B. Sc. PHYSICS PROGRAM LEARNING OUTCOMES

Graduates from the B. Sc. Physics undergraduate degree program will be able to

PLO1: Demonstrate a conceptual understanding in the core areas of physics and the supporting mathematics including the range of validity of key concepts.

PLO2: Translate physical descriptions into mathematical equations, and conversely, explain the physical meaning of mathematical results.

PLO3: Use computational techniques such as coding at a level necessary to perform statistical analysis and simulations in solving complex problems.

PLO4: Use basic laboratory equipment effectively in order to conduct measurements and analyze the results including the understanding of error limits.

PLO5: Communicate the scientific results efficiently, making use of clear and well-organized writing and presentation skills, and employ equations and visualization tools as needed.

CLOs of B.Sc. (H) Physics Programme

List of Major Courses
offered to
Four Year B.Sc. Physics programme in the
Department of Physics
w.e.f. Academic Year 2024-25

S No	Semester	Course Code	Course Title	L	T	P	Credits	Course Category
1	I	24PHBS101	Mathematical Physics I	3	0	0	3	Major Course
2		24PHBS151	Computational Physics lab I	0	0	2	1	Major Course Lab
3		24PHBS102	Mechanics	3	0	0	3	Major Course
4		24PHBS152	General Properties Of Matter Lab	0	0	2	1	Major Course Lab
5	II	24PHBS201	Mathematical Physics II	3	0	0	3	Major Course
6		24PHBS251	Computational Physics lab II	0	0	2	1	Major Course Lab
7		24PHBS202	Optics	3	0	0	3	Major Course
8		24PHBS252	Optics Lab	0	0	2	1	Major Course Lab
9	III	24PHBS301	Mathematical Physics III	3	1	0	4	Major Course
10		24PHBS302	Electricity & Magnetism	3	0	0	3	Major Course
11		24PHBS352	Electricity & Magnetism lab	0	0	2	1	Major Course Lab
12		24PHBS303	Thermal Physics	3	0	0	3	Major Course
13		24PHBS353	Thermal Physics lab	0	0	2	1	Major Course Lab
14	IV	24PHBS401	Analog Electronics	3	0	0	3	Major Course
15		24PHBS451	Analog Electronics Lab	0	0	2	1	Major Course Lab
16		24PHBS402	Modern Physics	3	0	0	3	Major Course
17		24PHBS452	Modern Physics Lab	0	0	2	1	Major Course Lab
18		24PHBS403	Classical Mechanics	3	1	0	4	Major Course
19	V	24PHBS501	Digital Electronics	3	0	0	3	Major Course
20		24PHBS551	Digital Electronics lab	0	0	2	1	Major Course Lab
21		24PHBS502	E. M. Theory	3	0	0	3	Major Course
22		24PHBS552	E. M. Theory Lab	0	0	2	1	Major Course
23		24PHBS503	Quantum Mechanics I	3	1	0	4	Major Course
24		24PHBS504	Condensed Matter Physics I	3	0	0	3	Major Course
25		24PHBS554	Condensed Matter Physics I Lab	0	0	2	1	Major Course Lab
26	VI	24PHBH601	Condensed Matter Physics II	3	1	0	4	Major Course
27		24PHBS602	Electrodynamics	3	1	0	4	Major Course
28		24PHBS603	Quantum Mechanics II	3	1	0	4	Major Course
29		24PHBS604	Laser and Non linear Optics	3	1	0	4	Major Course

30	VII	23PHBS701	Atomic and Molecular Physics - I	3	1	0	4	Major Course
31		23PHBS702	Nuclear and Particle Physics	3	1	0	4	Major Course
32		23PHBS703	Statistical Mechanics I	3	1	0	4	Major Course
33	VIII	23PHBS801	Atomic and Molecular Physics - II	3	1	0	4	Major Course
34		23PHBS802	Quantum Field Theory	3	1	0	4	Major Course
35		23PHBS803	Statistical mechanics II	3	1	0	4	Major Course

MATHEMATICAL PHYSICS I	
Course Code: 24PHBS101	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

Course Learning Outcome (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would:

1. Familiarity with the behaviour of vectors under rotations and scalar products.
2. Demonstrate Gauss' divergence theorem, Green's theorem, and Stokes' theorem to solve practical problems.
3. Apply coordinate transformations to vector calculus operations.
4. Analyze the basic concepts of probability and its applications in physics.
5. Able to solve differential equations and apply it in physics.

COMPUTATIONAL PHYSICS - I	
Course Code: 24PHBS151	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be

1. Identify and explain the fundamental components of Python and C++.
2. Describe the functionality and use of control structures and functions in Python or C++.
3. Utilize various data types, arrays, and looping constructs to implement solutions to programming problems.
4. Critically analyze and assess different 2D plotting techniques using Gnuplot or Matplotlib.
5. Design and implement new software programs by integrating advanced methods and features in Python or C++.

MECHANICS	
Course Code: 24PHBS102	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

Course Learning Outcome (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Articulate Newton's laws of motion and discuss their significance for understanding inertial frames, force, and mass.
2. Analyze and solve problems involving the dynamics of particle systems in diverse scenarios.
3. Explain and apply the principles of central force fields and gravitational interactions.
4. Apply methods to analyze the rotational dynamics of particle systems and the behavior of non-inertial reference frames.
5. Well Versed with the concepts of the special theory of relativity and apply them to relevant physical phenomena.

GENERAL PROPERTIES OF MATTER LAB	
Course Code: 24PHBS152	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

Course Learning Outcome (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Familiarity with measurement of rigidity modulus and moment of inertia.
2. Get an insight into the principle involved in measuring the various physical parameters.
3. Understand how to measure various physical parameters including rigidity modulus, moment of inertia, coefficient of viscosity, Young's modulus, elastic constants etc.
4. Understand the error estimation.
5. Perform the experiment for various properties of the liquid.

MATHEMATICAL PHYSICS - II	
Course Code: 24PHBS201	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

Course Learning Outcome (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be:

1. Equipped with good knowledge of basic methods of single variable calculus and the ability to apply the same in physics.
2. Well-versed with the techniques of multi-variable calculus and the ability to apply the same in physics.
3. Demonstrate the expansion of various functions according to the Fourier series.
4. Familiar with special functions such as Legendre, Bessel, Hermite and Laguerre functions and the capability to use them in physics.
5. Evaluate various forms of special integrals using gamma and beta functions.

COMPUTATIONAL PHYSICS II	
Course Code: 24PHBS251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Learn how to write code to find the roots of mathematical equations.
2. Apply numerical methods to solve physics problems that are challenging or impossible to solve analytically.
3. Implement and analyze various methods for the least square fitting.
4. Interpret and communicate findings through graphs and plots using series representation.
5. Design new methods for generating and plotting polynomials using series expansion.

OPTICS	
Course Code: 24PHBS202	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: Knowledge on Wave & Oscillations	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Get a basic understanding of the core principles underlying wave propagation.
2. Well-versed with the interference phenomena.
3. Understanding of Fraunhofer diffraction.
4. Knowledge of Fresnel diffraction.
5. Familiarity with the concepts of polarization and its applications.

OPTICS LAB	
Course Code: 24PHBS252	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Interpret the various methods to perform waves and optics experiments.
2. Describe a comprehensive understanding of the Physics underpinning optical experiments.
3. Illustrate the practical understanding of diverse optical principles through hands-on experimentation
4. Explain with the analysis of results of optical experiments.
5. Design new experiments or variations of existing methods.

MATHEMATICAL PHYSICS - III	
Course Code: 24PHBS301	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be:

1. Examine mathematical techniques involving complex variables and their importance in tackling physics problem-solving tasks.
2. Explain the methods of solving second-order differential equations using various techniques and illustrate their practical application in physics scenarios.
3. Analyse the methods of solving second-order partial differential equations for practical application in physics scenarios.
4. Interpret the significance of the Fourier transform transform in physics, and they will be able to compare their advantages and limitations for specific applications.
5. Demonstrate the significance of the Laplace transform in physics, and they will be able to compare their advantages and limitations for specific applications.

ELECTRICITY & MAGNETISM	
Course Code: 24PHBS302	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Demonstrate knowledge and understanding of Coulomb interaction and the fundamental concepts of electrostatics.
2. Explain the dielectric properties of matter and the significance of these properties in electrical and electronic applications.
3. Describe the principles of magnetic fields and magnetostatics to solve problems and analyze magnetic interactions in various scenarios.
4. Distinguish the behavior of magnetostatics and magnetic fields within different types of matter.
5. Construct a comprehensive understanding of basic circuit theory and demonstrate its application in designing and analyzing electrical circuits.

ELECTRICITY & MAGNETISM LAB	
Course Code: 24PHBS352	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Illustrate circuit theorems and demonstrate solving complex electrical circuits.
2. Demonstrate principles to measure parameters in electrostatic experiments along with experimental setup and data analysis.
3. Deduce principles in measuring parameters in magnetism.
4. Evaluate various aspects of electromagnetic induction experiments.
5. Design new experiments or variations of existing methods.

THERMAL PHYSICS	
Course Code: 24PHBS303	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Summarize the principles of heat transfer mechanisms and describe the behavior of ideal gases and the kinetic theory of gases.
2. Demonstrate the ability to calculate heat transfer, work done, and efficiency in various thermodynamic processes.
3. Differentiate between reversible and irreversible processes and their impact on efficiency.
4. Critique the concept of absolute zero temperature and the third law of thermodynamics and judge the feasibility of different heat engine cycles and their efficiency.
5. Develop strategies for optimizing the efficiency of heat engines or designing effective heat exchangers.

THERMAL PHYSICS LAB	
Course Code: 24PHBS353	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Summarize the theory behind different heat transfer experiments.
2. Demonstrate the ability to set up and operate equipment for heat conduction experiments.
3. Examine the effects of variables like material composition and surface area on heat transfer rates.
4. Judge the significance of experimental findings in relation to real-world applications.
5. Develop setups to demonstrate thermal expansion phenomena and measure coefficients of expansion.

ANALOG ELECTRONICS	
Course Code: 24PHBS401	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Explain the operation and characteristics of various electronic components.
2. Familiarize students with the applications of electronic circuits.
3. Fluent with the understanding of the Field effect transistor and its characteristics.
4. Becomes familiar with the working of operation amplifier and its application
5. Able to understand the principles behind oscillators and signal generators

ANALOGUE ELECTRONICS LAB	
Course Code: 24PHBS451	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Summarize the characteristics of different amplifier configurations, filters, and oscillators.
2. Demonstrate the ability to measure voltage, current, and impedance using appropriate instruments.
3. Differentiate between different types of amplifiers and their frequency responses.
4. Critique the limitations of components and their impact on circuit functionality.
5. Develop projects that integrate multiple electronic components to achieve specific functionalities.

MODERN PHYSICS	
Course Code: 24PHBS402	Continuous Evaluation: -- Marks
Credits: 3	End Semester Practical Examination:-- Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the limitations of classical physics and the onset of quantum effects.
2. Construct the Schrödinger equation and able to solve it.
3. Able to apply quantum mechanical approach to solve simple 1D problem.
4. Analyse the application of Schrödinger equation in three dimension problem.
5. Evaluate the solution of Schrödinger equation in spherical polar coordinates.

MODERN PHYSICS LAB	
Course Code: 24PHBS452	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would able to:

1. Relate the experimental knowledge of various modern physics concepts.
2. Compare various constants including Boltzmann constant, Planck's constant etc
3. Demonstrate the insights of the Physics involved in the experiments
4. Analyse the absorption lines in rotational spectra and photoelectric effect.
5. Assess the error estimation in various experiments

CLASSICAL MECHANICS	
Course Code: 24PHBS403	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Compare the concepts of constraints, Lagrangian and Hamiltonian formulation.
2. Demonstrate the canonical transformation and Poisson's bracket.
3. Analyse the mechanics of rigid bodies.
4. Evaluate the ideas of fluid dynamics.
5. Design the Classical field theory formalism.

DIGITAL ELECTRONICS	
Course Code: 24PHBS501	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	Course Type: **MAJOR COURSE THEORY**
Prerequisite: Basic knowledge about electronics	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Learn to minimise a given Boolean function using laws of Boolean algebra.
2. Develop the digital signals, positive and negative logic, Boolean variables, truth table, various number system codes and their inter-conversions.
3. Understand the working principle of arithmetic circuits, sequential logic circuits, registers, counters based on flip flops.
4. To learn the Karnaugh map to minimise the hardware requirement of digital logic circuits.
5. Develop schematics for practical implementation of electronic designs

DIGITAL ELECTRONICS LAB	
Course Code: 24PHBS551	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination:40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Familiarity with on measurement methods and use of specific instruments to analyze plane polarized light.
2. Get an insight into the principle involved in measuring specific rotation of solutions and wavelength and velocity of ultrasonic waves in a solution.
3. Understand how to measure various optical properties and phenomena using different methods.
4. Well-versed with the various method to determine various constants in radiation laws.
5. Evaluate data reading carefully and estimate error.

ELECTROMAGNETIC THEORY	
Course Code: 24PHBS502	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination:60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able:

1. Explain the basics of electromagnetic induction.
2. Demonstrate fundamental laws of electromagnetic theory and Maxwell's equations.
3. Compare the EM propagations propagation in free space, dielectric and metals.
4. Formulate the reflections, refraction and polarization of EM waves.
5. Evaluate the polarization of light and various related phenomena.

ELECTROMAGNETIC THEORY LAB	
Course Code: 24PHBS552	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

1. Familiarity with on measurement methods and use of specific instruments to analyze plane polarized light.
2. Get an insight into the principle involved in measuring specific rotation of solutions and wavelength and velocity of ultrasonic waves in a solution.
3. Understand how to measure various optical properties and phenomena using different methods.
4. Well-versed with the various method to determine various constants in radiation laws.
5. Understand to take data reading carefully and estimate of error.

QUANTUM MECHANICS-I	
Course Code: 24PHBS503	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: NIL	

COURSE LEARNING OUTCOME (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Compare the wave functions, operators, and their properties to describe and analyse quantum systems.
2. Construct the angular momentum algebra in quantum mechanics.
3. Analyse the hydrogen atom problem and compare to experimental findings.
4. Evaluate the effect of electric and magnetic fields on the solutions of the hydrogen like atoms.
5. Appraise the Schrödinger equation solution for identical particle system and its symmetries.

CONDENSED MATTER PHYSICS - I	
Course Code: 24PHBS504	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Equipped with the knowledge of crystal structure and various structural parameters
2. Familiar with X-ray diffraction methods
3. Well versed with the understanding of crystal bonding, defects and diffusion in solids.
4. Well versed with concepts of lattice vibrations and phonon modes, and theory of specific heat.
5. Familiar with free electron theory and band theory of solids.

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CONDENSED MATTER PHYSICS LAB - I	
Course Code: 24PHBS554	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Practical Examination: 40 Marks
L T P : 0 0 2	**Course Type: MAJOR COURSE LAB**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Get Familiar with different methods to estimate magnetic susceptibility of solids.
2. Get an insight into the practical method and principle involved in measuring the various physical parameters of dielectric materials.
3. Understand how to measure energy loos form BH curve loop.
4. Fluent with understanding of handle instruments and measure various conducting properties of semiconductors such as hall coefficient and resistivity.
5. Understand to take data reading carefully and estimate of error.

CONDENSED MATTER PHYSICS - II	
Course Code: 24PHBS601	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: CONDENSED MATTER PHYSICS I	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of course, students would be:

1. Fluent with good knowledge of transport properties of solids.
2. Get an understanding of optical properties of materials.
3. Well-versed with the magnetic properties of solids.
4. Able to gain good knowledge to students about superconductivity.
5. Familiarity with the dielectric and ferroelectric properties of solids.

ELECTRODYNAMICS	
Course Code: 24PHBS602	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: Basic knowledge about Electricity and Magnetism	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Get an understanding of covariance laws of classical electrodynamics.
2. Well versed with the different potential and fields acting on the charged particles.
3. Fluent with the knowledge about radiation.
4. Well versed with the knowledge of relativistic electrodynamics.
5. Able to understand the propagation of EM wave in different waveguides.

QUANTUM MECHANICS - II	
Course Code: 24PHBS603	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	Course Type: MAJOR COURSE THEORY
Prerequisite: Basic knowledge of quantum well, harmonic oscillator problems	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Reinforce students' foundational knowledge of quantum mechanics while demonstrating its applicability in diverse physical situations.
2. delve into advanced problem-solving methods for dealing with complex quantum systems that defy exact solutions..
3. Analyse scattering experiments, calculate scattering cross-sections, and understand the quantum mechanical implications of scattering processes.
4. Justify the complexities of quantum mechanical descriptions of atoms and the challenges posed by electron correlations.
5. Evaluate the quantum phenomena in the context of both radiation and the relativistic regime, expanding their understanding of the theory's applicability..

LASER AND NON-LINEAR OPTICS	
Course Code: 24PHBS604	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Able to gain good knowledge about lasing action.
2. Well-versed with the construction and working of different laser systems.
3. Fluent with the principle, working, and construction of different types of laser.
4. Well equipped with the non-linear processes.
5. Able to get an understanding of laser applications in various fields

ATOMIC AND MOLECULAR PHYSICS - I	
Course Code: 24PHBS701	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: Basic knowledge about atomic and molecular structure of atom.	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the fundamental concepts of atomic and molecular structure, energy levels, and transitions.
2. Identify and describe the types of spectroscopic techniques used to study atomic and molecular systems.
3. Analyze and interpret electronic, vibrational, and rotational spectra to extract relevant information about energy levels and molecular properties
4. Apply selection rules and transition probabilities to predict allowed electronic and vibrational transitions.
5. Compare and contrast the advantages and limitations of various spectroscopic techniques for different types of samples and research objectives.

1. Lacowicz, Principle of Fluorescence spectroscopy, Springer, 3rd Edition, 2006.

NUCLEAR AND PARTICLE PHYSICS	
Course Code: 24PHBS702	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite: Basic understanding of Quantum mechanics.	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be

1. Well-versed with nucleus structure and its fundamental properties.
2. Able to get an understanding of nuclear reactions, radioactive decay.
3. Equipped with construction and working of nuclear energy reactors and thermonuclear reactions.
4. Able to grasp knowledge of energy generation in nuclear fission.
5. Fluent the students with elementary particles, and symmetry groups.

STATISTICAL MECHANICS - I	
Course Code: 24PHBS703	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination:60 Marks
L T P : 3 1 0	**Course Type: MAJOR COURSE THEORY**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Relate the basics of mathematical statistics.
2. Describe the understanding of statistics of system of identical particle.
3. Demonstrate various aspects of Bose-Einstein statistics.
4. Formulate the Fermi-Dirac statistics.
5. Evaluate various laws and phenomena of radiation.

ATOMIC AND MOLECULAR PHYSICS - II	
Course Code: 24PHBS801	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	Course Type: MAJOR COURSE THEORY
Prerequisite: Basic knowledge about atomic and molecular structure of atom.	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the fundamental concepts of Raman Spectroscopy.
2. Analyze and interpret electronic spectra to extract relevant information about energy levels and molecular properties.
3. Describe the origin and basics of X-ray Spectroscopy.
4. Understand the principle and technique of NMR Spectroscopy.
5. Fluent with principle, working and applications of ESR Spectroscopy.

QUANTUM FIELD THEORY	
Course Code:24PHBS802	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: Minor Stream Course Theory**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Derive and construct quantum field theories for various physical systems, including scalar, fermionic, and gauge fields.
2. Perform calculations of scattering amplitudes, cross-sections, and decay rates using perturbation theory and Feynman diagrams.
3. Apply symmetry principles to analyze particle interactions, derive conservation laws, and understand the structure of Lagrangians.
4. Apply renormalization techniques to remove divergences and extract finite, meaningful results from quantum field theory calculations.
5. Develop problem-solving skills and enhance critical thinking abilities by tackling complex theoretical and mathematical challenges in the context of quantum field theory.

1. University Press, 2005.

STATISTICAL MECHANICS - II	
Course Code: 24PHBS803	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination:-- Marks
L T P : 3 1 0	Course Type: MAJOR COURSE
Prerequisite: Basic knowledge about thermodynamics	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able:

1. Underline various statistical terms and their relations with thermodynamic quantities.
2. Compare different ensembles and partition function.
3. Demonstrate the quantum statistics of ideal gases.
4. Comply fluctuations and thermodynamic irreversible processes.
5. Evaluate the phase transition and different models.

List of Interdisciplinary Courses (IDC) / Minor Stream Courses (MSC) offered to Four Year B.Sc. Physics programme in the Department of Physics

w.e.f. Academic Year 2024-25

S. No	Cat.	Course code	Course title	Department	L	T	P	C
1	IDC	24MABS001	Introduction to Algebra	Mathematics	3	1	0	4
2		24MABS002	Differential calculus	Mathematics	3	1	0	4
3		24MABS003	Differential Equations	Mathematics	3	1	0	4
4		24MABS004	Statistical Methods and Probability	Mathematics	3	1	0	4
5		24CYBS001	Physical Chemistry I	Chemistry	3	1	0	4
6		24CYBS002	Inorganic Chemistry	Chemistry	3	1	0	4
7		24CYBS003	Physical Chemistry II	Chemistry	3	1	0	4
8		24CYBS004	Analytical Chemistry	Chemistry	3	1	0	4
9	MSC	24PHBS001	Waves and Oscillations	Physics	2	0	0	2
10		24PHBS051	Waves and Oscillations Lab	Physics	0	0	4	2
11		24PHBS002	Biophysics	Physics	3	1	0	4
12		24PHBS003	Solid State Devices	Physics	3	0	0	3
13		24PHBS053	Solid State Devices Lab	Physics	0	0	2	1
14		24PHBS004	Radiation Physics	Physics	3	1	0	4
15		24PHBS005	Numerical Analysis	Physics	3	0	0	3
16		24PHBS055	Numerical Analysis	Physics	0	0	2	1
17		24PHBS006	Statistical Analysis in Physics	Physics	2	0	0	2
18		24PHBS056	Statistical Analysis in Physics	Physics	0	0	4	2
19		24PHBS007	Advanced Mathematical Physics I	Physics	3	0	0	3
20		24PHBS057	Computational Physics lab III	Physics	0	0	2	1
21		23PHBS008	Astronomy & Astrophysics	Physics	3	1	0	4
22		23PHBS009	Atmospheric Physics	Physics	3	1	0	4
23		24PHBS010	Advanced Mathematical Physics II	Physics	3	1	0	4
24		24PHBS011	Renewable Energy Physics	Physics	3	1	0	4
25		24PHBS012	Nanomaterials	Physics	3	1	0	4
26		24PHBS013	Novel & Smart Materials	Physics	3	1	0	4
27		24PHBS014	Soft Matter Physics	Physics	3	1	0	4
28		24PHBS015	Nanomagnetism and Spintronics	Physics	3	1	0	4
29		24PHBS016	Optoelectronics	Physics	3	1	0	4
30		24PHBS017	Nanophotonics	Physics	3	1	0	4
31		24PHBS018	Non-linear spectroscopy	Physics	3	1	0	4
32		24PHBS019	Fiber Optics	Physics	3	1	0	4

33	24PHBS020	Advanced Electronics	Physics	3	1	0	4
34	24PHBS021	Advanced Solid State Physics	Physics	3	1	0	4
35	24PHBS022	Advanced Solid State Physics Lab	Physics	0	0	4	2
36	24PHBS023	Quantum Computation I	Physics	3	1	0	4
37	24PHBS024	Quantum Computation II	Physics	3	1	0	4
38	24PHBS025	Quantum Computation Lab	Physics	0	0	4	2
39	24PHBS026	Plasma Physics	Physics	3	1	0	4
40	24PHBS027	Advanced Nuclear Physics	Physics	3	1	0	4
41	24PHBS028	Medical Physics	Physics	3	1	0	4
42	24RMBS710	Research Methodology	Physics	2	0	0	2

INTRODUCTION TO ALGEBRA	
Course Code: 24MABS001	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Identify and develop concept of mapping and relations.
2. Solve the basics problems of set theory.
3. Well versed with different type of matrices.
4. Apply matrix method solving system of equations problems.
5. Solve vector identities.

DIFFERENTIAL CALCULUS	
Course Code: 24MABS002	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Identify and develop concept of mapping of functions.
2. Solve the limit continuity problems of functions.
3. Apply graphical method for test differentiability of function.
4. Well versed with tangent normal and curvature.
5. Solve problems of polar coordinate and curve tracing of curve.

DIFFERENTIAL EQUATIONS	
Course Code: 24MABS003	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Identify ordinary differential equations.
2. Solve the linear differential equations by various methods.
3. Well versed with Cauchy-Euler equation.
4. Apply the concept of total differential equations.
5. Identify classification of second order partial differential equations.
6.

STATISTICAL METHODS AND PROBABILITY	
Course Code: 24MABS004	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Identify and develop knowledge of basics and importance of statistics.
2. Solve the problems based on concept of central tendency.
3. Apply the concept of random experiment, definition of probability.
4. Well versed with Bayes theorem and its applications.
5. Solve problems of concept of discrete random variables.

PHYSICAL CHEMISTRY-I	
Course Code: 24CYBS001	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Calculate the heat flow into and work done by a system and how that is constrained by the first law of thermodynamics.
2. Explain the behaviour of ideal and real gases.
3. Describe various radioactive decay process, decay kinetics and to measure the radioactivity.
4. Demonstrate the symmetry elements and symmetry operation, lattice parameters using the X-ray diffraction pattern.
5. Apply X-ray diffraction techniques in structural characterization.

INORGANIC CHEMISTRY	
Course Code: 24CYBS002	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Describe the atomic structure and shape of orbitals.
2. Explain the concept of concept of ionic bonding.
3. Explain the concept of concept of covalent bonding
4. Demonstrate the structure and properties of important coordination compounds.
5. Apply the methods to get the structure of few important compounds.

PHYSICAL CHEMISTRY-II	
Course Code: 24CYBS003	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Apply the postulates of quantum chemistry and to simple system.
2. Describe the applications of rotational spectroscopy.
3. Explain vibrational energy and transitions in molecules.
4. Demonstrate the structure and properties of compounds using electronic spectroscopy.
5. To explain the Lambert Beer's Law and concept of Fluorescence.

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ANALYTICAL CHEMISTRY	
Course Code: 24CYBS004	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Interdisciplinary course**
Prerequisite:	

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COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Apply the data analysis in qualitative and quantitative estimation.
2. Explain the principle and applications of thermal methods of analysis.
3. Illustrate principle and applications of different electroanalytical methods.
4. Demonstrate various techniques in separation of different compounds.
5. Learn various aspects of Chromatography

WAVES AND OSCILLATIONS	
Course Code: 24PHBS001	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P : 2 0 0	**Course Category: Minor Stream Course theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Get better understanding of SHM and superposition of waves.
2. Can observe the damped oscillations and differentiate different type of damped oscillations.
3. Solve the problems related to forced oscillator
4. Can calculate the energy transfer and energy relations for coupled oscillators.
5. Solve the wave equations for waves on stretched strings.

WAVES AND OSCILLATIONS LAB	
Course Code: 24PHBS051	Continuous Evaluation: 60 Marks
Credits: 2	End Semester Examination: 40 Marks
L T P : 0 0 4	**Course Category: Minor Stream Course lab**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Demonstrate a solid understanding of the basic principles of waves and oscillations, including wave properties, harmonic motion, and resonance.
2. Design and conduct experiments to investigate various wave and oscillatory phenomena. This includes selecting appropriate equipment, setting up experiments correctly, and ensuring accurate data collection.
3. Analyse experimental data using appropriate techniques and tools. Interpret the results to draw meaningful conclusions about the behaviour of waves and oscillations.
4. Recognize and appreciate the relevance and application of waves and oscillation principles in various real-world contexts, such as engineering, medicine, and environmental science.
5. Can use CRO in different practical applications.

BIOPHYSICS	
Course Code: 24PHBS002	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Outline key terms and concepts related to molecular biophysics, cellular mechanics, and bioenergetics.
2. Demonstrate the ability to calculate forces and energies in biophysical systems using appropriate equations.
3. Differentiate between different biophysical methods and their applications in studying biological systems.
4. Review the limitations and potential artifacts of biophysical techniques and propose solutions for improving accuracy.
5. Develop innovative approaches to address biological questions using biophysical methods.

SOLID STATE DEVICES	
Course Code: 24PHBS003	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the concept of energy bands and bandgap in semiconductors and describe their significance in electronic behaviour.
2. Explain the characteristics and applications of various electronic components.
3. Analyse the concept of diode in both half and full rectifier.
4. Differentiate between intrinsic and extrinsic semiconductors and explain the role of dopants in controlling carrier concentrations.
5. Appraise the importance of semiconductors in modern technology, including integrated circuits, communication devices, and renewable energy systems.

SOLID STATE DEVICES LAB	
Course Code: 24PHBS053	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Category: Minor Stream Course Lab**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Summarize the characteristics of different amplifier configurations, filters, and oscillators.
2. Demonstrate the ability to measure voltage, current, and impedance using appropriate instruments.
3. Differentiate between different types of amplifiers and their frequency responses.
4. Critique the limitations of components and their impact on circuit functionality.
5. Develop projects that integrate multiple electronic components to achieve specific functionalities.

RADIATION PHYSICS	
Course Code: 24PHBS004	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite: NIL	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Infer the biological effects of radiation exposure and the factors influencing dose distribution.
2. Display the ability to use dosimetry techniques to measure and assess radiation levels.
3. Differentiate between different types of radiation detectors and dosimeters and their applications.
4. Examine the safety protocols and regulations for handling radiation sources in various settings.
5. Develop protocols for radiation safety and emergency response procedures.

NUMERICAL ANALYSIS	
Course Code: 24PHBS005	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be:

1. able to apply Computational techniques to solve the numerical problems
2. able to understand the fundamental principles and methods to solve the mathematical problems related to linear systems
3. analyse the different interpolation techniques and their applications.
4. Validating the numerical integration methods on the various problems related to problems in physics.
5. Adapt the initial and boundary value conditions to solve different problems.

NUMERICAL ANALYSIS LAB	
Course Code: 24PHBS055	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Category: Minor Stream Course LAB**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be:

1. Analyse the concept of approximation and error.
2. Derive numerical solutions of linear equations.
3. Analyse and evaluate the accuracy of the numerical methods learned.
4. Apply the numerical methods for evaluating the integrals.
5. Demonstrate the numerical solutions of IVP and BVP.

STATISTICAL ANALYSIS IN PHYSICS	
Course Code: 24PHBS006	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P : 2 0 0	**Course Type: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the fundamental concepts in statistical data analysis.
2. Define in a Bayesian context, the likelihood, prior and posterior distributions and their role in Bayesian inference and hypothesis testing.
3. Estimate the parameters of a distribution from sample.
4. Perform hypothesis testing and validate a model.
5. Apply multi-linear and logistic models to real life situation. In the practical component, students will be able to
6. Learn basic data analysis techniques such as linear and non-linear fittings
7. Apply hypothesis testing techniques in physics
8. Perform multi-linear and logistic regression analysis for a given data
9. Understand the concept of gradient descent and use it for the regression analysis Understand the stochastic processes, Markov chains and transition probability matrix

STATISTICAL ANALYSIS IN PHYSICS LAB	
Course Code: 24PHBS056	Continuous Evaluation: 60 Marks
Credits: 2	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Type: Minor Stream Course Lab**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the fundamental concepts in statistical data analysis.
2. Define in a Bayesian context, the likelihood, prior and posterior distributions and their

role in Bayesian inference and hypothesis testing.
3. Estimate the parameters of a distribution from sample.
4. Perform hypothesis testing and validate a model.
5. Apply multi-linear and logistic models to real life situation. In the practical component, students will be able to
6. Learn basic data analysis techniques such as linear and non-linear fittings
7. Apply hypothesis testing techniques in physics
8. Perform multi-linear and logistic regression analysis for a given data
9. Understand the concept of gradient descent and use it for the regression analysis

ADVANCED MATHEMATICAL PHYSICS - I	
Course Code: 24PHBS007	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	**Course Type: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be:

1. Understand algebraic structures in n-dimension and basic properties of the linear vector spaces.
2. Understand the concept of dual spaces and inner product spaces.
3. Represent linear transformations as matrices and understand basic properties of matrices.
4. Describe the properties of matrices and understand their relevance in various physics applications.
5. Determine the eigenvalues and eigenvectors of matrices and diagonalise the matrices.

COMPUTATIONAL PHYSICS III	
Course Code: 24PHBS057	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	**Course Type: Minor Stream Course Lab**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Learn how to write, debug, and optimize code for numerical simulations.
2. Apply numerical methods to solve physics problems that are challenging or impossible to

solve analytically.

3. Implement and analyze various ODE solvers, including Euler, Runge-Kutta, and adaptive methods.
4. Interpret and communicate findings through graphs, plots, and visual representations.
5. Design new experiments or variations of existing methods.

ASTRONOMY & ASTROPHYSICS	
Course Code: 24PHBS008	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite: Basic knowledge of astronomy and astrophysics	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Demonstrate a thorough comprehension of key fundamental concepts in astronomy and astrophysics.
2. Possess detailed knowledge of the processes involved in star formation and evaluation.
3. Illustrate an understanding of the Sun's characteristics and its various dynamic activities.
4. Describe and analyze the structure, types, formation, and evolutionary pathways of galaxies.
5. Compare and contrast various theories of the universe's origin and evolution, demonstrating a comprehensive understanding.

ATMOSPHERIC PHYSICS	
Course Code: 24PHBS009	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Illustrate the fundamental of atmospheric science and its various applications.
2. Develop a detailed understanding of microphysics and chemistry of clouds.
3. Identify and describe various atmospheric instruments used for measurements and analysis.
4. Analyze the principles and phenomena related to atmospheric optics.
5. Evaluate the concept of remote sensing and its application the context of Earth's atmospheric.

ADVANCED MATHEMATICAL PHYSICS - II	
Course Code: 24PHBS010	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES(CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would:

1. Have a knowledge and understanding of tensor analysis and tensor calculus
2. Be able to apply the concepts of tensors in anisotropic media with examples of moment of inertia tensor, elasticity tensor and polarizability tensor.
3. Be able to write down the Lorentz Transformation in four-vector notation.
4. Utilize group theory concepts creatively to solve complex problems.
5. Acquire an understanding of error analysis within a dataset.

RENEWABLE ENERGY PHYSICS	
Course Code: 24PHBS011	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would

1. Elucidate the environmental and economic benefits of utilizing renewable energy sources.
2. Demonstrate the ability to analyze data and predict energy generation from renewable sources.
3. Differentiate between different types of solar cells, wind turbine designs, and hydropower systems based on their operational principles.
4. Judge the potential environmental impacts and solutions associated with large-scale renewable energy installations.
5. Formulate innovative approaches to optimize the performance and reliability of renewable energy systems.

NANO MATERIALS	
Course Code: 24PHBS012	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion ofcourse, students would be:

1. Fluent with good knowledge on the properties of material at nanoscale.
2. Get an understanding of characterization of nanomaterials
3. Able to understand the growth of thin film and vacuum systems.
4. Well-versed with the techniques of thin film deposition and its characterization.

NOVEL & SMART MATERIALS

Course Code: 24PHBS013	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Fluent with good knowledge about the Physics of Electronic, Nano and Magnetic Materials
2. Able to understand the physical mechanism in electronic materials
3. Get an understanding of Integrated Circuit (IC) Technology and their Fabrication
4. Able to understand the properties and applications of magnetic materials
5. Get an understanding about magnetic bubbles and transducers and optic sensors.

SOFT MATTER PHYSICS	
Course Code: 24PHBS014	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion ofcourse, students would be:

1. Fluent with good knowledge about materials viz. liquid crystals, colloids, polymers etc.
2. Able to understand the different statics involved in polymer materials
3. Get an understanding of the elastic properties of soft materials and fluid dynamics.
4. Well-versed with the various interactions involved in soft matter physics
5. Able to have an understanding about the special nanomaterials.

NANOMAGNETISM AND SPINTRONICS	
Course Code: 24PHBS019	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination:-- Marks
L T P : 3 1 0	**Course Category: Minor Stream Course**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Explain the concepts of magnetism and to nano-magnetism.
2. Fluent with good knowledge on the concepts of magnetism in metals
3. Get an understanding of different magnetic interactions.
4. Able to understand the spin dependent transport processes in spintronics devices.
5. Well-versed with the advances in spintronic materials, technology.

OPTOELECTRONICS	
Course Code: 24PHBS016	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would

1. Describe the characteristics of optoelectronic devices, such as LEDs, lasers, and photovoltaic cells.
2. Demonstrate the ability to design and analyze simple optical waveguides and resonators.
3. Differentiate between various types of lasers and photodetectors based on their operational principles.
4. Judge the challenges and solutions for integrating optoelectronic components into modern

technologies.

5. Develop innovative approaches to improve the performance and functionality of optoelectronic devices

NANOPHOTONICS	
Course Code: 24PHBS017	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion ofcourse, students would be:

1. Fluent with good knowledge of the field of nanophotonics.
2. Get an understanding of near field interaction and their application in microscopy.
3. Able to understand the Plasmonics and photonic crystals.
4. Formulate non-linear behaviour of the photonic crystals
5. Well-versed with the application of photonic materials in biotechnology.

NONLINEAR SPECTROSCOPY	
Course Code: 24PHBS018	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination:-- Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would:

1. Describe the differences between linear and nonlinear spectroscopy and their significance.
2. Demonstrate the ability to calculate nonlinear susceptibility and predict signal intensities

in various nonlinear spectroscopy processes.

3. Differentiate between different types of nonlinear spectroscopy techniques based on their underlying principles and applications.
4. Critique the potential sources of error in nonlinear spectroscopy measurements and propose strategies for improving data quality.
5. Develop innovative applications of nonlinear spectroscopy in interdisciplinary research fields.

FIBER OPTICS	
Course Code: 24PHBS019	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Equipped with knowledge of the wave guide characteristics and basic structures of optical fibres.
2. Able to understand the principle behind the signal dispersion of the guided mode of optical fiber
3. Well-versed with the principles behind spectroscopic application of optical fibers.
4. Fluent with good knowledge of the optical fiber application
5. Well versed with health-based applications of fiber sensors.

ADVANCED ELECTRONICS	
Course Code: 24PHBS020	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Good understanding of the microwave characteristics and its detection techniques.

2. Ability to understand the working, and principle behind LAN, WAN, MAN and topology.
3. Get an understanding of the signal transmission by Amplitude and phase modulations.
4. Able to grasp the knowledge about the working and applications of INTEL 8085 microprocessor architecture.
5. Familiarity with the working and application of LED and diode LASERS.

ADVANCED SOLID STATE PHYSICS	
Course Code: 24PHBS021	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: Minor Stream Course Theory**
Prerequisite: Condensed Matter Physics	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Fluent with good knowledge on the glasses and polymers.
2. Get an understanding of structure of liquid crystals.
3. Able to understand the phase transitions in solid state materials.
4. Well-versed with the knowledge of surface physics.
5. Able to understand the theory of quantum Hall effect

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ADVANCED SOLID STATE PHYSICS LAB	
Course Code: 24PHBS022	Continuous Evaluation: 60 Marks
Credits: 2	End Semester Examination: 40 Marks
L T P : 0 0 4	**Course Type: Minor Stream Course Lab**
Prerequisite: Advanced Solid State Physics	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Fluent with good knowledge structural detection of solid state materials.
2. Get an understanding of experimental techniques for finding the optical and electrical properties of materials.
3. Able to understand the thermo-gravimetric analysis of materials.
4. Well-versed with the extent of error involved in the experimental techniques.

QUANTUM COMPUTATION I	
Course Code: 24PHBS023	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: Minor Stream Course Theory**
Prerequisite: Quantum Mechanics	

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate a solid understanding of key quantum concepts, including qubits, quantum gates, and superposition, entanglement, and quantum measurement.
2. Create and analyze quantum circuits to perform specific tasks, and understand how to combine quantum gates to construct algorithms.
3. Apply quantum algorithms to solve computational problems more efficiently than classical algorithms, and analyze the advantages and limitations of quantum computation.
4. Formulate the interpretation of Quantum entanglement.
5. Evaluate advantages of quantum algorithm over classical counterparts.

QUANTUM COMPUTATION II	
Course Code: 24PHBS024	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Type: Minor Stream Course Theory**

Prerequisite: Quantum Computation I

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Apply critical thinking and problem-solving skills to analyze and solve quantum computational problems, and present solutions effectively.
2. Stay informed about recent developments and advancements in the field of quantum informatics and quantum computation, and discuss potential future trends.
3. Analyse the quantum computing algorithms.
4. Formulate the quantum computing in the application of cryptography.
5. Evaluate the concepts of lattice based cryptography.

QUANTUM COMPUTATION LAB	
Course Code: 24PHBS025	Continuous Evaluation: 60 Marks
Credits: 2	End Semester Examination: 40 Marks
L T P : 0 0 4	**Course Type: Minor Stream Course Lab**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Apply critical thinking and problem-solving skills to analyze and solve quantum computational problems, and present solutions effectively.
2. Stay informed about recent developments and advancements in the field of quantum informatics and quantum computation, and discuss potential future trends.
3. Analyse the quantum computing algorithms.
4. Formulate the quantum computing in the application of cryptography.
5. Evaluate the concepts of lattice based cryptography.

PLASMA PHYSICS

Course Code: 24PHBS026	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite: Basic knowledge about classical mechanics and electrodynamics	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Well-versed with basics of plasma and its applications.
2. Equipped with the motion of a charged particle.
3. Able to apply knowledge of waves in cold, warm and hot isotropic plasma.
4. Well-versed with the waves in hot magnetized plasmas, stability and equilibrium.
5. Able to understand the transport processes in plasmas.

ADVANCED NUCLEAR PHYSICS	
Course Code:-24PHBS027	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite: Basic knowledge about thermodynamics	

COURSE LEARNING OUTCOME (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would

1. List the properties of deuteron in ground state and solve Schrodinger wave equation to explore the properties of deuteron.
2. Interpret the significance of nuclear cross-sections and reaction rates in nuclear processes.
3. Search for different nucleus for production of SHE elements.
4. Analyze the interaction in different region and different scattering process.
5. Design experiments to investigate specific particles with the help of detectors

MEDICAL PHYSICS	
Course Code: 24PHBS028	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	**Course Category: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be:

1. Demonstrate familiarity with key concepts in Medical Physics.
2. Apply knowledge and skills in conducting bio-potential measurements.
3. Invent the various new applications of Medical Instrumentation.
4. Demonstrate proficiency in Radio Physics concepts.
5. Apply knowledge to measure blood pressure and volume flow accurately.

RESEARCH METHODOLOGY	
Course Code: 24RMBS710	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P : 2 0 0	**Course Type: Minor Stream Course Theory**
Prerequisite:	

COURSE LEARNING OUTCOMES (CLO):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. have an idea about research methodology
2. understand the applications of sampling schemes and data types and data analysis
3. know how to write a report for a particular type of research work
4. understand the presentations method

List of Multidisciplinary Courses (MDC) offered to Four Year B.Sc. Physics programme in the Department of Physics w.e.f. Academic Year 2024-25

Cat.	Code	Course Name	L	T	P	Credits
MDC I		Renewable Energy Sources	3	0	0	3
		Hybrid Electric Vehicle	3	0	0	3
		IPR in Business	3	0	0	3
		Library Information Sciences & Media Literacy	3	0	0	3
		Management Process & Organizational Behaviour	3	0	0	3
MDC II		Introduction to Bio-engineering	3	0	0	3
		Introduction to Robotics	3	0	0	3
		Psychology and Emotional Intelligence	3	0	0	3
		Indian Economy	3	0	0	3
		Creating an Entrepreneurial Mind	3	0	0	3
MDC III		Arduino based programming	3	0	0	3
		Electoral Literacy in India	3	0	0	3
		Personal Financial Planning	3	0	0	3
		Interior Design	3	0	0	3

Renewable Energy Sources			
Year/Semester		**Course Category**	**Multidisciplinary Course**
Course Code		**Course Title**	**Renewable Energy Sources**
Continuous Evaluation: 40		**End Semester Examination:60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

COURSE LEARNING OUTCOMES (CLO) : At the end of the course, the student will be able to

1. Analyze the energy scenario of the world and nation.
2. Carry out a comparative analysis of different types of coal, including their treatment, Liquefaction and gasification.
3. Compare the liquid and gaseous fuels sourced from petroleum including their characterization.
4. Analyze the potential of alternate energy sources and their scope and limitations.

Electric Vehicles			
Year/Semester		**Course Category**	**Multidisciplinary Course**
Course Code		**Course Title**	**Electric Vehicles**
Continuous Evaluation: 40		**End Semester Examination:60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

COURSE LEARNING OUTCOMES (CLO): At the end of the course, the student will be able to

1. Realize the importance of electric transportation systems.
2. Understand the basics of electric vehicle components and configuration.
3. Understand the various charging types, comfort and safety methods.
4. Understand the application of electric vehicle in Smart grid.

DEPARTMENT OF LAW			
Year/Semester		Course Category	Multidisciplinary Course (MDC)
Course Code		Course Title	IPR for Business
Continuous Evaluation: 40		End Semester Examination: 60	
Prerequisite: Nil		L T P: 3 0 0	Credits: 3

COURSE LEARNING OUTCOMES

At the end of this course, the students would be able to:

CLO1: Define and discuss about the various types of IPR and its relevance for business
CLO2: Discuss the adjudicating bodies and mechanisms under each of these IPRs
CLO3: Analyze and resolve business disputes relating to IPR
CLO4: Apply the learning to the real-life situations in business

Department of Library & Information Science			
Year/Semester		**Course Category**	**MDC**
Course Code		**Course Title**	**Library Information Science & Media Literacy**
Continuous Evaluation: 40		**End Semester Examination:60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

Course Learning Outcomes (CLO) – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

CLO-1: Explain the library collection and their classifications.
CLO-2: Analyse the library information services.
CLO-3: Analyse the media roles.
CLO-4: Analyse the motive of media.

Management Process & Organizational Behaviour	
Course Code:	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
Prerequisite: NIL	Course Category: Multidisciplinary

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate the roles, skills and functions of management.
2. Analyse the causes and consequences of applying different business strategies.
3. Analyse and compare individual behaviour related to motivation and rewards.
4. Identify group behaviour, leadership styles and the role of leaders in a decision making process.

Introduction to Bioengineering	
Course Code:	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
Prerequisite: NIL	Course Category: Multidisciplinary

COURSE LEARNING OUTCOMES (CLO):

1. Improve biological concepts using an engineering approach.
2. Explain the importance of biological phenomenon in bioengineering.
3. Learn to understand the different imaging system and applications of AI.
4. Able to understand the application of living organisms in various fields.

Department of Mechanical Engineering			
Year/Semester	**1st Year/1st Semester**	**Course Category**	**Multidisciplinary Course**
Course Code		**Course Title**	**Introduction to Robotics**
Continuous Evaluation: 40		**End Semester Examination:60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

COURSE LEARNING OUTCOMES (CLO) : At the end of the course, the student will be able to

1. Explain basic concepts of Programmable Logic Controller (PLC) and Industrial automation.
2. Determine basic programming languages and instructions of a PLC and Use a particular Programmable Logic Controller (PLC) for various applications.
3. Design an automated system for industrial derive to meet defined operational specifications.
4. Explain basic concept, type and components of Robotic system and Define the principles and benefits of the various actuators, drives and sensors. Solve forward kinematics of any serial robot, compute position and orientation of end effectors as a function to joint variables.

Department of Psychology			
Year/Semester	**1st Year/1st Semester**	**Course Category**	**MDC**
Course Code		**Course Title**	**Psychology and Emotional Intelligence**
Continuous Evaluation: 40		**End Semester Examination : 60**	
Prerequisite: NIL		**L T P : 3 0 0**	**Credits: 3**

COURSE LEARNING OUTCOMES

1. Describe the basic concepts in psychology
2. Get equipped with various psychological techniques used to assess human behavior at various developmental stages
3. Develop an overview of psychology that would lead to better communication and enhance adjustment in work and personal life
4. Learn the skills for applying knowledge to real life situations so as to improve interpersonal interactions and adjustment in life

Department of Economics			
Year/Semester		**Course Category**	**Multidisciplinary Course**
Course Code		**Course Title**	**Indian Economy**
Continuous Evaluation: 40		**End Semester Examination:60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. review major demographic indicators
2. comprehend the concept of inequality
3. analyse agriculture sector

ARDUINO BASED PROGRAMMING	
Course Code:	Internal Examination: -- marks
Credits: 3	External Examination: -- marks
L T P : 3 0 0	**Course Category: Multi-Disciplinary Course**
Prerequisite:	

Course Learning Outcomes (CLO):

The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to

1. Demonstrate a clear understanding of Arduino's architecture, components, and capabilities.
2. Write, upload, and debug Arduino sketches using the Arduino IDE.
3. Integrate various sensors and retrieve data from the physical world.
4. Control actuators to produce desired physical effects or actions.
5. Design and complete Arduino-based projects from ideation to implementation.

Department of Political Science			
Year/Semester		**Course Category**	**MDC**
Course Code		**Course Title**	**Electoral Literacy in India**
Continuous Evaluation : 40		**End Semester Examination : 60**	
Prerequisite: Nil		**L T P : 3 0 0**	**Credits: 3**

Course Learning Outcomes (CLO) – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. The student shall be able to understand the meaning, definition, and significance of elections in India.
2. The course will help the students to analyse and understand electoral institutions, and their role and functions in the conduct of free and fair elections.
3. The student shall be able to know the party system of India.
4. The course will help the student understand issues and challenges in conducting free and fair elections in India.

Department of Hotel Management	
Interior Decoration	
Course Code: 23MDCXXX	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P: 3 0 0	Course Title: Interior Decoration
Prerequisite: NIL	

Course Outcomes: -

CLO 1: At the end of the first unit students would be able to understand the basics of Interior design and décor.

CLO 2: At the end of the Second unit students would be able to utilize elements and principles of design in décor enhancement.

CLO 3: At the end of the third unit students would be able to understand the Importance of window and lightings in enhancing décor of the interiors.

CLO 4: At the end of the fourth unit students would be able to explain and use furniture and accessories in Interior décor and design.

CLO 5: At the end of the fifth unit students would be able to use different wall and floor finishes in enhancing the décor and design

List of Ability Enhancement Courses (AEC) offered to Four Year B.Sc. Physics programme in the Department of Physics w.e.f. Academic Year 2024-25

S. No.	Code	Course Name	L	T	P	Credits
1		Functional English I	2	0	0	2
2		Functional English II	2	0	0	2
3		Hindi / German / French	2	0	0	2
4		Hindi / German / French	2	0	0	2

Department of English			
Year/Semester		**Course Category**	**AEC**
Course Code	**23MDCXXX**	**Course Title**	**Functional English-I**
Continuous Evaluation : 40		**End Semester Examination : 60**	
Prerequisite: Nil		**L T P : 2 0 0**	**Credits: 2**

Course Learning Outcomes (CLO) – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. Demonstrate comprehensive and fluent communication in standard English – written & spoken
2. Apply the skills to engage in group discussions, debate, deliver speeches and such others.
3. Analyse texts on various parameters expected/demanded during different situations and circumstances
4. Integrate the knowledge and skills to prepare basic/preliminary research documents, official documents and deliver presentations on a given topic

Department of English			
Year/Semester		**Course Category**	**AEC**
Course Code	**23MDC**	**Course Title**	**Functional English-II**
Continuous Evaluation : 40		**End Semester Examination : 60**	
Prerequisite: Nil		**L T P : 2 0 0**	**Credits: 2**

Course Learning Outcomes (CLO): – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. Illustrate the stylistic conventions of academic writing.
2. Analyse readings critically by evaluating the various contexts (social, historical, or personal) surrounding and underpinning each text.
3. Evaluate various texts while identifying and highlighting their main ideas and messages
4. Develop independent perspectives and arguments via persuasive support and successful incorporation of research thus developing their own voice and creating a balance between their own voice and source summaries.
5. Assess counter arguments in order to present a more compelling argument

GERMAN LANGUAGE-I	
Course Code: 23UAEC301	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P: 2 0 0	Course Type: AEC
Prerequisite: Nil	

COURSE LEARNING OUTCOMES (CLO)

- After completion of this student will be able to read and write short, simple texts.
- After completion of this student will have Fluency in reading and writing.
- After completion of this student will be able understand a dialogue between two native speakers and to take part in short, simple conversations using the skills acquired.
- student will able to know the culture of the countries where the German language is spoken.
- Developing pronunciation so that they can read the text and e-mail during their employment, instructing them to write their own CV and developing a fundamental conversation with any German national.

GERMAN LANGUAGE-II	
Course Code: 23UAEC401	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P: 2 0 0	Course Type: AEC
Prerequisite: Nil	

COURSE LEARNING OUTCOMES (CLO)

- After completion of this student will be able to read and write short, simple texts.
- After completion of this student will have Fluency in reading and writing.
- After completion of this student will able to use language creatively and spontaneously.
- Students will get awareness of cross-cultural and intercultural difference.

2.
3.

FRENCH LANGUAGE -I	
Course Code: **23UAEC302**	Continuous Evaluation: **40** Marks
Credits: **2**	End Semester Examination: **60** Marks
LTP: **2 0 0**	Course Type: **AEC**
Prerequisite: **Nil**	

COURSE LEARNING OUTCOMES (CLO)

1. After completion of this course, the student will be able **to express and interactin French** used in daily conversations.
2. The student will be able **to write short and simple texts.**
3. The student will be able to **initiate and respond to various situations** using French language skills.
4. The student can **understand and respond** effectively to the cultural elements ofthe French and Francophone culture.

FRENCH LANGUAGE-II	
Course Code: **23UAEC402**	Continuous Evaluation: **40** Marks
Credits: **2**	End Semester Examination: **60** Marks
LTP: **2 0 0**	Course Type: **AEC**
Prerequisite: **23UAEC302**	

COURSE LEARNING OUTCOMES (CLO)

1. After completion of this course, the student will be able **to express andinteract in French** used in daily conversations.
2. The student will be able **to write short and simple texts.**
3. The student will be able to **initiate and respond to various situations** using French language skills.
4. The student can **understand and respond** effectively to the culturalelements of the French and Francophone culture.

List of Value Added Courses (VAC) offered to Four Year B.Sc. Physics programme in the Department of Physics w.e.f. Academic Year 2024-25

S. No.	Code	Course Name	L	T	P	Credits
1		Indian Constitution & Polity	2	0	0	2
2		Environment Protection & Sustainable Development	2	0	0	2
3		Sports, Yoga & Fitness	0	0	4	2

DEPARTMENT OF LAW			
Programme: Undergraduate program			
Year/Semester		**Course Category**	**Value Added Course (VAC)**
Course Code	**23VAC**	**Course Title**	**Indian Constitution & Polity**
Continuous Evaluation: 30		**End Semester Examination: 70**	
Prerequisite: Nil		**L T P : 2 0 0**	**Credits: 2**

Course Learning Outcomes (CLO) – At the end of this course, the learners are expected to:

1. Explain the concept of democracy, diversity and the Constitutional Values
2. Describe the functioning of the three wings of the State
3. Sketch the functioning of decentralised administration under the Constitution of India and appreciate the political dimensions.
4. Examine the scope of various rights and duties under the Constitution of India.

Department of Environmental Sciences			
Programme: Undergraduate program			
Year/Semester	**1ST/I or II**	**Course Category**	**Value Added Course (VAC)**
Course Code		**Course Title**	Environmental Protection & Sustainable development
Continuous Evaluation: 30		**End Semester Examination: 70**	
Prerequisite: Nil		**L T P : 2 0 0**	**Credits: 2**

Course Learning Outcomes (CLO) – The Syllabus has been prepared in accordance with the NEP-2020 and based on the UGC curriculum framework. Upon completion of this course, learners will be able to:

1. Demonstrate to safeguard the Earth's environment and its resources.
2. Explain sustainable development, its goals, challenges, and global strategies.
3. Analyse the environmental pollution and sensitize themselves to adverse health impacts of pollution.
4. Appraise the concept of climate change, its science and response measures.

Department of Physical Education & Sports			
Programme: Undergraduate program			
Year/Semester		**Course Category**	**Value Added Course (VAC)**
Course Code	**23VAC**	**Course Title**	Sports, Yoga & Fitness
Continuous Evaluation: 80		**End Semester Examination: 20**	
Prerequisite: Nil		**L T P : 0 0. 4**	**Credits: 2**

Course Learning Outcomes (CLO)–The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to

1. Explain the role of yoga and fitness in life.
2. Apply the rules of healthy and fit life
3. Analyse the ways and methods of yoga and sports
4. Recommend the practices of Asanas and different sports
5. Integrate the concept of yoga and sports in all round development of students and beings.

List of Skill Enhancement Courses (SEC) offered to Four Year B.Sc. Physics programme in the Department of Physics w.e.f. Academic Year 2024-25

Courses on Soft Skills

S. No.	Code	Course Name	L	T	P	Credits
1	24SS151	Effective Communication Skills	0	0	2	1
2	24SS252	Teamwork & Interpersonal Skills	0	0	2	1
3	24SS353	Presentation Skills	0	0	2	1
4	24SS454	Professional Skills	0	0	2	1
5	24SS555	Aptitude & Reasoning	0	0	2	1

Courses on Technical Skills

S. No.	Code	Course Name	L	T	P	Credits
1	24SS101	Digital Literacy & IT Skills	0	0	2	1
2	24SS202	Advanced Excel Skills	0	0	2	1
3	24SS303	Statistical Analysis with SPSS	0	0	2	1
4	24SS404	R language programming	0	0	2	1
5	24SS505	Programming with MATLAB	0	0	2	1

Department Of Training & Placement			
Training Cell			
Programme	**Faculty of Science & Humanities**		
Year / Semester	**1 / 1**	**Course Category**	**SEC (soft skills)**
Course Code		**Course Title**	**Effective Communication Skills**
Continuous Evaluation: 70		**End Term Examination: 30**	
Prerequisite: Nil		**L T P: 0 0 2**	**Credits: 1**

Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

- TLO1. To communicate effectively and interact with people with confidence.
- TLO2. To demonstrate and differentiate between various forms of communication.
- TLO3. To apply effective communication skills confidently which a student need to get ahead in job and life.

Department Of Training & Placement			
Training Cell			
Programme	**Faculty of Science & Humanities**		
Year / Semester	**1 / 2**	**Course Category**	**SEC (soft skill)**
Course Code	**24SS252**	**Course Title**	**Teamwork & Interpersonal Skills**
Continuous Evaluation: 70		**End Term Examination: 30**	
Prerequisite: Nil		**L T P: 0 0 2**	**Credits: 1**

Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

- TLO1. To be confident working in a team and leading it as well.
- TLO2. To categorize the work and achieve expected performance within the time frame & will be able to adapt himself to work under various kinds of stress and re-energies himself to bounce back from such situations.
- TLO3. To get benefitted from Emotional Quotient in building stronger professional relationships and achieving career and personal goals.
- TLO4. To face complex problems and effectively deal with it in the job due to Critical Thinking & Problem Solving Skills.

Department Of Training & Placement			
Training Cell			
Programme	**Faculty of Science & Humanities**		
Year / Semester	**2 / 3**	**Course Category**	**SEC (soft skill)**
Course Code	**24SS353**	**Course Title**	**Presentation Skills**
Continuous Evaluation: 70		**End Term Examination: 30**	
Prerequisite: Nil		**L T P: 0 0 2**	**Credits: 1**

Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

- TLO1. To be confident in presenting himself in front of audience.
- TLO2. To become professional in his approach towards work culture.
- TLO3. To enhance the level communication skills while interacting with others.

Department Of Training & Placement			
Training Cell			
Programme	**Faculty of Science & Humanities**		
Year / Semester	**2 / 4**	**Course Category**	**SEC (soft skill)**
Course Code	**24SS454**	**Course Title**	**Professional Skills**
Continuous Evaluation: 70		**End Term Examination: 30**	
Prerequisite: Nil		**L T P: 0 0 2**	**Credits: 1**

Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

- TLO1. To understand the importance of professional writing required in workplace.
- TLO2. To explore different formats in resume, cover letters & other business related letters.
- TLO3. To develop knowledge, skills and understanding people in-group and individually.
- TLO4. To apply communication strategies either in-group or one on one basis and will be confident to lead the discussion among them.

Department Of Training & Placement			
Training Cell			
Programme	**Faculty of Science & Humanities**		
Year / Semester	**3 / 5**	**Course Category**	**SEC (soft skill)**
Course Code	**24AR555**	**Course Title**	**Aptitude & Reasoning**
Continuous Evaluation: 70		**End Term Examination: 30**	
Prerequisite: Nil		**L T P: 0 0 2**	**Credits: 1**

Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

- TLO1. To understand the basic concepts of quantitative ability.
- TLO2. To solve campus placements aptitude papers covering Quantitative Ability.
- TLO3. To Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.
-

DIGITAL LITERACY & IT SKILLS	
Course Code:	Continuous Evaluation: -- Marks
Credits: 1	End Semester Examination: -- Marks
L T P : 0 0 2	**Course Type:** Skill Enhancement course (Technical skills)
Prerequisite: NIL	

COURSE LEARNING OUTCOMES

1. Understand the basic fundamental components of computersincluding the working of internet.
2. Familiarize in working of MS-Word including creating and modifying the text documents and its conversion into different other formats like pdf. etc.
3. Students will be able to apply different formulas in the Excel sheets to solve complex business problems.
4. Ability to create a good interactive presentation using MS-PowerPoint.
5. Ability to enhance the data analytics practices executed in the business world.
6. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
7. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
8. Demonstrate the types of machine learning: Supervise learning, unsupervised learning, and deep learning.
9. Describe popular algorithms Classification, Regression, Clustering, and Dimensional Reduction.
10. Analyse the factors that influenced the advancements of AI in recent years.

Department of Mathematics			
Year/Semester	**1 Year/ 2nd Semester**	**Course Category**	**Skill enhancement course (SEC) (Technical Skills)**
Course Code		**Course Title**	**Advance Excel Skills**
Continuous Evaluation: 80		**End Semester Examination: 20**	
Prerequisite: Nil		**L T P : 0 0 2**	**Credits: 1**

COURSE LEARNING OUTCOMES (CLO)

On successful completion of the course, students will be able to do following:
1. To optimize the use of MS-Excel for powerful data analysis.
2. To apply correct data visualization technique to gain optimal presentation of data.
3. To apply enhanced features of MS-Excel.

Department of Mathematics			
Year/Semester	**2nd Year/ 4th Semester**	**Course Category**	**Skill enhancement course (SEC)**
Course Code		**Course Title**	**R language Programming**
Continuous Evaluation: 80		**End Semester Examination: 20**	
Prerequisite: Nil		**L T P : 0 0 2**	**Credits: 1**

COURSE LEARNING OUTCOMES (CLO)

On successful completion of the course, students will be able to do following:
1. Develop an R script and execute it
2. Install, load and deploy the required packages, and build new packages for sharing and reusability
3. Extract data from different sources using API and use it for data analysis

Department of Mathematics			
Year/Semester	**3rd Year/ 5th Semester**	**Course Category**	**Skill enhancement course (SEC)**
Course Code		**Course Title**	**Programming with MATLAB**
Continuous Evaluation: 80		**End Semester Examination: 20**	
Prerequisite: Nil		**L T P : 0 0 2**	**Credits: 1**

COURSE LEARNING OUTCOMES (CLO)

- Understand the basics of MATLAB.
- Apply MATLAB software for basic matrix computation problems through loops.
- Demonstrate MATLAB software to solve various mathematical problems numerically.

SUMMER INTERNSHIP (Faculty of Science , Humanities& Social Science)	
Course Code:	Continuous Evaluation: 60 Marks
Credits: 4	End Semester Examination: -- Marks
Duration : 6 to 8 Weeks	Course Type: Skill Enhancement Course
Prerequisite: Nil	

COURSE LEARNING OUTCOMES

On completion of course, students will be

- Able to demonstrate various aspects of theory as well as practical.
- Able to build and expand network of professional relationships and contacts.
- Develop a solid work ethic and professional demeanour, as well as a commitment to ethical conduct and social responsibility.
- At the end of the course, a student will be competent in their domain area.