

FOUR YEAR UNDERGRADUATE PROGRAM (NEP- 2020)
PROGRAM: BACHELOR IN SCIENCE (2026-2030)
DISCIPLINE – PHYSICS
SESSION 2026-27

DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
Code	Course Title	Code	Course Title	Code	Course Title
PHSC- 01 T	Mechanics	PHSE- 01	Introduction to Statistical Mechanics	PHGE- 01 T	Mechanics
PHSC- 01P	Lab Course			PHGE- 01 P	Lab Course
PHSC- 02 T	Electricity & Magnetism	PHSE- 02	Mathematical Physics-I	PHGE- 02 T	Electricity & Magnetism
HSC- 02 P	Lab Course			PHGE- 02 P	Lab Course
PHSC- 03 T	Heat & Thermodynamics	PHSE- 03	Nuclear Physics	VAC	
PHSC- 03 P	Lab Course				
PHSC- 04 T	Waves & Optics	PHSE- 04 T	Numerical Methods &C Programming		
PHSC- 04 P	Lab Course	PHSE- 04 P	Lab Course		
PHSC- 05 T	Introduction to Quantum Mechanics	PHSE- 05	Mathematical Physics-II	PHVAC- 01	Renewable Energy and Energy Harvesting
PHSC- 05 P	Lab Course				
PHSC- 06 T	Solid State Physics &SolidStateDevices	PHSE- 06	Classical Electrodynamics &Electromagnetic theory	SEC	
PHSC- 06 P	Lab Course				
PHSC- 07	Classical Mechanics	PHSE- 07 T	Digital Electronics		
		PHSE- 07 P	Lab Course		
PHSC- 08	Quantum Mechanics	PHSE- 08 T	Operational Amplifier& Its Applications	PHSEC- 01	BasicElectrical Skill
		PHSE- 08 P	Lab Course		
		PHSE- 09 T	Solid State Physics		
		PHSE- 09 P	Lab Course		
		PHSE- 10	Atomic and Molecular Physics		
		PHSE- 11	Statistical Mechanics		
		PHSE- 12 T	Microprocessor		
		PHSE- 12 P	Lab Course		

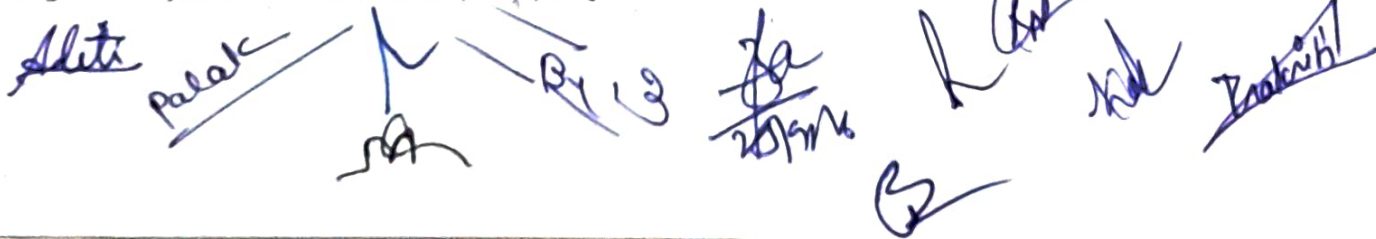
Signature of Convener & Members (CBoS):

The block contains several handwritten signatures in blue ink. From left to right, the signatures are: 'Palak', 'Aliti', a stylized 'N' or 'V' shape, 'R', 'h', 'K', 'B. B.', '24/9/26', 'R', and 'Pratik'.

FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)			Semester: I	Session: 2026-27
1	Course Code	PHSC-01T		
2	Course Title	Mechanics		
3	Course Type	Discipline Specific Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	<i>After going through the course, the student should be able to:</i> ➤ <i>Analyze and apply the laws of motion to various dynamical situations.</i> ➤ <i>Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation.</i> ➤ <i>Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies.</i> ➤ <i>Analyze flow of fluids.</i> ➤ <i>Describe special relativistic effects and their effects on the mass and energy of a moving object.</i>		
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40	
PART – B: CONTENT OF THE COURSE				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Periods
I	Historical Background: Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. Vectors: Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. Laws of Motion: Review of Newton’s Laws of motion, Dynamics of a system of particles, Concept of Center of Mass, Motion of center of mass, Conservation of linear momentum, Motion of Rocket. Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions			12
II	Rotational Dynamics: Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes(statements only). Calculation of Moment of Inertia of discrete and continuous objects (Rectangular lamina, disc, solid cylinder, solid sphere). Elasticity: Stress & Strain, Hooke’s law, Elastic constants, Poisson’s Ratio,Relationship between various elastic modulii (without derivation), Work done in twisting a cylinder. Fluid Dynamics: Flow of fluids, Coefficient of viscosity,Derivation of Poiseulli’s formula, Motion of a spherical body falling in a viscous fluid, Stoke’s law, Expression for terminal velocity.			12
III	Gravitation: Newton’s Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler’s Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. Oscillations: Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).			11
IV	Special Theory of Relativity: Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley’s Experiment, Postulates of Special Theory of Relativity, Lorentz Transformation, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.			10
Keywords:		Aryabhatta, Vectors, Newton's Laws, Angular Momentum, Elasticity, Gravitation, Oscillations, Relativity		

Signature of Convener & Members (CBOS):



FOUR YEARS UNDERGRADUATE PROGRAM(2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

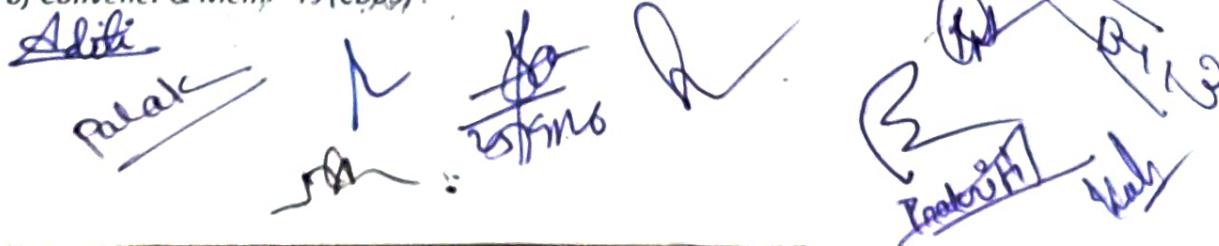
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2026-2027
1	Course Code	PHGE-01 T	
2	Course Title	Mechanics	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	<i>After going through the course, the student should be able to:</i> ➤ Analyze and apply the laws of motion to various dynamical situations. ➤ Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation. ➤ Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies. ➤ Analyze flow of fluids. ➤ Describe special relativistic effects and their effects on the mass and energy of a moving object.	
6	Credit Value	03 Credits 1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40

PART – B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Historical Background: Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. Vectors: Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. Laws of Motion: Review of Newton's Laws of motion, Dynamics of a system of particles, Concept of Center of Mass, Motion of center of mass, Conservation of linear momentum, Motion of Rocket. Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions	12
II	Rotational Dynamics: Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (Rectangular lamina, disc, solid cylinder, solid sphere). Elasticity: Stress & Strain, Hooke's law, Elastic constants, Poisson's Ratio, Relationship between various elastic moduli (without derivation), Work done in twisting a cylinder. Fluid Dynamics: Flow of fluids, Coefficient of viscosity, Derivation of Poiseuille's formula, Motion of a spherical body falling in a viscous fluid, Stoke's law, Expression for terminal velocity.	12
III	Gravitation: Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. Oscillations: Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	11
IV	Special Theory of Relativity: Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Lorentz Transformation, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	10
Keywords: Aryabhatta, Vectors, Newton's Laws, Angular Momentum, Elasticity, Gravitation, Oscillations, Relativity		

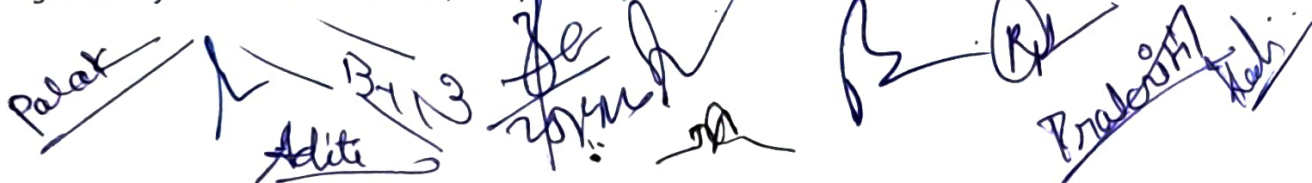
Signature of Convener & Members (CBPS):



FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: II		Session: 2026-2027
1	Course Code	PHISC-02T		
2	Course Title	ELECTRICITY AND MAGNETISM		
3	Course Type	Discipline Specific Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction. ➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics. ➤ Compare rise and decay of current in LR, CR, LCR circuits. ➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations. ➤ Derive and analyze Maxwell's equations.		
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40	
PART – B: CONTENT OF THE COURSE				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Periods
I	Power plants in Chhattisgarh: An overview of thermal and hydroelectric power plants in Chhattisgarh. Vector Analysis: Divergence & Curl of Vector fields, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics. Electrostatics field: Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, plane charged sheet, charged conductor.			12
II	Electrostatic potential:Electric potential as line integral of electric field, potential due to a point charge, Calculation of electric field from potential, Capacitance of Parallel plate capacitor, Energy per unit volume in electrostatic field. Dielectric & Electric Currents: Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric.Steady current, current density J, non – steady current and Continuity equation, Rise and decay of current in LR, CR, LCR circuits.			13
III	Magnetism: Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.			10
IV	Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field. Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.			10
Keywords:	Vector calculus, Electrostatics, Dielectrics and Electric Current, Magnetism, Electromagnetic Induction, Maxwell's Equation and Electromagnetic Wave Propagation			

Signature of Convener & Members (CRs)



FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)			Semester: II	Session: 2026-2027
1	Course Code	PHGE-02 T		
2	Course Title	ELECTRICITY AND MAGNETISM		
3	Course Type	Generic Elective Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ➤ State various laws related with electrostatics, dielectric, electric current, magnetism and electromagnetic induction. ➤ Apply vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics. ➤ Compare rise and decay of current in LR, CR, LCR circuits. ➤ Apply Biot-Savart law for calculation of magnetic field in simple geographic situations. ➤ Derive and analyze Maxwell's equations.		
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40	
PART – B: CONTENT OF THE COURSE				
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Periods
I	Power plants in Chhattisgarh: An overview of thermal and hydroelectric power plants in Chhattisgarh. Vector Analysis: Divergence & Curl of Vector fields, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics. Electrostatics field: Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, plane charged sheet, charged conductor.			12
II	Electrostatic potential: Electric potential as line integral of electric field, potential due to a point charge, Calculation of electric field from potential, Capacitance of Parallel plate capacitor, Energy per unit volume in electrostatic field. Dielectric & Electric Currents: Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current and Continuity equation, Rise and decay of current in LR, CR, LCR circuits.			13
III	Magnetism: Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.			10
IV	Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field. Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.			10
Keywords:		Vector calculus, Electrostatics, Dielectrics and Electric Current, Magnetism, Electromagnetic Induction, Maxwell's Equation and Electromagnetic Wave Propagation		

Signature of Convener & Members (CBoS) :

FOUR YEARS UNDERGRADUATE PROGRAM(2026-20230)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: III		Session: 2026-2027
1	Course Code	PHSC-03T		
2	Course Title	Heat and Thermodynamics		
3	Course Type	Discipline Specific Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ☐ Demonstrate a deep comprehension of the fundamental principles of thermodynamics, including concepts such as energy, entropy and laws of thermodynamics. ☐ Apply the laws of thermodynamics to analyze and solve problems related with energy transfer, heat engines, refrigeration system and other thermodynamic processes. ☐ Analyze basic aspects of kinetic theory and transport phenomenon in gases.		
6	Credit Value	03 Credits	1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100		Minimum Pass Marks: 40
PART – B: CONTENT OF THE COURSE				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Period
I	Historical background: A brief historical background of thermodynamics and statistical physics in the context of India and Indian culture, Contribution of S. N. Bose in Statistical mechanics. Laws of Thermodynamics: Thermodynamic Description of system, Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, various Thermodynamical Processes, Work Done during Isothermal and Adiabatic Processes, Reversible & irreversible processes. Second law of thermodynamics & Entropy, Carnot's cycle, Carnot's theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics.			12
II	Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy and Gibbs function. Maxwell's relations & applications, Clausius- Clapeyron Equation, Expression for ($C_p - C_v$), C_p/C_v , TdS equations, Thermodynamic energy equation- change in internal energy of an ideal and Vander Waal's gas, Joule-Thompson Effect, Cooling by adiabatic demagnetization.			11
III	Kinetic Theory of Gases: Maxwellian distribution of speeds in an ideal gas: distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values, Molecular Collision and Mean Free Path. Transport Phenomena in gases: Viscosity, Conduction and Diffusion, Law of equipartition of energy.			11
IV	Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Stefan Boltzmann Law, Newton's law of cooling from Stefan Boltzmann's law. Wien's displacement law and Rayleigh-Jeans Law (Only qualitative). Planck's radiation Law, Deduction of Wien's distribution law and Rayleigh- Jeans Law from Planck's law. Experimental verification of Planck's radiation law.			11
Keywords:		Zeroth and First Law of Thermodynamics, Second Law of Thermodynamics, Entropy, Thermodynamic Potentials, Maxwell's Thermodynamic Relations, Kinetic Theory of Gases, Distribution of Velocities, Molecular Collisions, Real Gases, Laws of radiation		



FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science (Diploma / Degree/Honors)		Semester - III	Session: 2026-2027
1	Course Code	PHSE-01	
2	Course Title	Introduction to Statistical Mechanics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes(CLO)	➤ Differentiate between macrostate and microstate and calculate their numbers ➤ Comprehend the concept of ensembles and its requirement in study of physical phenomenon ➤ Correlate and compare the classical and quantum statistical distribution laws. ➤ Apply concepts of statistical distribution laws for different physical systems.	
6	Credit Value	4 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	Maxwellian Distribution of Speeds In An Ideal Gas: Distribution of speeds and velocity, experimental verification, distinction between mean, rms and most probable speeds, Doppler broadening of spectral lines, transport phenomena in gases: molecular collision, collision cross section, estimates of molecular diameter and mean free path; transport of mass , momentum and energy and inter-relationship, dependence on temperature and pressure. Behaviour of Real Gases : deviation from ideal gas equation, the Virial equation, Andrew's experiment on CO ₂ gas; critical constants.	15
II	Macrostate & Microstate Macrostate, Microstate, Number of accessible microstates and Postulate of equal a priori. Concept of Ensemble: Concept of Gibb's ensemble, postulate of ensemble average, Micro Canonical, Canonical & Grand Canonical ensembles. Thermodynamic Probability, Postulate of Equilibrium and Boltzmann Entropy relation. Phase space, Phase trajectory, Volume element in phase space, Quantization of phase space and number of accessible microstates for free particle in 1D, free particle in 3D.	15

Palak, Aditi, B. 12, 27/9/21, and other signatures.

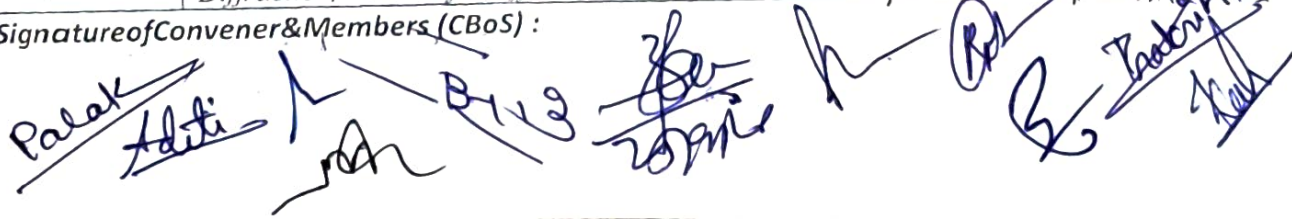
III	Transition to quantum statistics: h as a natural constant and its implications, cases of particle in 1D and 1Dimensional harmonic oscillator, Quantum Statistical Distribution Laws: In-distinguishability of particles and its consequences, Bose-Einstein & Fermi Dirac statistics. Comparison of statistical distribution laws and their physical significance. Canonical Distribution Law: Boltzmann's Canonical Distribution Law, Boltzmann's Partition Function, Proof of Equipartition Theorem (Law of Equipartition of energy) and relation between Partition function and Thermodynamic potentials.	15
IV	Bose-Einstein Distribution Law and its Applications: Bose-Einstein Statistics: Heat capacity, Bose Einstein condensation, Radiation as a photon gas, Quantum Theory of Radiation: Spectral Distribution of Black Body Radiation. Planck's Quantum Postulates. Planck's Law of Blackbody Radiation: Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law, (4) Wien's Displacement law from Planck's law Fermi-Dirac Distribution Law and its Applications: Free electrons in a metal, Definition of Fermi energy, Determination of Fermi energy at absolute zero, Kinetic energy of Fermi gas at absolute zero and concept of Density of States, Specific Heat of Metals (Density of Orbitals).	15
Keywords	Macrostate & Microstate, ensemble, distribution laws, Bose-Einstein Statistics, Fermi-Dirac Statistics	

Name and Signature of Convener & Members of CBoS:

FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: IV		Session: 2026-2027
1	Course Code	PHSC-04T		
2	Course Title	Waves and Optics		
3	Course Type	Discipline Specific Course		
4	Pre-requisite (if any)	As per Program		
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ➤ Analyze the behavior of waves propagating through different mediums and predict how factors such as density, elasticity, and temperature affect wave propagation. ➤ Demonstrate an understanding of interference phenomena, including constructive and destructive interference, and apply this knowledge to solve problems involving wave superposition. ➤ Explain the concept of diffraction and its implications for wave propagation, including how waves bend around obstacles and spread out after passing through narrow openings. ➤ Describe the polarization of waves, including linear, circular, and elliptical polarization, and apply polarization concepts to analyze and manipulate electromagnetic waves.		
6	Credit Value	03 Credits 1 Credit= 15 Hours - Learning & Observation		
7	Total Marks	Maximum Marks: 100		Minimum Pass Marks: 40
PART – B: CONTENT OF THE COURSE				
TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics (Course contents)			No. of Period
I	Contribution of C. V. Raman: Brief biography of C. V. Raman with his contribution in field of acoustics and optics. Waves in Medium: Speed of transverse waves on uniform string, Speed of longitudinal waves in a fluid, Energy density and energy transmission in waves. Group velocity and phase velocity and relationship between them. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, diffraction of sound, principle of a sonar system.			11
II	Interference: Principle of superposition, Division of wavefront and division of amplitude, Young's Double Slit experiment. Fresnel's Biprism, Phase change on reflection, Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings, measurement of wavelength and refractive index. Michelson's Interferometer, Formation of fringes, Determination of wavelength, Wavelength difference.			12
III	Diffraction: Fresnel Diffraction; Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction; Single slit, Double slit. Multiple slits & Plane Diffraction Grating, Resolving Power of Grating.			11
IV	Polarization: Polarized light and its mathematical representation, Electromagnetic theory of double refraction, Nicol Prism, Double image prism, Polaroid, Phase retardation plates, Circular and elliptical polarization. Polarization by double refraction and Huygens's theory, Rotation of plane of polarization, Biquartz polarimeter.			11
Keywords:		Longitudinal and transverse waves, principle of superposition, Haidinger Fringes, Fresnel Diffraction, Fraunhofer diffraction, Polarization		

Signature of Convener & Members (CBoS) :



FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program: Bachelor in Science (Diploma /Degree/Honors)		Semester - IV	Session: 2026-2027
1	Course Code	PHSE-02	
2	Course Title	Mathematical Physics-I	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes(CLO)	➤ Revise and apply the knowledge of calculus, vectors, vector calculus, probability and probability distributions in various cases. ➤ Illustrate proficiency in writing and solving Differential equation and solving them for a given physical system. ➤ Apply and interpret the curvilinear coordinates in problems with spherical and cylindrical symmetries. ➤ Use Dirac Delta function for various physical situation, especially in quantum mechanical approaches.	
6	Credit Value	4 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods(01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	Calculus: Recapitulation: Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions, Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. Origin and Evolution of Mathematical concepts in Ancient India: Bhaskaracharya, the Inventor of Calculus: some examples on calculus	16
II	First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral. Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	16

Palak
Aditi

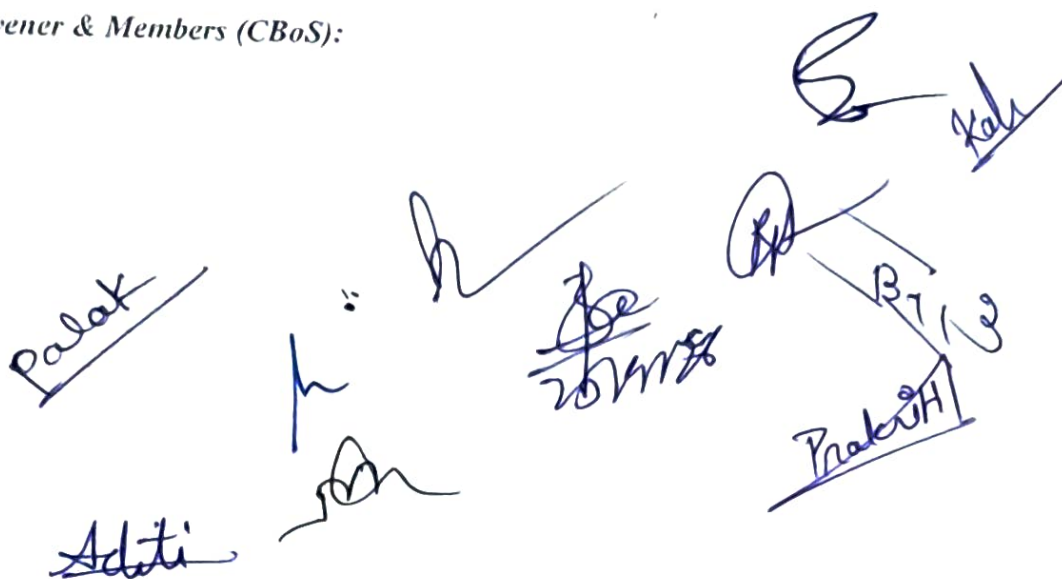
B-113
SA

20/06

RA
Shakti
Kash

III	Introduction to probability: Independent random variables: Probability distribution functions; binomial, Gaussian, and Poisson, with examples. Mean and variance. Dependent events: Conditional Probability. Bayes' Theorem and the idea of hypothesis testing.	15
IV	Dirac Delta function and its properties: Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function. Problems based on dirac-delta function and its application	13
Keywords	Calculus, Lagrange Multipliers, Homogeneous Equations, Particular Integral, Probability distribution, Dependent events, Dirac delta function	

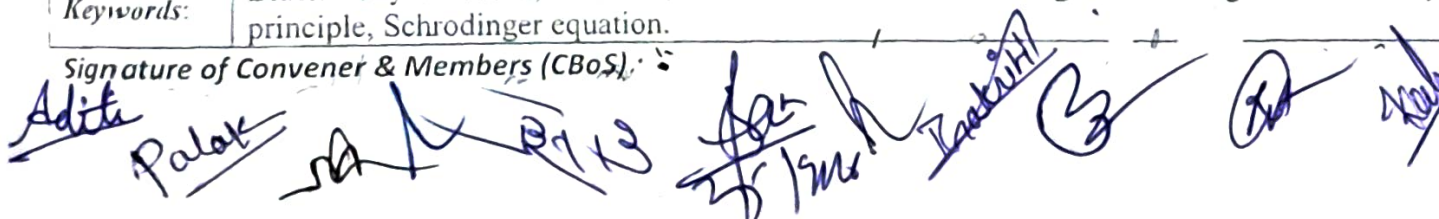
Signature of Convener & Members (CBoS):



FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION			
Program: Bachelor in Science <i>(Degree/ Honors)</i>		Semester: V	Session: 2026-2027
1	Course Code	PHSC-05T	
2	Course Title	Introduction to Quantum Mechanics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➤ Explain the basic postulates of quantum mechanics ➤ Explain the concept of the wave packet ➤ Describe the principle of Heisenberg's uncertainty principle and its applications ➤ Gain knowledge about physical quantities as operators ➤ Apply the Schrodinger equation to various quantum systems	
6	Credit Value	03 Credits 1 Credit = 15 Hours - Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40
PART – B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) – 45 Periods (45 Hours)			
Unit	Topics		No. of Period
I	Wave-particle duality: Limits of classical mechanics, Theoretical and experimental consequences and their explanation such as black body radiation, Planck's law, Photoelectric effect, Compton's effect, Specific heat of solids at low temperatures, wave-particle duality and demonstration of matter waves, Bohr's complementary principle and correspondence principle, Concept of the wave packet and its spread with time, Gaussian wave packet, Phase and Group velocity, de-Broglie wavelength using phase velocity and group velocity.		12
II	Uncertainty principle: Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables), Experiments for the verification of uncertainty principle, mathematical derivation of uncertainty principle for the one-dimensional wave packet, Applications and consequences of the uncertainty principle.		10
III	Schrodinger equation: Representation of dynamic variables by operators (operators for the position, momentum, energy, angular momentum), Schrodinger's wave equation, Wave function, Probabilistic interpretation of wave function, Probability current densities in one dimension, Equation of continuity, Normalization of wave function, Orthogonality property of wave function, Expectation value of dynamical variables, Ehrenfest's theorem, Postulates of Quantum Mechanics.		11
IV	Application of Schrodinger wave-equation Solution for free particle, Free particle in a box and density of states, Transmission through potential step, Rectangular potential barrier and tunnelling phenomena, Linear harmonic oscillator with the concept of zero-point energy and parity, Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation.		12
Keywords:		Black body radiation, Planck's, Photoelectric effect, de-Broglie wavelength, Uncertainty principle, Schrodinger equation.	

Signature of Convener & Members (CBoS):



FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program: Bachelor in Science (Degree/Honors)		Semester - V	Session: 2026-2027
1	Course Code	PHSE-03	
2	Course Title	Nuclear Physics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Describe nuclear constituents and their intrinsic properties. Analyze binding energy variations with mass number and understand the N/Z plot. ➤ Explain and apply nuclear models for clear understanding of stability of nuclei and nuclear processes. Differentiate alpha, beta, and gamma decay and interpret energy spectra. ➤ Apply conservation laws to compute Q-values, and analyze reaction mechanism. Explain significance of scattering and reaction cross section. ➤ Calculate and compare nuclear fission and fusion energy. Describe nuclear detectors and particle accelerators. ➤ Gain insights into cutting-edge research, accelerator technology, and interdisciplinary applications and apprehend the role of accelerators in advancing scientific knowledge and contributing to societal well-being.	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

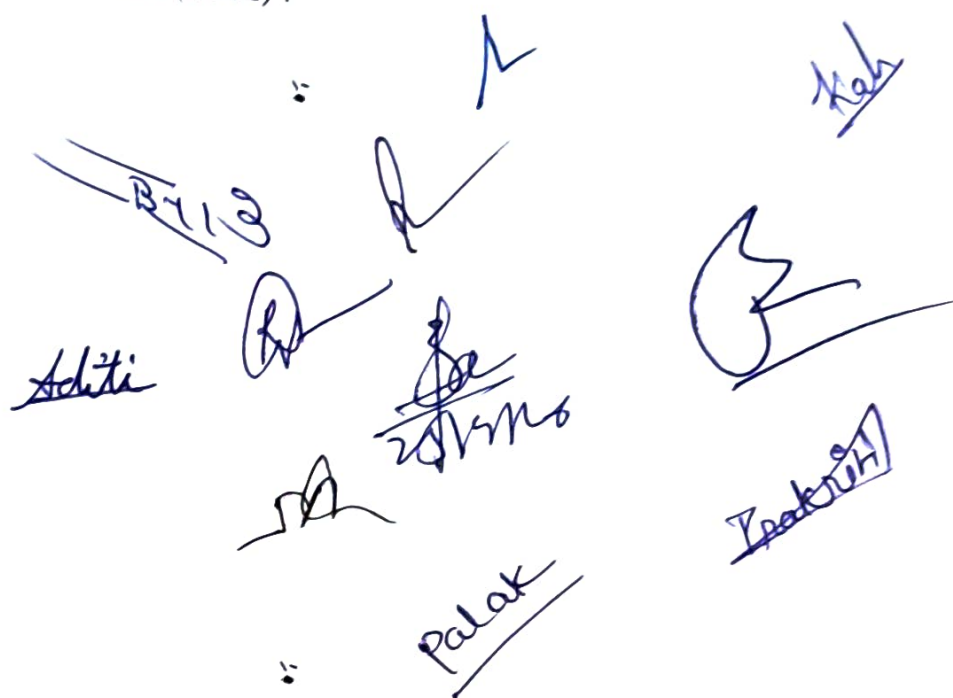
PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments.	15
II	Nuclear Models: Liquid drop model approach, semi empirical mass formula and, significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model, evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field.	15

III	Nuclear decay and Reactions: Alpha, beta, gamma decay, energy spectrum, Geiger-Nuttel law, disintegration energy, quantum theory of alpha decay, types of beta decay and energy spectrum, Pauli's prediction of neutrino. Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering). Nuclear Energy Reactions: Nuclear Fission, Calculation of energy released, Nuclear fusion, Energy released in Fusion, Comparison of Fission and fusion energy, Fusion as source of stellar Energy, Nuclear reactors in India, Contribution of nuclear energy in total energy requirement.	15
IV	Nuclear Detector and Particle Accelerators: Interaction of charge particle through matter, Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation, Detectors and construction of photo-multiplier tube (PMT), Semiconductor Detectors. Accelerator facility available in India: Van-de Graaff generator, Pelletron accelerator, Linear accelerator, Cyclotron accelerator Nuclear Accelerators in India: RRCAT, VECC, BARC TIFR Pelletron Facility, IUC : working, evolution and contribution.	15
Keywords	Properties of Nucleus, Nuclear forces, Nuclear Models, Decay reaction, detectors and accelerators	

Signature of Convener & Members (CBoS) :



FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2026-2027
1	Course Code	PHSE-04 T	
2	Course Title	Numerical Methods and C Programming	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite(if any)	As per Program	
5	Course Learning Outcomes(CLO)	At the end of this course, the students will be able to: ➤ Analyse the convergence of solutions to numerical methods. Understand the principles of Gaussian elimination, pivoting, and iterative methods to solve linear systems ➤ Use interpolation methods, Perform numerical differentiation and integration using Newton-Cotes formulae ➤ Explain the roles of compilers, interpreters, and operating systems, Learn the basics of C programming	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks : 100	Min Passing Marks:40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Methods for determination of zeroes of linear and nonlinear algebraic equations and transcendental equations, convergence of solutions. Solution of simultaneous linear equations, Gaussian elimination, pivoting, iterative method, matrix inversion, Finite differences, interpolation with equally spaced and unevenly spaced points, curve fitting, polynomial least squares and cubic spline fitting. Numerical differentiation and integration, Newton-Cotes formulae, error estimates, Gauss method.	13
II	Numerical solution of ordinary differential equations, Euler and Runge-Kutta methods, Solution of related problems, Predictor-corrector method, Solution of related problems, Elementary ideas of solutions of partial differential equations	10
III	Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing. Character set, constants, (numeric string) variables (numeric string) rules for arithmetic expressions and hierarchy of operators, rational expressions, logical expressions, and operators, library functions. Identifiers, qualifiers, define statements, value Initialized variables, operators, and expressions. Operator precedence and associativity. scanf with specifier, search set arrangements and suppression Character, format specifier for scanf. Control structure, if statement, if else statement, multiway decision, compound statement.	10
IV	Loops: for loop, while loop, do while loop, break statement, compound statement continue statement, go to statement, Function - function main, function accepting more than one parameter, user defined and library function concept associatively with functions, function parameter, return value, recursion comparison. Arrays, strings, multidimensional array, array of strings function in string	12

Keywords Transcendental equations, Ordinary differential equations, Numerical integration, Numerical differentiation, Flow charts, C - Statement.

Signature of Convener & Members (CBOS)

Aditi
Palak

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART - A: INTRODUCTION

Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I/ III/ V	Session: 2026-2027
1	Course Code	PHVAC-01	
2	Course Title	Renewable Energy and Energy Harvesting	
3	Course Type	Value Addition Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	Objective of the course is to impart students; the knowledge of renewable energy and they are expected to learn about: ➤ Energy crisis at national and international scenario. ➤ Renewable sources of energy and their importance. ➤ Availability of renewable energy resources in India. ➤ Knowledge about energy harvesting technology.	
6	Credit Value	02 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20

PART - B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)

Unit	Topics	No. of Period
I	Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. Limitations of non-conventional energy resources. Environmental aspect of energy, World energy status, Energy scenario in India. Geo thermal Energy: Geothermal Resources, Geo thermal Technologies.	07
II	Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, sun tracking systems. Hydro Energy: Hydro power resources, hydro power technologies, environmental impact of hydro power sources.	08
III	Biomass energy: Biomass resources, Biomass conversion technology, biogas generation, factors affecting bio-digestion, working of biogas plant (with block diagram), biogas from plant waste, biomass energy programme in India, Biodiesel production from non-edible oil seeds. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.	08
IV	Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines. grid interconnection topologies. Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, piezoelectric materials, Piezoelectric Energy harvesting applications.	07
Keywords:	Fossil fuel, Renewable energy sources, Solar energy, Biomass energy, Electromagnetic Energy Harvesting, Piezoelectric Energy harvesting.	

Signature of Convener & Members (CBQS):

FOUR YEARS UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

Program: Bachelor in science (Honors/Honors with Research)		Semester: VII	Session: 2026-2027
1	Course Code		
2	Course Title	PHSC-07	
3	Course Type	Classical Mechanics	
4	Pre-requisite (if any)	Discipline Specific Course	
5	Course Learning Outcomes (CLO)	As per Program	
6	Credit Value	At the end of this course, the students will be able to: ➤ The ideas and concepts in classical physics ➤ Explain Newtonian Mechanics, Lagrangian, and Hamiltonian formulation ➤ Gain knowledge about central force problems and its application in scattering phenomena ➤ Explain small oscillations and its applications. Apply mechanics to solve various physical problems	
7	Total Marks	04 Credits Maximum Marks: 100	1 Credit = 15 Hours for Learning & Observation Minimum Pass Marks: 40

PART – B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics	No. of Period
I	Preliminaries of classical mechanics Review of Newtonian Mechanics; Conservation laws; Constraints and their classification; Principle of virtual work; Generalized coordinates and velocities, D' Alembert's principle, Lagrangian and the Euler-Lagrange equations, Simple applications of Lagrangian formulation, Hamilton's principle, Lagrange's equation from Hamilton's principle; Legendre transformations and Hamilton's equation of motion; Hamilton's equation from Hamiltonian formulation; Conservation theorems, cyclic coordinates and symmetry properties	15
II	Canonical transformations and relativistic mechanics Canonical transformations; Poisson's Bracket; equation of motion and Conservation theorems in the Poisson Bracket formulation; Hamilton Jacobi (HJ) theory; Harmonic oscillator as an example of HJ method Four vectors; Four velocity and acceleration; Lorentz Covariant form of equation of motion.	15
III	Central forces Two-body central force problems and their reduction to the equivalent one-body problem; The equations of motion and first integrals; one-dimensional problems and classification of orbits; The differential equation of the orbit, Closure and stability of orbits; Kepler's laws and planetary motion; Scattering in central force; Rutherford's scattering	15
IV	Rigid body and Periodic motion Euler's angles, Euler's theorem on the motion of a rigid body; The Coriolis force; The Euler equations of motion of rigid bodies; Small oscillations; normal modes; Formulation of the problem of small oscillations; Vibrating string; normal vibrations; dispersion; Coupled vibrating systems, free vibration of a linear triatomic molecule.	15
Keywords: Newtonian Mechanics, Lagrangian formulation, Hamiltonian formulation, Poisson's bracket, central force problems, small oscillations		

Signature of Convener & Members (CBDS):

Palak *Bing* *Aditi* *Pratik* *Neha*

FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)

DEPARTMENT OF PHYSICS

COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science (Honors/Honors with Research)		Semester - VII		Session: 2026-2027	
1	Course Code	PHSE- 05			
2	Course Title	Mathematical Physics -II			
3	Course Type	Discipline Specific Elective			
4	Pre-requisite (if, any)	As per Program			
5	Course Learning Outcomes (CLO)	➤ Apply Fourier analysis of periodic functions in physical problems such as vibrating strings etc. ➤ Solve the beta, gamma and the error functions and their applications in doing integrations. ➤ Relate basic theory of errors, their analysis, and estimation with examples of simple experiments in Physics. ➤ Solve partial differential equations with the examples of important partial differential equations in Physics			
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation		
7	Total Marks	Max. Marks: 100		Min Passing Marks: 40	

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. Partial Differential Equations: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry	15
II	Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series	15
III	Frobenius Method and Special Functions: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite & Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Orthogonality. Simple recurrence relations. Some Special Integrals: Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral).	15
IV	Complex Analysis: Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable. Cauchy's Inequality. Cauchy's Integral formula	15
Keywords	Calculus, Partial derivatives, Differential equations, Periodic function, Singular point Beta and Gamma function, Complex number, Complex variables.	

Signature of Convener & Members (CBoS) :

of Convener & Members (CBoS) :

FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)

DEPARTMENT OF PHYSICS

COURSE CURRICULUM

PART-A: INTRODUCTION			
Program : Bachelor in Science (Honors/Honors with Research)		Semester - VII	Session: 2026-2027
1	Course Code	PHSE- 06	
2	Course Title	Classical Electrodynamics & Electromagnetic Theory	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Calculate the reflection and transmission of waves at the media interface. ➤ Understand the aspects related to Polarized lights and its generation as the superposition of different waves. ➤ Understanding the plasma state, the concept of Debye screening, and collective behavior	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)			
Unit	Topics (Course Contents)		No. of Period
I	Maxwell Equations: Review of Maxwell's equations. Vector and Scalar Potentials. Maxwell's equations in terms of scalar and vector potentials. Concept of Gauge. Gauge Transformations: Lorentz and Coulomb Gauge; four-vectors, mathematical properties of space-time in special relativity; matrix representation of Lorentz transformation; Poynting Theorem and Poynting Vector. Electromagnetic (EM) Energy Density and Momentum Density. Radiation Pressure. Radiation by moving charges: Lienard-Wiechert potential and fields for a point charge; total power radiated by an accelerated charge- Larmor's formula and its relativistic generalization		15
II	EM Wave Propagation in Unbounded : Transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. Propagation through conducting media, skin depth. Propagation of E.M. Waves in Anisotropic Dielectrics. EM Wave in Bounded Media: Boundary Conditions at Interface between two Media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Brewster's law. Total internal reflection, Metallic reflection (normal Incidence)		15
III	Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization. Double Refraction. Polarization by Double Refraction. Nicol Prism. Ordinary & extra – ordinary refractive indices. Phase Retardation Plates: Quarter-Wave and Half-Wave Plates. Babinet Compensator and its Uses. Optical Rotation. Fresnel's Theory of optical rotation. Specific rotation. Laurent's half-shade polarimeter		15
IV	Plasma: Definition, Debye Shielding phenomena and criteria for plasma, motion of charged particles in electromagnetic field, Uniform E and B fields, electric field drift, non-uniform magneto-static field, Gradient B drift, parallel acceleration and magnetic mirror effect, Elementary concepts of plasma kinetic theory, the Boltzmann equation, the basic plasma phenomena, plasma oscillations; Fundamental equations of magneto - hydrodynamics (MHD); Plasma confinement schemes		15
Keywords	Maxwell Equations, scalar and vector potentials, Lienard-Wiechert potential, EM wave propagation, Polarization, Debye Shielding phenomena, magnetohydrodynamics		

Signature of Convener & Members (CBoS)

Aditi
Palak

Bilal
MA
20/11/26

Kul
Prabhu
6

FOUR YEAR UNDERGRADUATE PROGRAM (2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science (Honors/Honors with Research)		Semester - VII	Session: 2026-2027
1	Course Code	PHISE- 07 T	
2	Course Title	DIGITAL ELECTRONICS	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Understand basics of logic gates, Boolean algebra, and simplifying complex Boolean functions. ➤ Learn about combinational circuits, logic families, and digital ICs. ➤ Understand the working of flip-flops and thus memory ➤ Capable to know the various sequential circuits an Ads & DAs	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Number system: Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion, Mathematics of number systems (addition, subtraction, multiplication and division), 1's and 2's compliments, addition and subtraction using 1's and 2's compliments. Binary Codes: Binary Coded Decimal (BCD), its addition and subtraction, Excess -3 code, its addition and subtraction, Gray code, binary to gray code and gray code to binary code conversion. Logic gates: Positive and negative logic, Basic gates, Universal building block. Basic laws of Boolean Algebra, De-Morgan's Theorem	12
II	Simplification of Boolean Functions: Simplification of Boolean functions through Boolean laws, Realization through logic gates, Minterms and Maxterms, Two, Three and Four variable Karnaugh Map (K-Map), and minimization of SOP and POS expressions. Combinational Logic Circuits: Half-adder, Full-adder, Binary serial and parallel adders, Half Subtractor, Full Subtractor. Multiplexers (2:1, 4:1 and 16:1), Demultiplexer (1:2, 1:4 and 1:16), Encoders (Octal to Binary encoder, Decimal to BCD), Binary decoders BCD to Decimal, BCD to Seven Segment)	11
III	Digital logic Families: Introduction, Basic concepts of RTL, DTL, TTL, ECL and CMOS logic families and their characteristics (Fan-in, Fan-out, Supply voltage range, Power dissipation, Input/ Output logic levels, Noise margin, Speed of operation) Flip-flop and timing diagram: RS flip-flop, R-S flip-flop using NOR gate, RS flip-flop using NAND gate, Clocked RS flip-flop, D- latch flip-flop, Flip-flop with Preset and Clearinputs, JK flip-flop, Positive and negative edge triggered flop-flops., JK Master Slave flip-flop	11
IV	Sequential Circuits: Counters: Synchronous and Asynchronous counters: Binary ripple counter, up counter, down counter, up-down counter and ring counter with their time diagrams. Registers: Shift Register, PIPO, SIPO, PISO, SISO and Bi-directional shift Register, Application of shift register (Serial Adder, Sequence generator) 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, applications of DACs and ADCs	11

Keywords Number System, Logic gates, Codes, Digital Logic Families, Flip flops, Registers, counters

Signature of Convener & Members (CBoS) :

Signature: Palak

Signature: [Handwritten]

Signature: [Handwritten]

Signature: [Handwritten]

Signature: [Handwritten]

Signature: [Handwritten]

Signature: [Handwritten]

FOUR YEAR UNDERGRADUATE PROGRAM(2026-2030)

DEPARTMENT OF PHYSICS

COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science (Honors/Honors with Research)		Semester -VII	Session: 2026-2027
1	Course Code	PHSE- 08 T	
2	Course Title	Operational Amplifier & Its Applications	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	After completion of the course students will be able to – ➤ The Idea and concepts of differential amplifier ➤ Basic concepts of Ideal operational amplifier and Practical operational amplifier with its electrical parameters ➤ Gain the knowledge of op-amp with feedback and its effect on different parameters ➤ Understand the concept of various oscillators and their applications ➤ Know the uses of Timer circuits and their applications	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course Contents)	No. of Period
I	Differential amplifier: Basic idea of direct coupled amplifier and its drawbacks, Circuit configurations of Differential amplifier, need for dual power supply, Basics of different configurations, dual input-balanced output differential amplifier, Its DC analysis and AC analysis. Inverting and Non-Inverting inputs, CMRR, need for constant current bias level transistor circuit Level translator	11
II	Operational Amplifier: Introduction, Block diagram, Functions of each block, Electrical parameters, Ideal op-amp, it's characteristics and equivalent circuit, Open-loop configurations: Differential, Inverting and Non-inverting amplifiers, Op-Amp with negative feedback: Block diagrams of feedback configurations, Voltage series feedback and its effect on Input resistance, Output resistance, Bandwidth, Total output offset voltage. Voltage follower, Voltage shunt feedback, Inverting input terminal at virtual ground, its effect on Input resistance, Output resistance, Bandwidth, Total output offset voltage	12
III	Practical Op-Amp: Input offset voltage, Input bias current, Input offset current, Total output offset voltage, Thermal drift, Error voltage, Common mode configuration and CMMR, Linear Applications: Summing, Scaling and Averaging amplifiers, Basics of Instrumentation amplifier, Instrumentation amplifier using Transducer bridge, Its uses, Voltage to current converter, Theory of Integrator and Differentiator	11
IV	Active Filters Using Op-Amp: Idea of active filters and their classification, First order and Second order low-pass Butterworth filter Op-Amp Oscillators: Oscillator block diagram and condition for sustained oscillations, Phase Shift oscillator, Wien Bridge oscillator and calculation for their frequency of oscillations. Square-wave generator, Triangular wave generator. The 555 Timer: Block diagram of 555, The 555 as a Monostable Multivibrator, Its use as pulse stretcher, 555 as a Stable Multivibrator, Its use as Square-wave oscillator	11

Keywords: Differential Amplifier, Operational Amplifier, Configuration, Feedback, Practical op-amp, Integrator, differentiator, Filters, Oscillators.

Signature of Convener & Members (CBoS) :

Aditi
Palak

N

Signature

Signature

Signature

Signature

DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

Program: Bachelor in Science (Honors/ Honors with Research)	Semester: VIII	Session: 2026-2027
---	-----------------------	---------------------------

1	Course Code	PHSC-08	
2	Course Title	Quantum Mechanics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➤ Explore uncertainty relations and states with minimum uncertainty. Learn and apply commutation relationships ➤ Master matrix representation of operators and solve the harmonic oscillator. Comprehend angular momentum in quantum mechanics. ➤ Explore spin angular momentum and Pauli's matrices. Master the concept of Clebsch- Gordon coefficients. ➤ Analyze central force problems and spherically symmetric potentials in 3D. Explore parity, square-well potentials, and hydrogen atom solutions	
6	Credit Value	04 Credits	1 Credit = 15 Hours- Learning & Observation
7	Total Marks	Maximum Marks: 100	
		Minimum Pass Marks: 40	

PART – B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Period (60 Hours)

Unit	Topics	No. of Period
I	Super position principle, State with minimum uncertainty product, commutation relationship, completeness and normalization of eigen functions, Dirac-delta function, Bra & Ket notation, matrix representation of an operator, harmonic oscillator and its solution by matrix method, Heisenberg equation of motion.	15
II	Angular momentum in quantum mechanics, matrix representation of angular momentum, commutation relationships of orbital angular momentum, eigen values and eigen functions of L^2 and L_z , Spin angular momentum: basic introduction, Total angular momentum and its commutation relationship, Pauli's spin matrices, addition of angular momentum, Clebsch-Gordon coefficients. Applied problem based on momentum and positions.	15
III	Central force problem, spherically symmetric potentials in three dimensions, separation of wave equation, parity, three-dimensional square-well potential and energy levels, the hydrogen atom; solution of the radial equation, energy levels and stationary state wave functions, discussion of bound states, degeneracy.	15
IV	Time-independent perturbation theory, non-degenerate case, first order and second perturbations with the example of an oscillator, degenerate cases, removal of degeneracy in second order, Zeeman effect without electron spin, first-order Stark effect in hydrogen, perturbed energy levels, correct eigen function, occurrence of permanent electric dipole moments.	15
Keywords:	Uncertainty principle, normalization of wavefunction, angular momentum spherically symmetric potential, Time independent perturbation theory, Zeeman effect	

Signature of Convener & Members (CBoS) :

Acti

palak

1

8742



[Signature]

[Handwritten signature]

[Handwritten signature]

FOUR YEAR UNDERGRADUATE PROGRAM(2026-2030)

DEPARTMENT OF PHYSICS

COURSE CURRICULUM

PART-A: INTRODUCTION			
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VIII	Session: 2026-2027
1	Course Code	PHSE- 09 T	
2	Course Title	Solid State Physics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	By course end, students will master: ➤ Energy band concept in solids, including energy gap analysis. ➤ Bloch function, Kronig-Penny model application for electron description. ➤ Hall effect in semiconductors, Fermi-Dirac distribution temperature impact, and free electron gas behavior in 3D. ➤ Zone schemes exploration, Fermi surface construction, and understanding of nearly free electrons, holes, and open orbits.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Electrical Properties of solid Free electron model; Solution of one-dimensional Schrodinger equation in a constant potential; density of states; Fermi energy; Energy bands and origin of energy gap and its magnitude, Bloch an electron, Hall effect Magnetic properties of solids Dia, para and ferromagnetism; Langevin's theory of dia and paramagnetism, Curie-Weiss law		11
II	Effect of temperature on F-D distribution, free electron gas in three dimensions. Different zone schemes, reduced and periodic zones, construction of Fermi surfaces, nearly free electrons, electron, hole, open orbits, Calculation of energy bands, Tight binding, Wigner-Seitz, cohesive energy, pseudo potential methods. Experimental methods in Fermi surface studies, quantization of orbits in a magnetic field, de Haas van Alphen Effect, External orbits, Fermi surface of copper		11
III	Lattice dynamics in monoatomic and diatomic lattice: two atoms per primitive basis, optical and acoustic modes, quantization of elastic waves, phonon momentum, inelastic neutron scattering by phonons, Anharmonic crystal interactions-thermal expansion, thermal conductivity, thermal resistivity of phonon gas, umklapp processes, imperfections		11
IV	Superconductivity Experimental survey: occurrence of superconductivity, Destruction of superconductivity by magnetic field, Meissner effect, heat capacity, energy gap, MW, and IR properties, isotope effect. Theoretical survey: thermodynamics of superconducting transition, London equation, Coherence length, Cooper pairing due to phonons, BCS theory of superconductivity, BCS ground state, flux quantization of superconducting ring, duration of persistent currents, Type II superconductors, Vortex states, estimation of Hc1 and Hc2, single particle and Josephson superconductor tunneling, DC/AC Josephson effect, Macroscopic quantum interference. High-temperature superconductors, critical fields and currents		12
Keywords	Free electron model, Kronig Penny Model, Hall effect, Zone schemes, fermi surfaces, optical and acoustic modes, Superconductivity, BCS theory		

Signature of Convener & Members (CBOS):

Heliti
Palak

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

FOUR YEAR UNDERGRADUATE PROGRAM(2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION			
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VIII	Session: 2026-2027
1	Course Code	PHSE- 10	
2	Course Title	Atomic and Molecular Physics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Explain Vector atom model and use it for analyzing hydrogen spectra. ➤ Analyze various spectra and check for possibility of a given transition ➤ Explain and Apply Raman's effect and spectroscopy for various application. ➤ Appreciate the extraordinary characteristic of lasers and differentiate it from an ordinary light. ➤ Explore more about scientific contribution of Sir C V Raman	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Vector atom model, quantum numbers associated with vector atom model, Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules, singlet, triplet fine structure in alkaline earth spectra, L-S and J-J coupling		15
II	Different types of Spectra, Discrete set of electronic energies of molecules, quantization of vibrational energies, determination of inter-nuclear distance, Transition rules for vibration and electronic vibration spectra. Pure rotational and rotation vibration spectra, Quantization of States Dissociation limit for the ground and other electronic states, transition rules for pure rotation and electronic- rotation Spectra		15
III	Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy. Application of Raman Spectroscopy, Resonance Spectroscopy, X-Rays, Production of X-rays, X-ray spectra, Mosley's law, X-Ray Spectroscopy,		15
IV	Atom Radiation interactions: Semi-classical description of radiation. Absorption, spontaneous and stimulated emissions, Einstein's A and B coefficients, Coherent and Incoherent emissions, LASERS and MASERS, Line widths, various types of line broadening, two-level atoms in a radiation field		15
Keywords	Vector atom model, hydrogen spectra, electronic transitions, vibrational spectra, rotational spectra, Raman effect		

Signature of Convener & Members (CBoS) :



FOUR YEAR UNDERGRADUATE PROGRAM(2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION			
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VIII	Session:2026-2027
1	Course Code	PHSE-11	
2	Course Title	Statistical Mechanics	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➤ Explain the connection between statistics and thermodynamics. Define the phase space of the classical system. ➤ Define three different types of Ensembles and discuss corresponding theories. Define partition functions for different canonical systems. ➤ Explain energy, energy-density fluctuations, and correspondence of various ensembles. Explain statistics of different quantum mechanical ensembles. ➤ Discuss Bose-Einstein (BE) Condensate w.r.t. liquid Helium II, Define and discuss electron gas behavior w.r.t. Fermi Dirac Statistics ➤ Discuss Virial expansion of the equation of state. Discuss Brownian motion and Einstein and Smoluchowski theory	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	Foundation of Statistical Mechanics Macroscopic and microscopic states, contact between statistics and thermodynamics, physical significance of Ω (N, V, E), the classical gas, entropy of mixing and Gibb's paradox, phase space of classical system, Liouville's theorem and its consequences, quantum states and phase space.	15
II	Elements of ensemble theory A system in microcanonical, canonical, and grand canonical ensembles, partition functions, physical significance of statistical quantities, example of classical system, energy and energy-density Fluctuations and mutual correspondence of various ensembles	15
III	Formulation of quantum statistics Quantum mechanical ensemble theory, density matrix, statistics of various quantum mechanical ensembles, system composed of indistinguishable particles. Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac distributions Thermodynamic behavior of an ideal Bose gas, Bose-Einstein condensation and, elementary excitations in liquid helium II, Thermodynamic behavior of an ideal Fermi gas, the electron gas, non-relativistic and relativistic degenerate electron gas, theory of white dwarf stars.	15
IV	Statistical Mechanics of interacting systems The method of cluster expansion for a classical gas, Virial expansion of the equation of state. Theory of phase transition – general remark on the problem of condensation, Fluctuations: thermodynamic fluctuations, Spatial correlation in a fluid Brownian motion: Einstein Smoluchowski's theory of Brownian motion	15
Keywords	Macro and microstates, ensembles, phase space, partition function, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, Fluctuations, Brownian motion	

Signature of Convener & Members (CBQS):

Selvi

Palak

Raj

Shah

R

Pradeep

Sh

FOUR YEAR UNDERGRADUATE PROGRAM(2026-2030)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION			
Program : Bachelor in Science (Honors/Honors with Research)		Semester -VIII	Session: 2026-2027
1	Course Code	PHSE-12 T	
2	Course Title	Microprocessor	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	After completion of this course a student will be able to- ➤ Understand the basics of digital computer, Clarify the concept of memories used in computer system ➤ Familiar with buses and registers available in microprocessor ➤ Understand the addressing modes, data transfer group, arithmetic group, logical group etc. Know about Assembly Language, High-Level and Area of applications of various languages ➤ Able to use Assembly Language for programming of microprocessor	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Digital Computer: Generation of computer, Digital Computer, Its basic components: Input and output devices, Central Processing Unit (CPU) and its organization, Primary memory: Introduction, Types of Primary memory - RAM, SDRAM, SGRAM, DDR SDRAM, SIMM, DIMM, ROM, PROM, EPROM, EEPROM, Secondary memory: Construction and working principles of Hard Disc, Floppy Disc, Optical Disc, Magnetic Bubble Memory. Cache memory, Real and Virtual Memory. Memory hierarchy		11
II	Microprocessor: Introduction and evaluation, Architecture and functional organization of Intel 8085, ALU, Timing and Control unit, Buses: Address Bus, Data Bus and Control Bus. Bus architecture: PCI, ISA, USB and AGP. Registers: ACC, General purpose register, Stack pointer, Program counter, Instruction register, Temporary register. Processing speed of processor, Types of processors (Basic Idea), Opcode and Operand, Pin Diagram and Pin Configuration of 8085, Intel 8085 instructions, Instruction cycle, Timing diagram		12
III	Instruction set of 8085: Addressing modes, Data transfer group, Arithmetic group, Logical group, Branch group, Stack, I/O and Machine control group. Programming of Microprocessor: Assembly Language, High-Level languages. Advantages and Disadvantages of high-level languages, Area of applications of various languages, Stack, Subroutines, Modular programing, Structured programming		11
IV	Assembly Language Programs: Addition of two 8-bit number; sum 8-bit, Addition of Two 8-bit number; sum 16-bit, 8-bit subtraction, Shift an 8-bit/ 16-bit number left by 1-bit, Shift an 8-bit/ 16-bit number left by 2-bit, Find larger number of two numbers, Find the largest number in a data array, Find smaller number of two numbers, Find the smallest number in a data array, To arrange a series of numbers in Descending order, To arrange a data array in ascending order, 8-bit multiplication; product in 16-bit, 8-bit division		11
Keywords	CPU, Memory, Microprocessor, Buses, Registers, Opcode, Instructions, Addressing mode, Assembly Language, Programming.		

Signature of Convener & Members (CBoS) :

Aditi

Palak

Pratik

Pratik

Pratik

Pratik

Pratik

Pratik