase space, Boltazman entropy relation and distribution law. 4. To explain the concept of partition function and the concept of statistics with M-B, B-E, and F-D.
	PAPER – II WAVE, SOUND AND OPTICS	1. To understand the basic of wave theory and production of ultrasonic wave and infrasonic waves with their application and principle sonar system and reflection, reffrection and diffractoion. 2. To explain the principle of Fermat's of extremum path and monochromatic aberration & their reductions, and optical instruments. 3. To demonstrate the basic theory of interference of light: the principle of superposition with their application. 4. To explain the basic theory of diffraction , type of diffraction fresnel's diffraction etc. 5. To explain the basic theory laser with type and different experimental method and properties of laser.

B.Sc. - III YEAR	PAPER – I RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS	1. To explain the basic of Postulates for the special theory of ralativity, Lorentz tranformations, length contraction,time dilation, velocity additon theorem, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass, Compton effect. 2. To explain the basic Origin of the quantum theory : Failure of classical physics to explain the phenomena black-body spectrum, photoelectric effect, and Wave-particle duality and uncertainty principle. 3. To understand the basic of Quantum Mechanics : Schrodinger's equation. Postulatory basis of quantum mechanics, operators, expectation values, transition probabilities, applications to particle in a oneand three dimensional boxes and H- atom. 4. To learn the basic of Spectra of hydrogen, pure rotatinal and rotation vibration spectra and Raman effect, and Stokes and anti-Stokes lines. 5. To explain basic Structure of nuclei, basic properties and Gamow's explanation of beta decay, alpha decay and continuous and discrete spectra. Nuclear reactions, channels, compound nucleus, direct reaction (concepts). Shell model & liquid drop model, fission and fusion.
	PAPER – II SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS	1. To explain basic of Amorphous and crystallinesolids, Elements of symmetry and Laue's equation for X-ray diffraction, Bragg's Law. Specific heat of solids, classical theory. 2. To explain the Free electron model of a Metals, Insulator and Semiconductors. Hall effect. Dia, Para and Ferromagnetism. Langevin's theory of dia and para-magnetism. Curie Weiss's Law. 3. To explain the Intrinsic semiconductors and Light emmitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET. 4. To explain basic of Half and full wave rectifier, rectifier efficiency ripple factor, Bridge rectifier, Filters,Inductor filter, T and N filters, Zener diode, regulated power supply. Applications of transistors. 5. To explain basic the Introduction to C programming and application to simple problems of arranging numbers in ascending / descending orders :

		sorting a given data in an array, solution of simultaneous equation.
M.Sc. – I SEM.	PAPER – I Mathematical Methods-I	UNIT - I To explain the basic of Vector Spaces and Matrices linear independence Bases; Dimensionality; Inner product; linear transformations; Matrices; Inverse; Orthogonal and unitary matrices; Independent elements of a matrix; Eigen values and eigenvectors. UNIT - II Special Functions; Solution by series expansion; Legendre Polynomial Legendre polynomials; Recurrence formulae and orthogonal properties, Laguerre Polynomial Generating function. UNIT - III Bessel's Differential equations, First and Second kind, Recurrence formulae and generating function for Jn (x), Jacob! Series Bessel's Integrals, orthonormality of Bessel's functions and Hermite Differential equation and polynomials, generating function, Recurrence relation, Rodrigue formula, orthogonality UNIT-IV Integral Transforms, Laplace transform; first and second shifting theorems; Inverse LT by partial fractions and Fourier series; FS or arbitrary period.
	PAPER – II Classical Mechanics	UNIT-I Conservation Principles, Mechanics of particle conservation Principles for system of particles. Constrained motion constraints and degrees of freedom generalised coordinates, Generalised Notations. UNIT - II Variational Principle Euler Lagrange differential equation. Hamilton variational principle Deduction of Hamilton's Principle from D'Alemberts principle. UNIT - III Hamiltonian formulation of mechanics: Phase space and the motion of the system, Hamiltonian function, Hamilton's canonical equation of motion. And its application UNIT - IV Canonical or constant transformation, its advantage example of canonical transformation, necessary and sufficient condition for a transformation to be canonical, Infinitesional

		contact transformations.
	PAPER - III NUMERICAL METHOD AND C – PROGRAMMING	UNIT-I Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing. Character set, constants. UNIT-II Control structure, If statement, if else statement, multi-way decision, compound statement. Loops: for loop, while loop, do while loop, break statement, compound statement continue statement, go to statement Function: function main and array. UNIT-III (Without Programming) Method for determination of zeroes of linear, non linear, algebraic equations, and transcendental equations and their convergence. Solution of simultaneous linear equations, Gaussian elimination pivoting, iterative method matrix inversion. UNIT-IV (Without Programming) Finite deference interpolation with equally spaced and unequally spaced points, Numerical differentiation and Integration, Newton cote's formula, Monte Carlos evaluation of Integral Numerical solution of ordinary differential equation. Euler and RungaKutta methods. Predictor corrector method.
	PAPER - IV ELECTRONICS – I	UNIT- I Junction Field Effect Transistor (FET), Metal Oxide Field Effect Transistor (MOSFET) - DE MOSFET and E-MOSFET, UNIT -II MIS Diode: Introduction, Energy band diagram, accumulation, depletion and inversion condition concept of surface space charge and mos diode. UNIT - III Microwave devices: Tunnel Diode, Gun Diode, Backward Diode and IMPATT Diode. UNIT - IV Modulation : Definition , Types of Modulation, Mathematical expression of modulation, Percentage of modulation, DSBSC, SSB and FDM.
M.Sc. – II	PAPER – I	

	MATHEMATICAL METHODS- II	UNIT- I Tensors, Definition of Tensor, contra variant and covariant tensors and Christophers symbol and their transformation law. UNIT- II Green's function: Non-homogeneous boundary value problem, Green's function for one dimensional problem, eigen function expansion of Green's function. UNIT -III Boundary value problems: Transverse vibration of a stretched string, D'Alembert solution, Two dimensional heat flow, rectangular membrane, Poisson's and Laplace equations. UNIT -IV Function of Complex Variables, limit, continuity and differentiability , Analytic function, the necessary and sufficient condition for a function to be analytic and Cauchy-Riemann condition, Cauchy integral theorem.
	PAPER-II QUNATUM MECHANICS-I	UNIT - I Inadequacy of classical mechanics; Schrodinger equation; Continuity equation; Ehrenfest theorem; Admissible wave functions; Stationary states. UNIT- II Uncertainty relation of x and p, States with minimum uncertainty product; Representation of states and dynamical variables; Completeness of Eigen function; Direct delta function; bra and ket notation. UNIT - III Angular momentum ; Commutation relationship , Eigen values, Spin Angular Momentum , Paulis Matrices , Addition of Angular Momentum, Clebsch-Gordon Coefficients and H – atom. UNIT- IV Time-independent perturbation theory; Non-degenerate cases; first order Perturbation Degenerate cases, Applications such as Stark effect. Zeeman Effect without electron spin.
	PAPER - III ELECTRODYNAMICS	UNIT - I Equation of continuity, Maxwell's equations (SI unit) and its derivation, Maxwell's equations , Electromagnetic energy: Poynting Theorem and Plane electromagnetic waves. UNIT -III

		Postulates of Einstein's special theory of relativity, Galilean transformations. Lorentz's transformations and it's consequence, Transformation of differential operator, Invariance of D'Alembertian operator. UNIT -IV Electromagnetic vector and scalar potential, Lorentz Gauge, LienardWiechart potentials, the electromagnetic field of a uniformly moving point charge, Radiation from anaccelerated charge at low velocity - Larmer's formula.
	PAPER - IV ELECTRONICS - II	UNIT - I Radiative and non radiative transitions , Optical Absorption, bulk and thin film, photoconductive devices (LDR) , Emission spectra , Luminescent efficiency , method of excitation. Light emitting diode (LED). UNIT - II Photo detectors: Photoconductor, equivalent circuit of photoconductor. Phototransistor. Bipolar phototransistor, photo - Darlington transistor and Solar cells. UNIT - III Basic Op-amp. Differential amplifier - circuit configurations, dual input, balanced output,differential amplifier, Block diagram of a typical Op-amp. Analysis, open loop configuration, inverting and non-inverting amplifier. UNIT - IV Practical Op-amp. Input offset voltage, Input offset current, total output offset voltage, CMRR frequency response, DC and AC amplifier
M.Sc. – III SEM	PAPER - I QUANTUM MECHANICS-II	UNIT - I Variational method, principle, Application to problems like H atom, He atom, harmonic oscillator. WKB method, connection formula. UNIT - II Time dependent perturbation theory, harmonic perturbation theory, harmonic perturbation, constant perturbation, Fermi's Golden rule. UNIT - III Collision in 3d., scattering, scattering amplitude scattering cross section, Born approximation and its validity scattering by spherically symmetric potential.

		UNIT - IV Identical particle symmetric anti symmetric wave function, spin angular momentum. Relativistic quantum mechanics, Klein Gorden equation, Dirac equation for free particle.
	PAPER - II STATISTICAL MECHANICS	UNIT - I Foundation of statistical mechanics, specification of states of a system contact between statistics and thermodynamics, classical ideal gas entropy of mixing and Gibb.s paradox. Microcanonical ensemble and partition function. UNIT-II Statistics of ensembles, statistics of indistinguishable particles, density matrix, Maxwell - Boltzmann, Fermi Dirac and Bose-Einstein statistics, properties of ideal Bose gases,Bose . Einstein condensation. UNIT-III Cluster expansion for a classical gas, viriai equation of state, mean field theory of Ising model in 3, 2 and 1 dimension. Exact solution in one-dimension. UNIT-IV Thermodynamics fluctuation, fluctuation in energy, pressure, volume and enthalpy, one dimensional random walk, Brownian movement, Langevin theory, fluctuation dissipation theorem, Fokker-Plank equation, Onsager reciprocfty relation.
	PAPER III CONDENSED MATTER PHYSICS – I	UNIT - I Crystalline and amorphous solids, unit cells and direct lattice. Two and three dimensional Bravaislattices , Laue's equation, Bragg's Law, Reciprocal lattice, Ewald's construction, Brillolin Zones. UNIT - II Defects or imperfections in crystals and their classification, Point defects, Schottky and Frenkel defects, Edge and Screw dislocations. UNIT - III Electron's in a periodic lattice, Block theorem, Kroning-Panny model, Band theory, Classification of solids, effective mass, Tight bonding, de Haas von Alfen effect, quantum Hall Effect. UNIT - IV Weiss theory of ferromagnetism, Heisenberg model and molecular field theory, Curie -Weiss

	PAPER IV ELECTRONICS - III	law for susceptibility, Ferri and Antiferromagnetic order, Doman's and Block wall energy. Spin waves and magnoins. UNIT -I Number system : Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion, BCD addition and subtraction Logic gates: Positive and negative logic, Basic gates, Universal building block. Basic laws of Boolean Algebra, De-Morgan's Theorem UNIT - II Ex-OR gate, Ex-NOR gate circuitry, Half adder, Full adder, binary parallel adder, Serial adder, Half Subtracter, Full Subtracter and BCD, Multiplexer, DeMultiplexer. UNIT - III Flip-flop and timing diagram, RS flip-flop using NOR gate, RS flip-flop using NAND gate, Clocked RS flip-flop, D- latch flip-flop, Preset and Clear, JK flip-flop and Registers: Parallel and shift Register, Scaling, PIPO, SIPO, PISO, SCSI. UNIT - IV Digital to analog converter and Analog to Digital converters : D/A converters using binary weighted resistor network and R-2R ladder Network; Counter type A/D converter, Successive approximation A/D.
M.SC. – IV SEM	PAPER - I CONDENSED MATTER PHYSICS – II	UNIT - I Superconductivity, critical temperature, persistent current, Meissner effect and flux penetration, type I and type II superconductors, London's equations, BCS theory of superconductivity. UNIT - II Polarization, depolarization field, local electric field at an atom, Lorenz field, dielectricconstant and polarizabflity, Electronic polarizability, Ionic and orientationalpoiarizability, Landau theory of phase transition. UNIT - III Energy bands in semiconductor, Intrinsic and Extrinsic semiconductors, Drift velocity, mobility, carrier concentration and Fermi level for intrinsic and extrinsic semiconductors. UNIT - IV

		Interatomic forces and lattice dynamics of simple metals, ionic and covalent crystals, lattice dynamics of linear monoatomic and diatomic lattices, Quantization of elastic waves/ phonons, momentum of phonons.
	PAPER - II NUCLEAR PHYSICS	UNIT I Nuclear Decay: α decay: Measurement of α particles energies, particle spectra, Geiger Nuttal law, barrier penetration applied to α decay and β decay. UNIT II Nuclear Reactions and Energy: Conservation laws, Q equation, theories of nuclear reactions, partial wave analysis, compound nucleus: formation and breakup, resonance scattering and reactions. UNIT III Counters and Accelerators Gas filled counter, solid state counter, scintillation counters, neutron detection. Accelerators: Cyclotron, linear accelerators, betatron, electron synchrotron, proton synchrotron. UNIT IV Elementary Particles Classification of elementary particles, basic particle interactions, conservation laws, invariance under parity, CP, time, CPT,
	PAPER - III ATOMIC AND MOLECULAR PHYSICS	UNIT-I Spectra of hydrogen and hydrogen like atoms, Reduced mass of electron, Variation of Rydberg constant, Sommerfeld's UNIT -II Spectra of Helium, Alkaline earth atoms, Singlet - Triplet series, L S and J J coupling, Interaction energy, Doublet Fine structure of X-ray spectra, normal and anamolouszeeman effect, Paschen Back effect. UNIT – III Types of molecules, Diatomic linear symmetric top, asymmetric top molecules, Rotational energy and spectra of diatomic molecules as rigid rotor and non - rigid rotor. UNIT -IV Vibrational energy of diatomic molecule, Energy levels, spectrum and Morse potential energy curve, dissociation energy.
	PAPER - IV ELECTRONICS- IV	UNIT - I

		Microprocessor & Micro Computers:-Evolution of Microprocessor, Internal Microprocessor, Architecture, Architecture of digital Computer, and memory, networking. UNIT - II Intel 8085: ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration. Instruction Cycle and Machine Cycle, Instruction and Data flow. UNIT - III Addressing Modes, Instruction set of 8085Assembly Language Programs. UNIT - IV Optical Fibers: Introduction, Structure, Classification, Refraction and Snell's law, Total internal refraction, Types of Optical Fiber : HPSUU, HPSIR, Halide fiber.