SYLLABUS OF PHYSICS

UGPHS-01
Elementary Mechanics

Block- 1 Concept in Mechanics

Unit-1 **Motion –** Introduction, Language, for describing motion, vectors, Products of vectors, Displacement, Velocity & Acceleration, Uniform Circular motion, Relative motion.

Unit-2 **Force and Momentum –** Introduction, Newton's of motion, Application of Newton's Equilibrium of forces, Linear Momentum Conservation of linear momentum, Impulse, motion with mass.

Unit-3 **Work and Energy –** Introduction, works dome by constant force & variable force, Energy, Kinetic Energy – work-energy, Theorem, Conservative force and Potential Energy, Principal of Conservation of energy, Elastic and Inelastic collisions, Power

Unit-4 **Angular Motion –** Introduction, Kinematics of Angular motion, angular displacement, angular velocity and angular acceleration relation linear and angular kinematical variables, circular motion, Torque, kinetic energy of rotation, angular momentum, conservation of angular momentum and its application

Unit- 5 **Gravitation –** Introduction, Law of Gravitation, arriving at the law moon's rotation about earth, principal of superposition, Gravitational field and potential Gravitational P.E., due to a spherical shell and solid sphere, Gravity and its variation, velocity of scope, fundamental forces in Nature.

Block - 2 **Systems of Particles**

Unit-6 **Motion under Central Conservative Forces-** Central conservative forces, Properties of motion under central conservation forces, Inverse square central conservative forces.

Unit – 7 **Many-Particles System –** Introduction, Motion of two-body system, equation of motion in centre of mass and relative coordinates, linear and angular momentum and kinetic energy, dynamics and many particle system, linear momentum, Angular momentum , K.E. of N-Particle system.

Unit-8 **Scattering –** Introduction, Scattering cross-sections, differential cross – section total cross-section, laboratory and centre of mass farmers of reference, Relations between augus and scattering cross section in the lab and C.M. Farmers of Reference, Impact Parameters, Elasting Scattering of two Hard Shapers, Rutherford scattering.

Unit-9 **Rigid Body Dynamics-** Introduction, a rigid body and its motion, Translational, general and Rotational motion of a rigid body, moment of inertia, determination of moment of Inertia of a rigid body. Rotational Dynamics of rigid body, rotational Analogue of Newton's second law, work and energy in Rotational motion, conservation of Angular momentum and its Application, Precession.

Unit-10 **Motion in Non Inertial Frames of References-** Introduction, Non- inertial frame of reference, motion observed from a non-inertial frame, Newton's Second law and Inertial Forces, Weightlessness. Rotating Frame of reference, Time derivatives in Inertial and Rotating Frames, centrifugal force, carioles forces, The earth as a rotating frame of reference, the variation of g with latitude , Motion on the rotating earth, Foucault's Pendulum.

UGPHS-03
Oscillation and Waves

Block- 1 Oscillations and Waves

Unit-1 **Simple Harmonic Motion (SHM) –** Introduction, SHM-, basic characteristics, oscillations of spring mass system, differential equation of SHM. Amplitude and phase, Time Period and frequency, velocity and Acceleration, example of SHM.

Unit-2 **Superposition of Simple Harmonic Oscillations –** Introduction, Principles of Superposition, Superposition of two Harmonic oscillations of two collinear Harmonic oscillations of different frequencies, superposition of many harmonic oscillation of the same frequencies, Method of vector addition method of complex numbers, oscillations in two dimensions, superposition of two mutually perpendicular Harmonic and too harmonic oscillations of same and nearly equal frequencies.

Unit-3 **Damped Harmonic Motion –** Introduction, Differential equation of a Damped oscillators, Solutions of differential equation, heavy damping, critical damping, weak or light damping, methods of describing damping, logarithmic decrement, relaxation time, quality factor, examples of weakly damped systems, LCR circuit, Galvanometer.

Unit-4 **Forced oscillations and resonance-** Introduction, differential equation of a weakly damped forced oscillators, Solution of the differential equations, steady state solution, Effect of the frequency of the driving force on the amplitude and phase of steady – state forced oscillations law driving frequency, Resonance, frequency, high driving frequency, power absorbed by a forced oscillator, Quality factory.

Unit-5 **Coupled Oscillations-** Introduction, Oscillations of two coupled masses, differential equation, co-ordinates and Normal modes, Modulation of Coupled oscillations, Energy of two couple masses, Normal mode Analysis of other coupled systems two coupled pendulums, inductive coupled LC-circuits, longitudinal oscillations of N – coupled masses : The wave equation.

Block – 2 **Waves**

Unit-6 **Wave Motion –** Introduction, Basic concepts of wave motion, types, propagation, Graphical representation of wave motion, Relation between phase velocity, Frequency and wavelength Mathematical description of wave motion, energy Transported by progressive waves, One dimensional progressive waves. Waves equations, waves on stretched string, waves in fluid, waves in uniform Rod, Wave motion and impedance, Transverse waves, sound waves, Waves in two and three dimensions.

Unit-7 **Waves at the Boundary of two media –** Introduction, Concept of wave of wave front and Huygen's Constitution, Reflection and Refraction of waves, Transmission Amplitude Coefficients, Transverse and longitudinal waves, Transmission energy Coefficients, the Doppler effect, Source in motion and observed both in motion, shock stationary and observed in motion, source and observed both in motion, shock waves.

Unit-8 **Superposition of Waves-I –** Introduction, Principle of superposition of waves stationary waves, velocity of a particle and strain at any point in a stationary wave. Harmonics in stationary wave, properties of stationary waves, waves groups and group velocity beats.

Unit-9 **Superposition of Waves-II –** Introduction, Interference, coherent sources, Interference between waves from two slits, Intensity distribution in interference pattern interference in thin films, Diffraction, types fraunhofer and frensel, fraunhofer diffraction by a single lilt, diffraction by a single slit, diffraction at a straight Edge.

UGPHS-04
Electric and Magnetic Phenomena

Block- 1 Electrostatics in free space

Unit-1 **Electric Charge, Force and field –** Introduction, Propertied, types, unit conservation, Quantization of charge, coulomb's law, Principle of superposition, electric lines of force.

Unit-2 **Gauss's Law –** Introduction, Counting lines of force, electric flux, Gauss's law, spherical, line, plane symmetry, Charge isolated conductor, differential.

Unit-3 **Electric Potential -** Introduction, Gradient of Scalar, Line Integral of vector, line integral of electric field, path independence of line integral of electric field, consequence of path Independence, Electric potential, Potential due to system of charge potential difference relation between electric field and electric potential, Electric field and potential of an electric Dipole and quadrupeds; Dipole in an electric field

Unit- 4 **Potential for continuous charge distributions and Energy –** Introduction, line charge, charge circular Disc, equi potential surface, electrostatic potential energy, Nature of electrostatic force method of Images.

Block -2 **Electrostatic in Medium**

Unit-5 **Macroscopic Properties of Dielectrics -** Introduction, Simple models of dielectric material, Behavior of a dielectric in a electric field, Gauss's law in dielectric medium, displacement Vector, Boundary conditions D and E, Dielectric Strength and Dielectric Breakdown

Unit-6 **Capacitor –** Introduction, Capacitor, Parallel plate capacitor or condenser energy stored in a capacitor, Parallel plate capacitor with dielectrics, Voltage, rating of capacitor, capacitance of cylindrical capacitor, capacitor in series and parallel, combinations of capacitor in parallel and series energy, stored in a dielectric medium practical capacitors, Fixed, Ceramic, Electrolytic, variable air capacitor/ Gang Capacitor, Guard Ring Capacitor.

Unit-7 **Microscopic properties of dielectrics -** Introduction, uniform electric field, Clausius mossotte formula, Polarisation in Gas, Relation and Refractive Index: Behavior or dielectric in changing Alternating Fields, Role of dielectric in practical life.

Block -3 Electric Current and Magnetic Field

Unit-8 **Electric Current-** Introduction, electric current and current density conduction mechanism, Drift velocity and ohm's law Temperature dependence of resistively, Break down of ohm's law current voltage relationship of Diode (non-ohmic conduct).

Unit-9 **Magnetic Field-** Introduction, Def^{n} and source of magnetic field Gauss's law of magnetism, Biot and savart law. Force between two parallel Conductors, Ampere's law , Application and differential forms of ampere's Torque on a current loop.

Unit-10 **Motion of charges in electric and magnetic field –** Introduction, motion in an electric field, motion in magnetic field, cathode Roy oscilloscope (CRO) electrostatic Deflection, magnetic Deflection, Lorentz force and its applications velocity selector cyclotron.

Unit-11 **Magnetism of materials – I** Introduction, response of various substance of a magnetic field, magnetic field, magnetic moment and Angular momentum of an Atom, Diamagnetism and Paramagnetism, Interaction of an atom with magnetic field, larmor Precession, magnetization of paramagnets.

Unit- 12 **Magnetism of materials- II** Introduction, Ferromagnetism, magnetic field due to a magnetized material, The Auxiliary field H, Magnetic Intensity, Relationship between B an H for magnetic material, magnetic circuits.

Block-4 **Electromagnetism**

Unit-13 **Electromagnetic Induction-** Introduction, Induced currents, faraday's law, lenz's law, motional electrometric force, Inductance self and mutual inductance, The transformer, energy stored in magnetic field, and Inductor.

Unit-14 **Maxwell's equations and electromagnetic waves –** Introduction, Maxwell's equations, electrometric force Inductance self and mutual Inductance, The transformer, Energy stored in a magnetic field and Inductor.

Unit-15 **Reflection and Refraction of electromagnetic waves –** Introduction, Boundary conditions, reflection and refraction at normal incidence, law of reflection and refraction, Generation of electromagnetic waves.

UGPHS-05

Electrical Circuit and Electronics

Block- 1 Network Analysis and Devices

Unit-1 **Circuit Analysis –** Introduction, Circuit elements, Kirchoff's law, complex Impedances, Current-voltage source, Transformations, Superposition, Theorem, Reciprocity Theorem, Thevenin's Theorem, Norton's Theorem, maximum power Transfer theorem.

Unit-2 **A.C. and D.C. Circuit-** Introduction, recall complex Impedance, Resonant circuit, Series resonant circuit independence and phase angle of series resonant circuit, voltage and current in series resonant circuit, Band width of RLC circuit Parallel Resonance, Q factor of parallel resonant circuit, Impedance matching, Theory of passive filters, constant K law and high filter, Band pass filters, Attenuator, T-Z and lattice Attenuator.

Unit-3 **Electron Device-** Introduction, vacuum tubes, thermionic Emission, Vacuum Diode, Triode, Tetrode and Pentode, Semiconductor materials, p-n Junction Diodes, Transistor, MOSEFT.

Block-2 **Electronic Circuits**

Unit-4 **Amplifiers-** Introduction, Classification, equivalent circuit of transistor, common Emitter, common base, common collector amplifier, operating point and bias stability, small signal amplifier, coupling and by pass capacitors multistage amplifiers, frequency response of an R-C coupled amplifiers, large signal amplifiers, single ended power amplifiers, push-pull amplifiers. Raio frequency amplifiers, single and double tuned voltage amplifiers.

Unit-5 **Oscillators-** Introduction, concept of feedback, negative feed bade and its effect on amplifiers performance, positive feedback and oscillations, LC oscillators, Tuned collector Oscillators, Hartley and colpit oscillators, R-C oscillators, phase- shift oscillator, wien bridge oscillator.

Unit-6 **Power Supply-** Introduction, power source, voltage & current source DC power unit the transformer, half wave rectification full wave rectification, performance of half and full wave rectification, filter circuits, capacitance, Inductance and LC Filters, Regulation of output voltage, principle of regulation, Zener regulator.

Block-3 **Linear Integrated Circuits**

Unit-7 **The operational Amplifier-** Introduction, Technical detailed of op amps, symbol, Package, Number Code, Power supply, Precautions, characteristics of op Amps, input-output relationship,

input offset voltage, output offset voltage Differential input resistance, common mode rejection ratio maximum output current, power consumption, slew rate, Gain Bandwidth product, characteristics of Ideal of Amp. And 741C, Equipment circuit of an op amp. Ideal voltage Transfer cure, op amp as a comparator, voltage level Detector, Zero crossing detector.

Unit-8 **Applications of operational Amplifiers-** Introduction, Inverting amplifiers, non-inverting amplifiers, inverting adder, Basic, differentiator, Basic integrator, feedback in op Amp.

Unit-9 **Linear IC's- Amplifiers and Voltage regulators-** Introduction, Power amplifiers IC LM380, Pin out and block diagram, fixed Gain audio amplifier, Higher and variable Gain amplifiers, voltage Regulator IC's Dropout voltage, self protection circuit, performance parameter, fixed voltage regulators adjustable voltage regulators.

Block-4 **Digital Electronics**

Unit-10 **Number System and Codes-** Introduction, Binary Number system, Octal number system, Octal to Decimal to Octal, Octal to binary, Binary to octal conversion, Hexadecimal number system, Hex to Decimal, Decimal to Hex, Hex to binary, Binary to Hex, Hex to octal to Hex conversion, Codes, BCD and ASCII code, binary arithmetic.

Unit-11 **Fundamentals of Boolean algebra and Flip Flops –** Introduction, logic Gates, AHP, OR, NOT Gates, Combination of logic Gates, Boolean theorem, Algebric method for combinational logic, exclusive- OR and MOR Gates, Half and full adder, Flip-Flops, RS flop, Flop clocked RS, D, and JK flip flop.

Unit-12 **Registration, Counters, Memory circuit and Analog/ Digital Converters-** Introduction, Registers, Buffer, Controlled Buffer, Shift Controlled Shift registers, Counters, People counters, Synchronous Ring, Controlled synchronous, decade counter, Semiconductor memories, RAM, ROM, A/D and D/A converters.

Unit-13 **Electronic Instruments –** Introduction, Cathode Roy oscilloscope, Cathode Ray Tube, The Basic oscilloscope, laboratory, oscilloscopes, Measurement of voltage, current and time, digital and storage oscilloscope, signal Generators, Electronic voltmeter, Power meter, magnetic field meter.

UGPHS-06

Thermodynamics and Statistical Mechanics

Block-1 **The Zeroth Law & the First Law**

Unit-1 **Basic concepts of thermodynamics –** Introduction, Classifications of system and Boundaries, Intensive and Extensive variables, Thermodynamic equilibrium, eversible and irreversible process, quasistatic process, The Zoroth law of Thermodynamics The equation of state.

Unit-2 **Measurement of Temperature-** Introduction, principles of measurement of temperature, Gas Thermometer, Resistance Thermometers, Thermocouples radiation, pyrometers, the international practical temperature scale.

Unit-3 **The first law of Thermodynamics-** Introduction, heat work, expression for work, path dependence of work and heat, internal energy, First law of Thermodynamics.

Unit-4 **Applications of the first law of Thermodynamics -** Introduction, Difference of heat capacities of a gas, equation of state for adiabatic processes, the enthalpy Hess's law.

Block-2 The second and The third Law of Thermodynamics-

Unit-5 Entropy and the second law of Thermodunamics- Introduction, Entropy, The second law of Thermodynamics, Entropy change of an ideal gas, entropy of mixing and phase transition, The Carnot cycle, Heat Engines, Refrigerators.

Unit-6 The Thermodynamic Potentials – Introduction, Thermodynamic potential functions, General Condition for thermodynamic equilibrium, equilibrium conditions for specific processes, Maxwell's relations, Deductions from Maxwell's relations, Tds equations, energy equations, Heat capacity equations.

Unit-7 Phase Transitions- Introduction, Phase equilibrium, First order phase transitions, Latent Heat equations, Higher order phase transitions, Gibbs phase rule.

Unit-8 Production of law temperatures and The Third law- Introduction, ordinary methods of cooling, Joule Thomson effect, liquefaction of Gases, Adiabatic demagnetization, The third law of thermodynamics consequences of the third law Unassailability of absolute Zero.

Block-3 Elementary Kinetic Theory

Unit-9 Ideal Gases- Introduction, Assumptions of Kinetic Theory, pressure exerted by a gas, Kinetic interpretation of temperature molecular speeds, deduction of gas laws, Equipartition of energy , Head capacities of gases.

Unit-10 Transport Phenomena- Introduction, mean free path, elementary derivation distribution of free paths, experimental determination, Transport phenomena viscosity, transport of momentum thermal conductivity, transport of energy, diffusion, Transport of matter.

Unit-11 Brownian Motion – Introduction Brownian motion revisited, one dimensional random work, Theoretical analysis of Brownian motion Einstein's derivation, langevin's analysis, determination of Auogadra's Number.

Unit-12 Real Gases- Introduction, Deviations from Ideal Gas Behaviour Vander Waals equation of state, other equations of state.

Block-4 Elements of Statistical Mechanics

Unit-13 Basic Concepts of Statistical Mechanics- Introduction, elementary probability theory, elementary, combinatories random variables, Description of system in

equilibrium, Bridging Microscopic and Macroscopic view points, Distribution functions.

Unit-14 **The Partition function-** Introduction, The partition function of an ideal monatomic gas, Thermodynamics functions, Gibbs Paradox, The Sackur tetrode formula, Diatomic gases, Rotational and vibrational partition functions, Heat capacity of hydrogen.

Unit-15 **Quantum Statistics –** Introduction, towards quantum statistics, Ideal Base Einstein Gas, Einstein distribution function, Bose's derivation of plank's law, condensation, Ideal Fermi Dirac Gas Fermi- Dirac distribution function, Fermi energy, Electronic Heat capacity.

UGPHS-07

Optics

Block-1 Introduce Light

Unit-1 **Nature of Light –** Introduction, the corpuscular model, the wave model, light as an electromagnetic wave, the pointing, vector, the electromagnetic spectrum.

Unit-2 **Reflection and Refraction of light-** Introduction, electromagnetic waves at the interface separating two media, idealization of waves as light rays, Fermat's principle.

Unit-3 **Perception of light-** Introduction, Human vision, colour vision, colour receptors.

Unit-4 **Polarisation of light-** Introduction, simple state of polarized light, linear polarization, circular polarization, Elliptical polarization, principles of producing linearly polarized light, Malu's law, Brewser's law, polarization by double refraction, selective absorption dichrosim, wave place circular elliptic polarizes.

Block-2 Interference

Unit-5 **Interference by Division of wave front-** Introduction, wave motion, principle of superposition, Young's double-slit Experiment, white light fringes, displacement of fringes, fresnel's Biprism.

Unit-6 **Interference of division of amplitude-** Introduction, stokes analysis of phase change on reflection, Interference in thin films, interference by a wedge, shaped film Newton's Rings, applications of the principle of interference in thin films.

Unit-7 **Interferometry-** Introduction, Micheloson Interferometer, circular fringes, localized fringes, white light fringes, adjustment of the Michelson interferometer, Fabryperot, Interferometer, Intensity distribution, Superiority over Michelson, Interferometer.

Blcok-3 **Diffraction**

Unit-8 **Fresnel Diffraction-** Introduction, observing diffraction, diffraction pattern transition from Fresnel to fraunhofer class, Fresnel construction, Half period elements, Rectilinear Propagation, the zone plate, diffraction patterns of simple obstacles, circular aperture, straight edge.

Unit-9 **Fraunhoper diffraction-** Introduction, diffraction from single slit, diffraction by circular aperture.

Unit-10 **Diffraction Grating –** Introduction, diffraction from two vertical slits, Intensity distribution in double slit pattern, positions of minima and maxima, missing

orders, graphical presentation Fraunhofer pattern from Nidential slits, diffraction grating.

Unit-11 **Diffraction and resolution-** Introduction, diffraction and image Astronomical telescope, microscope, diffraction grating, Improving resolution, Michelson stellar interferometer.

Block-4 Lasers and their applications

Unit-12 **Coherence –** Introduction, temporal coherence, spatial coherence, visibility of frienges.

Unit-13 **Physics of Lasers –** Introduction, light emission and absorption, Quantum Theory, Einstein's prediction, prerequisites for a laser, Types of lasers, applications of lasers.

Unit-14 **Holography –** Introduction, production of hologram, reconstruction of image, application of holography.

Unit-15 **Fibre Optics –** Introduction, optical fibre, Types of fibres, optical communication through fibres, Pulse, dispersion, step- index fibre, GRIH Fibre, material dispersion, power loss.

UGPHS-08

Modern Physics

Block-1 Special Theory of Relativity

Unit-1 Emergence of special relativity – Introduction, Classical relativity, Galilean Transformation Galilean principle of relativity, Electromagnetism and classical relativity, Galilean relativity and the speed of light, Michelson – morley experiments. The special theory of relativity, principle of relativity and constancy of speed of light.

Unit-2 **Relativistic Kinematics –** Introduction Lorentz Transformation, implications of special relativity, length contraction, Time dilation relativistic transformation of velocity; relativistic Doppler effect.

Unit-3 **Relativistic Dynamics-** Introduction, Dynamics of single particle, linear momentum, relativistic energy, equivalence of mass and energy, momentum of a free particle.

Block-2 **An Introduction to Quantum Mechanics**

Unit-4 **Wave-particle Duality-** Introduction, birth of quantum physics, the de Broglie hypothesis, wave – particle duality, Experimental Evidence for the existence of matter waves.

Unit-5 **Matter waves and uncertainty principle -** Introduction, matter waves, uncertainty principle, its application.

Unit-6 **Schrodinger Equation -** Introduction, one diamentional Schrodinger equation, Statistical Interpretations of wave function; probability of wave functions, Time dependent Schrodinger equation Boundary conditions and acceptable solutions.

Unit-7 **Observables and operators –** Introduction, quantum mechanical operators, properties of operators, expectation values, Engen functions and Eigen values, Ehrenfest theorem.

Block-3 Application of Quantum Mechanics to some systems

Unit-8 **Some Simple System –** Introduction, free, particle in a box, one dimensional rectangular potential Barrier, one dimensional potential well, one dimensional Harmonic oscillator.

Unit-9 **Spherically Symmetric Systems : Hydrogen Atom –** Introduction, three dimensional Schrodinger equation for a central potential, Eigen function and eigen values of the angular momentum operator, space Quantization, radial eigenfunctions, The hydrogen Atom spectra of the hydrogen atom quantum, numbers and constants of motion.

Unit-10 **Atomic spectra-** Introduction, stern, Gerlach Experimental, Spin Angular momentum, total angular momentum, spectral terms, optical spectra of a hydrogen like, Atoms and selection rules, multi electron Atoms, life time of excited states and line Broadening.

Unit-11 **X-ray spectra-** Introduction, X-ray spectra and selection Rules, Moseley's law, application of X-rays.

Block-4 **Nuclear Physics**

Unit-12 **Radioactivity -** Introduction, Radioactive decay Growth and decay of Radioactivity, successive radioactivity transformations radioactive equilibrium.

Unit-13 **The Atomic Nucleus –** Introduction, The alpha-particle experiment, binding energy of nuclei, Nuclear Fission, Liquid Drop model of Fission, Critical Energy for Fission – Spontaneous Fission, Nuclear models, shell model, Collective model.

Unit-14 **Applied Nuclear Science –** Introduction, self sustained chain reaction, Nuclear radiations in environment, Radioisotopes in every life.

Unit-15 **Elementary Particles-** Introduction, positron, the first antiparticle machines of Nuclear physics, particle accelerations particle detectors, Inventory of particles, conserved quantities.

UGPHS-09

Mathematical Methods in Physics I

Block-1 Vector Calculus

Unit-1 **Vector Algebra –** Introduction, addition and subtraction of vector, Scalar and vector product in component from. Multiple product of vector, Scalar triple product, vector triple product quadruple products of vectors, Polar and Axial vectors.

Unit-2 **Vector Differential Calculus –** Introduction, differentiation of vector, vector functions, scalar field contour curves and contour surfaces, Gradient operator and the directional derivative, partial derivatives, Gradient of a scalar field, directional derivative. Vector operator ∇. The vector field, its divergence and curl, Vector field lines, divergence of vector field the curl of vector filed, identities involving the Del operator, product rules involving Del operator, Application of product rule, application of Del Operator.

Unit-3 **Coordinate Systems-** Introduction, non-Cartesian co-ordinate systems, Plane, Polar and spherical polar and cylindrical co ordinate system, Expressing a vector in polar Co-ordinates, Curvilinear, Co-ordinate system. Orthogonality conditions, vector, diff. operators, unit vectors.

Unit-4 **Integration of Scalar and vector Fields-** Introduction, integration of a vector with respect to a scalar, multiple integrals, double and triple integrals, line integral of a field, path of integrals, surface integral of a field, volume integral of a field vector integral theorems, Gauss divergence Theorem Stokes Theorem, Green's Theorem.

Block-2 **Probability and Statistics**

Unit-5 **Basic concepts of probability theory –** Introduction, elements of probability Theory, random variables, Expectation, variance, covariance, correlation coefficient.

Unit-6 **Probability Distributions-** Introduction, Binomial distribution, Poission distribution, Normal distribution, Maxwell BAltzmann distribution.

Unit-7 **Application in Physics-** Introduction, Correlation analysis, Regression analysis, method of least square, method of standard error of estimate, Types of error estimation of random errors, statistical theory of error.

UGPHS-10

Mathematical Methods in Physics II

Block-1 Ordinary Differential equations

Unit-1 **First order ordinary differential equations –** Introduction, Classification of ordinary differential equations, Solutions of differential equations, equations reducible to separable from, method of separation of variable, Homogeneous differential equations of the first order, Exact equations, first order linear differential equations, equations reducible to first order.

Unit-2 **Second order ordinary differential equations with constant coefficients –** Introduction, Homogeneous and non-homogeneous linear equations with constant coefficients, methods of undetir mined multiplier, and method of variation of parameters.

Unit-3 **Second order ordinary differential equations with variables coefficients –** Introduction, terminology, power series method, forbenius method.

Unit-4 **Some applications of ODE's physics –** Introduction, Mathematical modeling, first order ODE's in physics, second order ODE's in physics. Coupled differential equations, Coupled oscillators, Coupled electrical circuits, Charged particle motion in electric and magnetic fields.

Block-2 **Parital differential Equations**

Unit-5 **Introduction to partial differential equations -** Introduction, limits and continuity, partial differentiation, differentiability, partial differential equations.

Unit-6 **Partial differential equations in Physics-** Introduction, method separation of variables, solving initial and boundary value problem in physics.

Unit-7 **Fourier Series –** Introduction, Finding the coefficient, uses, even and odd functions, Fourier sine and Cosine series, Half-range expansions, convergence of Fourier series.

Unit-8 **Applications of Fourier Series to PDEs –** Introduction, diffusion equation, Heat conduction diffusion of particles, wave, equations, vibrating string, Torsional vibrations, Laplace's Equation, Steady state Heat flow, Potential at a point due to a circular Disc.