M. Sc. PHYSICS PROGRAM LEARNING OUTCOMES

PLO1: Understanding the basic concepts of core courses such as classical mechanics, quantum mechanics, statistical mechanics, and electrodynamics to appreciate the underlying principles governing the natural phenomena through logical and mathematical reasoning.

PLO2: Understanding the basic concepts of certain advanced fields such as nuclear physics, atomic and molecular physics, solid state physics, plasma physics, and astrophysics, general theory of relativity, nonlinear dynamics, and complex system.

PLO3: Learning how to carry out experiments in basic as well as advanced areas of physics.

PLO4: Gaining hands-on experience to work in applied fields.

PLO5: Developing an attitude and capability for critical thinking and reasoning that can be applied to diverse fields.

MATHMATICAL PHYSICS	
Course Code: 24PHMS101	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about linear algebra and tensors, differential equation and complex variables	

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 various mathematical concepts in linear algebra and tensors.
2. Able to solve second order homogeneous and inhomogeneous differential equations.
3. Well versed with complex variables and evaluate complex integrals using Cauchy Integral theorem in various forms and residue theorem.
4. Familiar with the basics of Group Theory.

CLASSICAL MECHANICS	
Course Code: 24PHMS102	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about Newtonian Mechanics.	

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 knowledge of the advanced techniques of classical mechanics and skills to apply those techniques to real world problem.
2. Fluent with the dynamics of rigid bodies and small oscillations.
3. Get a basic understanding of Classical field theory.
4. Get an understanding of special theory of relativity.

QUANTUM MECHANICS I	
Course Code: 24PHMS103	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Pre-requisite: Basic knowledge about Quantum Mechanics.	

COURSE LEARNING OUTCOME

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

1. Equipped with the understanding of Schrödinger equation and its applications.
2. Fluent with the operator application on wave function and their outcome.
3. Get an understanding of angular momentum algebra.
4. Able to understand the time independent perturbation theory and its applications.

ELECTRODYNAMICS	
Course Code: 24PHMS104	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about Electricity and Magnetism	

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 about the fundamental laws of electrodynamics.
2. Get an understanding of EM waves in free space, dielectric and conducting media.
3. Gain understanding of relativistic electrodynamics.
4. Able to understand radiation and related concepts.

SOLID STATE PHYSICS	
Course Code: 24PHMS201	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about crystal physics, band theory of solids	

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. Gain understanding of crystal bonding, defects and diffusion in solids.
3. Well versed with concepts of lattice vibrations and phonon modes, and theory of specific heat.
4. Able to understand free electron theory and band theory of solids.

QUANTUM MECHANICS – II	
Course Code: 24PHMS202	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge of quantum well, harmonic oscillator problems.	

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 understanding of the time dependent perturbation theory.
2. Fluent with the understanding of the scattering theory and its application.
3. Well versed with the symmetries and identical particles in quantum mechanics.
4. Get an understanding about radiation and relativistic quantum mechanics.

ELECTRONICS	
Course Code: 24PHMS203	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about electronics	

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 understanding of the semiconductor devices.
2. Fluent with the understanding of Field effect transistor and its characteristics.
3. Becomes familiar with the working of operation amplifier and its application
4. Able to understand the principles behind oscillators and signal generators.

ATOMIC AND MOLECULAR PHYSICS	
Course Code: 24PHMS301	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about atomic and molecular structure of atom.	

COURSE LEARNING OUTCOMES

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

1. Well versed with the concepts of atomic physics.
2. Able to understand the concepts in Molecular Spectroscopy
3. Fluent with the ideas of electronic band spectra
4. Get an understanding Physics of Laser action and its application in Fluorescence Spectroscopy.

STATISTICAL MECHANICS	
Course Code: 24PHMS302	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about thermodynamics	

COURSE LEARNING OUTCOMES

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

1. Know various statistical terms and their relations with thermodynamic quantities.
2. Understand different ensembles and partition function.
3. Well versed with quantum statistics of ideal gases.
4. Understand phase transition and different models.

NUCLEAR AND PARTICLE PHYSICS	
Course Code: 24PHMS401	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course
Prerequisite: Basic knowledge about thermodynamics	

COURSE LEARNING OUTCOME

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

1. able to explain the basic properties, structures of nucleus and nuclear models.
2. able to understand deuteron and its properties and explain nuclear forces.
3. Can explain nuclear decay and nuclear reactions.
4. Basic knowledge of elementary particles.

PHYSICS LAB – I (General)	
Course Code: 24PHMS151	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course Lab
Prerequisite: Basic knowledge about various parameters involved in experiments.	

COURSE LEARNING OUTCOMES

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

1. Familiar with experimental knowledge of various diodes, transistors and amplifiers.
2. Get an insight into the Physics involved in the experiments.
3. Equipped with knowledge of various components of electronic circuits.
4. Well versed with the theoretical knowledge behind every experiments

PHYSICS LAB – II (General)	
Course Code: 24PHMS251	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Core Course Lab
Prerequisite: Basic knowledge about various parameters involved in experiments.	

COURSE LEARNING OUTCOMES

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

1. Become familiar with experimental knowledge of various diodes, transistors and amplifiers.
2. To get an insight into the Physics involved in the experiments.
3. Equipped with knowledge of various components of electronic circuits.
4. Well versed with the theoretical knowledge behind every experiments

COMPUTATIONAL PHYSICS LAB I	
Course Code: 24PHMS252	Continuous Evaluation: -- Marks
Credits: 2	End Semester Practical Examination:-- Marks
L T P : 0 0 4	Course Type: CORE
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. Able to draw the 2D plotting using Gnuplot
2. Equipped with the knowledge of linear and nonlinear fitting using Gnuplot
3. Fluent in data types, arrays and loops concepts required for programming.
4. Well-versed with basic programming.

COMPUTATIONAL PHYSICS LAB II	
Course Code: 23PHBS351	Continuous Evaluation: -- Marks
Credits: 2	End Semester Practical Examination:-- Marks
L T P : 0 0 4	Course Type: CORE
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. Able to extrapolation, intrapolation and curve fitting
2. Equipped with the knowledge of numerical technique to solve differential and integration problems
3. Fluent in numerical solution of ordinary differential equation.
4. Well versed with basic programming

ADVANCED SOLID STATE PHYSICS I	
Course Code: 24PHMS303	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
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 of transport properties of solids.
2. Get an understanding of optical properties of materials.
3. Well-versed with the magnetic properties ofsolids and can explain superconductivity.
4. Able to understand the dielectric and ferroelectric properties of solids.

NANO MATERIALS	
Course Code: 24PHMS304	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 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.

SOFT MATTER PHYSICS	
Course Code: 24PHMS305	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 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.

LASER PHYSICS & APPLICATIONS	
Course Code: 24PHMS306	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 Principles of Laser operation
2. Get an understanding of the working of different types of laser
3. Get an understanding of Nonlinear processes
4. Well-versed with the Novel applications of Laser

NANOPHOTONICS	
Course Code: 24PHMS307	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Discipline Specific Elective
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 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. Well-versed with the application of photonic materials in biotechnology.

NONLINEAR SPECTROSCOPY	
Course Code: 24PHMS308	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of different physical principles underlying in various spectroscopictechniques.
2. Get an understanding of broadening mechanism in saturation spectroscopy.
3. Well-versed with the concept of Coherent Raman spectroscopy and Coherent Anti Ramanscattering (CARS) spectroscopy.
4. Able to understand the basic ideas of non-linear spectroscopes.

ANALOGUE ELECTRONICS	
Course Code: 24PHMS309	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

COURSE LEARNING OUTCOME

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

1. Understanding of the Microwave characteristics and its detection techniques.
2. Understands the basic Radar communication and its performances.
3. The ability to understand the signal transmission by Amplitude and phase modulations.
4. Becomes familiar with the satellite communication techniques.

DIGITAL ELECTRONICS	
Course Code: 24PHMS310	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P: 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 communication system and kinds of noises involves.
2. Get an understanding of working principle behind LAN, WAN, MAN and topology.
3. Able to understand the signal transmission in optical fibres.
4. Well-versed with the working and application of LED and diode LASERS.
5. Able to understand the concept of Optical Joints and Couplers

OPTOELECTRONICS	
Course Code: 24PHMS311	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of the wave guide characteristics and basic structures
2. Get an understanding of the optical field confinement in the optical fibers
3. Able to understand the principles behind various optoelectronic devices
4. Well-versed with the working of semiconductor lasers
5. Able to understand the concept of quantum well devices

NUCLEAR PHYSICS I	
Course Code: 24PHMS312	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

COURSE LEARNING OUTCOMES

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

1. Can differentiate different nuclear reactions and calculate cross section.
2. Can explain nuclear fission and fusion.
3. Well aware of different reactors available and their use.
4. Can explain different accelerators.

ASTROPHYSICS - I	
Course Code: 24PHMS313	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite: Knowledge of astrophysics	

Learning outcome

1. Able to understand the stability and equilibrium of stars.
2. Get an understanding of the various properties of starts.
3. Fluent with up-to date knowledge of the Sun, its various activity features and space weather.
4. Basic knowledge about the composition, structure and evolution of galaxies and related objects.

QUANTUM FIELD THEORY	
Course Code: 24PHMS314	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** MAJOR
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.

ADVANCED SOLID STATE PHYSICS II	
Course Code: 24PHMS402	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 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

CHARACTERIZATION OF MATERIALS	
Course Code: 24PHMS403	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 on the structural analysis of materials
2. Get an understanding of working principle and application of electron microscopes.
3. Able to understand the working and different imaging modes of optical microscopes.
4. Well-versed with the trace level detection techniques of NMR and ESR.
5. Get familiar with laser as a source of radiation and its characteristics

NANOMAGNETISM AND SPINTRONICS	
Course Code: 24PHMS404	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 on the concepts of magnetism and nanomagnetism.
2. Get an understanding of domain wall dynamics in nanomagnetic systems.
3. Able to understand the spin dependent transport processes in spintronics devices.
4. Well-versed with the advances in spintronic materials, technology.

FIBER OPTICS SENSORS	
Course Code: 24PHMS405	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

COURSE LEARNING OUTCOMES

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

1. Able to understand 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

APPLIED OPTICS	
Course Code: 24PHMS406	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of photonic materials
2. Get an understanding of the basic concepts of Physical optics
3. Able to understand the light behavior in Photonic crystals and Meta materials
4. Well-versed with the optical and imaging techniques
5. Familiar with the concept of nonlinear optical microscopy

ROTATIONAL & VIBRATIONAL SPECTROSCOPY	
Course Code: 24PHMS407	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of Molecular Symmetry and Group Theory
2. Get an understanding of. the Rotational and Vibrational Spectroscopy of diatomic/polyatomic molecules
3. Able to understand the vibrational spectroscopy of diatomic and polyatomic molecules
4. Well-versed with the Various Selection Rules in Raman and Infrared Spectroscopy
5. Able to understand Vibration-rotation spectroscopy

NOVEL AND SMART MATERIALS	
Course Code: 24PHMS408	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 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

MICROPROCESSOR AND INTERFACING	
Course Code: 24PHMS409	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of programming in microprocessor 8085.
2. Get an understanding of programming in microprocessor 8086.
3. Able to understand the working with ICs 8051, 8253, 8259 and 8279.
4. Well-versed with the use microprocessor in the application of temperature, water level, traffic light control etc.
5. Able to receive more information on waveform generation and frequency measurement

SEMICONDUCTOR PHYSICS	
Course Code: 24PHMS410	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 the conductivity in intrinsic and extrinsic semiconductors
2. Get an understanding of the concept of direct and indirect band gap semiconductors
3. Able to understand the with the conductivity at the metal semiconductor interface
4. Well-versed with the principles behind FET, MOSFET, JFET, CMOS, RAM.
5. Able to get knowledge on Lithography.

NUCLEAR PHYSICS II	
Course Code: 24PHMS411	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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

1. Can explain interaction of charged particles.
2. Well versed with the knowledge of gas detectors.
3. Good knowledge of semiconductor detectors
4. Can explain light sensing detectors

ASTROPHYSICS - II	
Course Code: 24PHMS412	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

Learning outcome

1. Able to understand the basics concepts of observation of the universe.
2. Get an understanding of the basic measurement of starts.
3. Fluent with up-to date knowledge of the start cluster.
4. Detail knowledge about the evolution of the star.

QUANTUM INFORMATICS AND QUANTUM COMPUTATION	
Course Code: 24PHMS413	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** MAJOR
Prerequisite: Advanced 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. Apply critical thinking and problem-solving skills to analyze and solve quantum computational problems, and present solutions effectively.
5. Stay informed about recent developments and advancements in the field of quantum informatics and quantum computation, and discuss potential future trends.

ADVANCED SOLID STATE PHYSICS LAB I	
Course Code: 24PHMS352	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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.

LASER & SPECTROSCOPY LAB I	
Course Code: 24PHMS353	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of experiments related to the optical properties of alkali materials
2. Get an understanding of experimental techniques to determine the optical properties of materials
3. Able to understand the band structure of few solids.
4. Well-versed with the extent of error involved in the experimental techniques.

ELECTRONICS LAB I	
Course Code: 24PHMS354	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
Prerequisite:	

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 of general experimental techniques related to optical fibers
2. Get an understanding of experiments related to filter applications and modulation techniques
3. Able to understand the effect of noise in the signal processing.
4. Well-versed with the extent of error involved in the experimental techniques.

CONDENSED MATTER PHYSICS LAB II	
Course Code: 24PHMS451	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
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 knowledge of measurement instruments and experimental apparatus used in nano physics lab
2. Get an understanding of precaution.
3. Able to analyze the data.
4. Able to estimate the error in measurements.

LASERS AND SPECTROSCOPY LAB II	
Course Code: 24PHMS452	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
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 experiments for finding optical properties of thin films.
2. Get an understanding of vibrational and defect modes study by Raman spectroscopy.
3. Able estimate the physical parameters from the experimental data.
4. Fluent with different error estimation.

ELECTRONICS LAB II	
Course Code: 24PHMS453	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
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 transistor application as an amplifier.
2. Get an understanding of different electronic devices.
3. Able todesign of oscillators.
4. Fluent withdifferent applications of Op-amp and microprocessor.

QUANTUM COMPUTATION LAB I	
Course Code: 24PHMS355	Continuous Evaluation: 60 Marks
Credits: 4	End Semester Examination: 40 Marks
L T P : 0 0 8	**Course Type:** Discipline Specific Elective
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.

QUANTUM COMPUTATION LAB II	
Course Code: 24PHMS454	Continuous Evaluation: 60 Marks
Credits: 4	End Semester Examination: 40 Marks
L T P : 0 0 8	**Course Type:** Discipline Specific Elective
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.

CLEAN AND RENEWABLE ENERGY PHYSICS	
Course Code: 24OEPH101	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Discipline Specific Elective
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. Fluent with the fundamentals of renewable energy systems.
2. Get an understanding of solar and biomass energy.
3. Able to understand the hydrogen energy and different energy storage systems.
4. Well-versed with the wind, thermoelectric, hydropower and ocean energy.
5. Able to understand the current energy scenario and the significance of renewable energy technology

BIOPHYSICS	
Course Code:21OEPH102	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Generic Elective
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 Length and time scales in biology.
2. Get an understanding of Cellular dynamics
3. Get an understanding of the brain & Information in living systems
4. Able to design of oscillators.
5. Fluent with knowledge on Ecosystems.

.

MATLAB	
Course Code:21OEPH201	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Generic Elective
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 basic tools in MATLAB.
2. Get an understanding of MATLAB programming.
3. Fluent with different MATLAB scripts.

PROGRAMMING IN C	
Course Code: 21OEPH202	Continuous Evaluation: -- Marks
Credits: 4	End Semester Examination: -- Marks
L T P : 3 1 0	**Course Type:** Generic Elective
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 basic tools in C.
2. Get an understanding of C programming.
3. Fluent with different C scripts.