PROGRAMME OUTCOMES AND COURSE OUTCOMES

2023 – 2024

NAME OF THE PROGRAMME: M.Sc Physics **PROGRAMME CODE: PAPH**

Programme Outcomes

PO1	Gain exposure on the analysis and interpretation of mathematical models including the problems of physics
PO2	Promote experimental skills
PO3	Develop entrepreneurship and employability skills

Course Outcomes

Course Code	Course Title	Course Outcomes
23PG1P1	Mathematical Physics	CO1. Students will be able to Define and deduce gauss divergence and stokes theorem and solving problems on gauss divergence and stokes theorem. CO2. Students will be able to

		Discuss complex variables and Cauchy Residue Theorem. CO3. Students will be able to Explain special type of matrices and its Eigen value problems CO4. Students will be able to Illustrate the properties of Fourier and Laplace transforms CO5. Students will be able to Define Special Functions and find its relations
23PG1P2	Classical Mechanics And Relativity	CO1. Students will be able to understand the mechanics of single particle and system of particles and identify different types of constraints imposed on systems. CO2. Students will be able to derive Lagrange's equation equation of motion for any given system according to Lagrangian formulation. CO3. Students will be able to explain the Hamilton's canonical equation of motion and hence to discuss motion of particle in a central force field. CO4. Students will be able to apply the theory of small oscillations to a linear triatomic molecule and get the normal modes and normal frequencies of the same. CO5. Students will be able to Understand and apply the principles of relativistic kinematics to the mechanical systems.

23PG1P3	Practical I	Students will be able to handle the laboratory equipment's and develop lab skills in electronics experiments.
23PG1PE1	Linear And Digital Ics And Applications	CO1. Students will be able to Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve problems CO2. Students will be able to Develop skills to design linear and non-linear applications circuits using Op-Amp and design the active filters circuits. CO3. Students will be able to Gain knowledge about PLL, and develop the skills to design the simple circuits using IC 555 timer and can solve problems related to it. CO4. Students will be able to Learn about various techniques to develop A/D and D/A converters. CO5. Students will be able to Acquire the knowledge about the CMOS logic, combinational and sequential circuits.
23PG1PE2	Medical Physics	CO1. Students will be able to Learn the fundamentals, production and applications of X-rays. CO2. Students will be able to Understand the basics of blood pressure measurements. Learn about sphygmomanometer, EGC, ENG and basic

		principles of MRI. CO3. Students will be able to Apply knowledge on Radiation Physics CO4. Students will be able to Analyze Radiological imaging and filters CO5. Students will be able to Assess the principles of radiation protection
23PG1PE3	Advanced Optics	CO1. Students will be able to Understand the concept of polarization of light, production methods and double refraction. CO2. Students will be able to Understand the working of different types of LASERS CO3. Students will be able to Explain the types of fiber optics and their potential applications potential well; To discuss the problem of barrier penetration. CO4. Students will be able to Differentiate first and second harmonic generation and explain their applications CO5. Students will be able to Describe the principles of magneto-optic and electro-optic effects and its applications.
23PG1PE4	Communication Electronics	CO1. Students will be able to Discuss and compare the propagation of electromagnetic waves through sky and on earth's surface Evaluate the energy and power radiated by the different types of antenna

		CO2. Students will be able to Compare and differentiate the methods of generation of microwaves analyze the propagation of microwaves through wave guides- discuss and compare the different methods of generation of microwaves CO3. Students will be able to Classify and compare the working of different radar systems- apply the principle of radar in detecting locating, tracking, and recognizing objects of various kinds at considerable distances – discuss the importance of radar in military- elaborate and compare the working of different picture tube CO4. Students will be able to Classify, discuss and compare the different types of optical fiber and also to justify the need of it-discover the use of optical fiber as wave guide CO5. Students will be able to Explain the importance of satellite communication in our daily life-distinguish between orbital and geostationary satellites elaborate the linking of satellites with ground station on the earth.
23PG1PAE	Digital Photography	CO1. Students will be able to Understand the basic concepts of photography CO2. Students will be able to Discuss the different types of lenses and to introduce the technical knowledge of SLR camera. CO3. Students will be able to Understand the focusing aspects of camera.

		CO4. Students will be able to understand the composition techniques of photography CO5. Students will be able to understand the types of photography and practising indoor and outdoor objects
23PG2P4	Statistical Mechanics	CO1. Students will be able to examine and elaborate the effect of changes in thermodynamic quantities on the states of matter during phase transition CO2. Students will be able to analyze the macroscopic properties such as pressure, volume, temperature, specific heat, elastic moduli etc. using microscopic properties like intermolecular forces, chemical bonding, atomicity etc. CO3. Students will be able to Differentiate between canonical and grand canonical ensembles and to interpret the relation between thermodynamical quantities and partition function CO4. Students will be able to recall and apply the different statistical concepts to analyze the behaviour of ideal Fermi gas and ideal Bose gas and also to compare and distinguish between the three types of statistics. CO5. Students will be able to discuss and examine the thermodynamical behaviour of gases under fluctuation and also using Ising model.
23PG2P5	Quantum Mechanics-I	CO1. Students will be able to Demonstrates a clear understanding of the basic postulates of quantummechanics which serve to formalize the rules of

		quantum mechanics. CO2. Students will be able to apply and analyze the Schrodinger equation to solve one dimensionalproblems and three dimensional problems CO3. Students will be able to Can discuss the various representations, space time symmetries andformulations of time evolution CO4. Students will be able to formulate and analyze the approximation methods for various quantummechanical problems CO5. Students will be able to apply non-commutative algebra for topics such as angular and spin angularmomentum and hence explain spectral line splitting.
23PG2P6	Practical II	Students will be able to handle the laboratory equipment's and develop lab skills in electronics experiments.
23PG2PE5	Advanced Mathematical Physics	CO1. Students will be able to Define and Deduce illustrations in Physics as Tensors CO2. Students will be able to Discuss Legendre functions and recurrence formula CO3. Students will be able to Explain Bessel and Hermite functions CO4. Students will be able to Describe group, cyclic group , sub group and

		multiplication tables . CO5. Students will be able to Prove great orthogonality theorem and construct character tables of a group
23PG2PE6	Nonlinear Dynamics	CO1. Students will be able to analyze the numerical techniques of nonlinear dynamics CO2. Students will be able to Understand various dynamical systems CO3. Students will be able to explain the bifurcations and onset of chaos CO4. Students will be able to understand the concepts of various coherent structures CO5. Students will be able to describe the applications of solitons, chaos and fractals.
23PG2PE7	8086 Microprocessor And Microcontroller 8051	CO1. Students will be able to Gain knowledge of architecture and working of 8086 microprocessor CO2. Students will be able to write simple assembly language programs for 8086 microprocessor CO3. Students will be able to Learn about various techniques Of Interfacing A/D Converter Through Intel 8255. CO4. Students will be able to Gain knowledge of Intel 386 And 486 µP, And Pentium Processors.

		CO5. Students will be able to write simple assembly language programs for 8051 Microcontroller.
23PG2PE8	Biophysics	CO1. Students will be able to Understand the structural organization and function of living cells and should able to apply the cell signalingmechanism and its electrical activities. CO2. Students will be able to Comprehension of the role of biomolecular conformation to function. CO3. Students will be able to Conceptual understanding of the function of biological membranes and also to understand the functioning of nervous system. CO4. Students will be able to know the effects of various radiations on living systems and how to prevent ill effects of radiations. CO5. Students will be able to Analyze and interpret data from various techniques viz., spectroscopy, crystallography, chromatography etc.
23PG2PAE	Modern Photography	CO1. Students will be able to Understand the basic phenomena of photography CO2. Students will be able to discuss the optics behind photography CO3. Students will be able to Comprehend the types of camera, its important control parameters and composition techniques of photography CO4. Students will be able to understand the types of photography and

		practising indoor and outdoor objects CO5. Students will be able to Understand the modern technique of photoshop and develop skills to manipulate, edit and enhance the real time photographs using photoshop.
19PG3P13	Condensed Matter Physics	CO1. Students will be able to Explain Fourier analysis of crystals and compute the structure factor - Discuss the various types of crystal binding CO2. Students will be able to Discuss quantization of elastic waves in lattice vibrations CO3. Students will be able to Analyze the thermal properties of solids by applying different models CO4. Students will be able to Discuss the Kronig-Penney model and its implications CO5. Students will be able to Explain Fermi surfaces and determine the same by De Haas van Alphen effect
19PG3P14	Statistical Mechanics	CO1. Students will be able toAnalyse classical equilibrium thermodynamics to make physical predictions, describe the effects of quantum mechanics on statistical mechanics CO2. Students will be able to Acquire knowledge on Canonical and Grand canonical ensembles.

		CO3. Students will be able to Understand the concepts of Bose Einstein condensation. CO4. Students will be able to Apply statistical mechanics to condensed matter systems such as Fermi gases, white dwarfs and nuclear matter. CO 5. Students will be able to Compute fluctuations in the systems of canonical, micro canonical and grand canonical ensembles and comprehend random process using Fourier analysis
19PG3P15	Nuclear and Particle Physics	CO1. Students will be able to understand range of alpha particles, spectra and Gamow's theory of alpha decay. And to describe Fermi's theory of Beta decay. CO2. Students will be able to Describe nuclear energy sources CO3. Students will be able to Explain various nuclear models CO4. Students will be able to Describe nuclear reactions and solve some problems related to cross section CO5. Students will be able to Classify the elementary particles and explain their various properties
19PG3P16	Practicals V	Students will experience conceptual understanding of electrical, magnetic,

	(General Physics Lab)	optical and magneto-opticproperties of materials, propagation of Ultrasonic waves through liquids, lattice parameters of crystals, principle and efficiency of solar water heater, properties of polarized light
19PG3P17	Practicals VI (Advanced Electronics Lab)	Students will be able to use the various electronic devises for various applications. Also the student is exposed to Mathematica –Wolfram language and Wolfram cloud to plot simple functions.
19PG4P18	Advanced Condensed Matter Physics	CO1. Students will be able to Analyse the dispersion of electromagnetic waves in a non-magnetic solid CO2. Students will be able to Identify lattice vacancies and defects and explain the colorcenters in crystals Compare the behaviour of normal conductor and superconductor Explain superconductivity based on various models and theories CO3. Students will be able to Identify dielectric medium and analyze their polarization properties. CO 4. Students will be able to Apply quantum theory and analyze the magnetisation and susceptibility properties CO5. Students will be able to Discuss the formation of plasmons, polaritons, polarons and excitons and their interactions with the solids.
19PG4P19	Molecular Spectroscopy	CO1. Students will be able to identify the various interactions of radiation with matter and the corresponding regions in the electromagnetic spectrum.

		CO 2. Students will be able to derive the relationship between molecular spectra and molecular properties CO 3. To explain Microwave , Spin Resonance, Infra Red, Raman , Electronic and NMR spectra and the associated techniques and instrumentation. CO4. Students will be able to apply the theory to understand molecular spectra CO5. Students will be able to a derive Bloch equations.
19PG4P20	Advanced Quantum Mechanics	CO1. Students will be able to understand perturbation theory and Solve quantum mechanical problems using variation method CO 2. Students will be able to Solve one dimension Schrödinger equation using WKB approximation method CO3. Students will be able to Explain about dipole approximation, harmonic perturbation, Fermi's Golden rule CO4. Students will be able to Understand partial wave analysis techniques CO5. Students will be able to Solve the problems using relativistic equations
19PG4P21	Practicals VII Advanced General Physics	Students will be able to deals with electric, magnetic, optic and electromagnetic behaviour of materials,propagation of Ultrasonic waves through liquids, microwave characteristics

	Experiments	
19PG4P22	Practicals VIII Programming IN C++	Students will be familiar the to apply numerical methods in modern scientific computing.
19PG3PE1A	Communication Systems	CO1. Students will be able to Explain amplitude modulation techniques and sideband principles CO2. Students will be able to Describe the concepts of angle modulation and compare frequency and phase modulation CO3. Students will be able to Describe the key modules of digital communication systems with emphasis on...PAM, Pulse code modulation (PCM), DM CO4. Students will be able to Deduce the fundamental laws of of satellite communication and explain the principle of optical fiber communication CO5. Students will be able to Describe about basic, high frequency, microwave , wideband and special purpose antennas and principles of microwave generation.
19PG3PE1B	Numerical Methods & Programming in C++	CO 1. Students will be able to Solve Algebraic and Transcendental equations numerically using Regula Falsi and Newton Raphson method CO 2. Students will be able to Apply newton's forward and backward interpolation formulae to equal and unequal intervals

		CO3. Students will be able to Evaluate numerical differentiation and integration CO4. Students will be able to Compose C++ program using structures and classes and apply inheritance and polymorphism features in C++ programming. CO5.Students will be able to Describe the design concepts of counters and shift registers.Demonstrate the various techniques to develop A/D and D/A converters
19PG4PE2A	Materials Science	CO1. Students will be able to Deduce the expressions of Nucleation phenomena and explain various Crystal growth techniques CO2. Students will be able to Explain the mechanism of molecular movements in Ceramics, Polymers and Composites CO3. Students will be able to Analyse various methods of preparing thin films and its measurement techniches CO4. Students will be able to Explore novel methods of preparing carbon nanomaterials and carbon nanotubes. CO5. Students will be able to nderstand the concepts of Diffraction analysis, Thermal analysis and Electron microscopy used in crystal characterisation
19PG4PE2B	Astro Physics	CO 1. Students will be able tooutline variety of objects in the Universe with a sense of scale for size and time and different types of observing

		techniques, instruments used in Astronomy. CO2. Students will be able to acquire knowledge about the stellar evolution and mechanism of stellar energy generation CO3. Students will be able to gain an idea of fate of massive stars exploding as dazzling supernovae and medium mass stars condensing as neutron stars CO4. Students will be able to explain the surface features and regions of the nearest star Sun and the impacts of the solar activities on earth. CO 5. Students will be able to obtain knowledge about the origin and evolution of the Universe and comprehend its future course.
19PAD2CA	Computer Applications LATEX	CO 1. Students will be able to Install and understand the basics of Latex CO2. Students will be able to Defines commands for symbols, alignment and page layout in Latex CO3. Students will be able to Create tables, figures using Latex CO 4. Students will be able to Write documents containing mathematical formulas using Latex CO5. Students will be able to Prepare presentation, articles, books using Latex.
19PGSLP1	Instrumentation and Experimental	CO1. Students will be able to Explain the field of nanoscience to analyze

	Methods	and fit the experimental data with different kind of errors CO2. Students will be able to explain principle, theory and application of various sensors and transducers CO3. Students will be able to describe the various methods of vacuum and thin film measurements CO4. Students will be able to Discuss the basic principle and importance of the different AC and DC measurement techniques. CO5. Students will be able to Explain the developing instruments and their uses
21PG2PSL1	Nanotechnology for All	CO 1. Students will be able to brief about fabrication techniques and resources of nanotechnology. CO 2. Students will be able to Build a Better world with Nanomaterials CO3. Students will be able to describe The carbon nano tube connections CO4. Students will be able to understand the Nano fibers CO5. Students will be able to understand Nanotechnology in medical applications.