

Integrated Msc Physics

Vision

- To excel in quality based Physics Education by searching truth.

Mission

1. To provide quality Physics education for the holistic development of students.
2. To empower its stakeholders to face the challenges of life in the modern world.
3. To develop student's sensitivity to contribute to the betterment of society through knowledge in Physics
4. The physics department is committed to impart quality Physics with special emphasis on 'learning by doing' for socio-economic growth.

Programme outcomes

- 1: Domain Knowledge
- 2: Communicative competence
- 3: Proficiency in using Modern Technologies
- 4: Reflective response to ethical and social issues
- 5: Sustainability values
- 6: Critical thinking and Problem Solving
- 7: Entrepreneurship and Leadership
- 8: Team work and co-operation.
- 9: Self-Directed and Lifelong Learning

Programme Specific Outcomes: (PSO)

1. Develop in depth knowledge of various branches of Physics.
2. Demonstrate skills and competencies to conduct wide range of scientific experiments and research in Physics.
3. Capable of analyzing and solving problems using reasoning skills based on concepts of Physics
4. Develop the knowledge, skills and attitudes necessary to pursue further studies in Physics and research in Physics.
5. Demonstrate understanding of the concepts from basic and applied branches of Mathematics to solve problems in Physics.
6. Demonstrate proficiency in problem-solving techniques using the computation techniques.
7. Develop the fundamental theories, concepts and applications in different basic areas of chemistry
8. Ability to apply fundamentals of electronics in various domains of electronic systems.
9. Understand the diverse applications of various fields of applied science and carry the knowledge and applications of basic sciences to community.
10. Develop in depth knowledge in specialization area Quantum Nanostructures/Flexible Electronics.
11. Develop communication skills for reporting the results in journals and oral presentation.

Course Code	Course Name	Course Outcomes	
Semester I			

IPH2001	Mechanics	<p>CO1: Apply particle dynamics, conservation laws and the theories of collisions.</p> <p>CO2: Discuss inverse square law of force and central force motion.</p> <p>CO3: Explain the harmonic motion, different types of oscillators.</p> <p>CO4: Explain the material properties like elasticity and fluid dynamics.</p> <p>CO5: Identify the basics of classical mechanics.</p>	Lecture: 72 Credit: 4
IPH2002	Thermal Physics	<p>CO1: Explain laws of thermodynamics - zeroth law, first law and second law</p> <p>CO2: Explain the concept of Ideal gas, heat engine.</p> <p>CO3: Explain the concepts based on entropy and Maxwell's equations.</p> <p>CO4: Define the basics of statistical formulations</p>	Lecture: 72 Credit: 4
IPH2003	Basic Electronics	<p>CO1: Explain the fundamentals of diodes, circuits and its applications.</p> <p>CO2: Explain the basics of transistor properties, biasing and circuit design.</p> <p>CO3: Apply the theory and working of amplifiers and Oscillator circuits.</p> <p>CO4: Explain the principle, working and application of devices like FET, UJT and operational amplifiers.</p> <p>CO5: Illustrate the AM and FM modulation and demodulation.</p>	Lecture: 72 Credit: 4
IPH2004	Mathematics- I Trigonometry, Differential Calculus and Matrices	<p>CO1: Explain basic matrix properties, operations, and to solve applications in physical systems.</p> <p>CO2: Solve problems in differential calculus and its applications.</p> <p>CO3: Apply partial derivatives.</p>	Lecture: 54 Credit: 3

		CO4: Explain application of trigonometric functions and series	
IPH2005	Chemistry - I Basic Theoretical and Analytical Chemistry	CO1: Understand the structure of the atom, chemical bonding and intermolecular forces such as hydrogen bonding. CO2: Explain the periodic properties of atoms and the concept of chemical equilibrium. CO3: Illustrate the basic principles of Analytical Chemistry including various laboratory operations for qualitative and quantitative analysis, methods of separation and purification, and reporting of analytical data. CO4: Understand various chromatographic techniques.	Lecture: 72 Credit: 4
IPH2006	Physics Lab- Mechanics and Thermal Physics	CO1: Demonstrate experiments in mechanics, solid material properties, fluids CO2: Demonstrate experiments in Thermal Physics, thermal properties.	Lab: 54, Credit: 2
ICE2001	English Language Skills – I	CO1: Identify the distinct sounds in English words CO2: Choose the right words while writing/talking about everyday life CO3: Use expressions appropriate for various social occasions CO4: Articulate words and sentences clearly stressing the right syllables	Lecture: 54 Credit: 3
IPH2007	Latex Programming	CO1: Write ordinary text, mathematical formulae as equations CO2: Organize texts using formatting	Lecture: 18 Lab: 18 Credit: 0

		<p>CO3: Illustrate insertion of symbols and operators in texts</p> <p>CO4: Create array, table, header, font bibliography</p>	
IPH2008	Programming in Python-I	<p>Course Outcomes:</p> <p>After the completion of the course the students shall be able to:</p> <p>CO1: Understand the structure of a python program and how it works</p> <p>CO2: Understand the basic control structures</p> <p>CO3: Apply the structure of a python program and how it works, basic control structures</p>	<p>Lecture: 18</p> <p>Lab: 18</p> <p>Credit: 1</p>
Semester II			
IPH2009	Relativity, Waves and Optics	<p>CO1: Explain the preliminary concepts of different frame of references.</p> <p>CO2: Explain the basic concepts of relativity</p> <p>CO3: Illustrate the superposition of oscillations.</p> <p>CO4: Explain the nature of travelling waves and stationary waves.</p> <p>CO5: Explain the details of geometrical optics and optical components.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2010	Basic Electrodynamics	<p>CO1: Explain the electrostatic fields and potentials of physical systems and electric properties of matter</p> <p>CO2: Explain the properties of electric steady current and different network theorems.</p> <p>CO3: Calculate the magneto static field associated with a steady current.</p> <p>CO4: Explain the magnetic properties of matter.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>

		<p>CO5: Differentiate Laplace's equation, method of images</p> <p>CO6: Distinguish the properties of electromagnetic induction and time dependent fields.</p> <p>CO7: Explain the properties of time dependent electric circuits.</p> <p>CO8: Explain the Maxwell's equations and electromagnetic waves.</p>	
IPH2011	<p>Mathematics- II</p> <p>Integral Calculus and Fourier Series</p>	<p>CO1: Explain the properties of integral calculus and its applications.</p> <p>CO2: Illustrate the properties of integrals and use integrals to solve problems in physics.</p> <p>CO3: Explain the properties and applications of double and triple integrals.</p> <p>CO4: Illustrate the periodic functions using Fourier series.</p>	<p>Lecture: 54</p> <p>Credit: 3</p>
IPH2012	<p>Chemistry - II</p> <p>Basic Organic Chemistry</p>	<p>CO1: Understand the fundamental concepts in organic chemistry and structure of organic molecules.</p> <p>CO2: Explain various types of organic reactions and their mechanisms in brief.</p> <p>CO3: Understand stereochemistry and conformation of some simple organic molecules</p> <p>CO4: Familiarize with natural and synthetic polymers, biodegradability and environmental hazards.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2013	<p>Physics Lab - Waves, Optics, Electricity & Magnetism</p>	<p>CO1: Demonstrate experiments in sound and waves</p> <p>CO1: Demonstrate experiments in Optics .</p>	<p>Lab: 54,</p> <p>Credit: 2</p>

		CO3: Demonstrate experiments in Electricity, magnetism and electrical circuits.	
IPH2014	Chemistry Lab- I Volumetric Analysis & Organic Chemistry	CO1: Perform quantitative analysis using volumetric estimations. CO2: Carry out characterization of organic compounds using physical and chemical methods	Lab: 54 Credit: 2
ICE2002	English Language Skills- II	Course Outcomes: After completing this course, students should be able to: CO1: Write sentences adhering to tense rules CO2: Correct common errors such as punctuation and capitalization CO3: Identify the key points in a piece of writing CO4: Write CVs and cover letters	Lecture: 36 Credit: 2
IPH2015	Environmental Science	Course outcomes. After the completion of the course the students shall be able to: CO1: Illustrate the importance of ecosystems, biodiversity and its conservation. CO2: Illustrate the details of environmental pollution, social issues and the environment CO3: Illustrate different types of non-renewable and renewable energy sources solar energy	Lecture: 36 Credit: 2
IPH2016	Life Inspiring Skills	Course outcomes	Lecture: 18 Lab: 18, Credit: 0

		<p>After the completion of the course the students shall be able to: Total hours: 30 Hours</p> <p>CO1: Develop communication competency and report writing skills</p> <p>CO2: Practice interview & group discussion</p> <p>CO3: Develop critical thinking process and problem solving skills</p> <p>CO4: Formulate better team dynamics, ethics and human values</p>	
IPH2017	Programming in Python-II	<p>CO1: Demonstrate how Python can handle U data using statistical methods</p> <p>CO2: Describe how set theory operations can be done using python</p> <p>CO3: Perform representative task in practice.</p> <p>CO4: Apply the structure of a python program and handle data using statistical methods ,set theory operations</p>	<p>Lecture: 18</p> <p>Lab: 18</p> <p>Credit: 1</p>
Semester III			
IPH2018	Mathematical Physics – I (Differential Equations - 1)	<p>Course Outcomes</p> <p>After the completion of the course the students shall be able to:</p> <p>CO1: Discuss the solution of first and second order differential equations</p> <p>CO2: Demonstrate the skills of modelling physical problems in terms of differential equations.</p> <p>CO3: Describe the theoretical framework of the existence and uniqueness of Solutions</p>	<p>Lecture: 72</p> <p>Credit: 4</p>

		<p>CO4: Describe the behavior nonlinear systems and its stability</p> <p>CO5: Solve numerically initial value problems described by differential equations.</p>	
IPH2019	Classical Electrodynamics	<p>CO1: Explain the properties of EMW, interaction in a medium and at interface.</p> <p>CO2: Understand the details relativistic electrodynamics.</p> <p>CO3: Able to explain the properties and behavior of different sources of radiation.</p> <p>CO4: Explain the properties of wave guide, transmission line and guided wave.</p>	Lecture: 72 Credit: 4
IPH2020	Modern Optics	<p>CO1: Analyze the details of interference and interferometry.</p> <p>CO2: Analyze the details of Fresnel's and Fraunhofer diffraction and its applications.</p> <p>CO3: Explain the polarization of light and associated properties.</p> <p>CO4: Explain the coherence nature of optical sources</p> <p>CO5: Illustrate matrix method for the analysis of optical systems.</p>	Lecture: 54 Credit: 3
IPH2021	Physics Lab- Computational Physics Lab – I	<p>CO1: Apply the mathematical concepts to formulate a computational problem</p> <p>CO2: Demonstrate skills in writing computer programs, executing it and interpreting the results.</p>	Lab: 54 Credit: 2
IPH2022	Physics Lab- Electronics, Modern	<p>CO1: Demonstrate experiments using semiconducting diodes, transistors, ICs</p>	Lab: 54 Credit: 2

	Optics and Electrodynamics	555 & 741 and demonstrate experiments of optics and electromagnetic waves. CO2: Demonstrate experiments in optics and electromagnetic waves.	
IPH2023	Mathematics- III Vector Calculus, Analytic Geometry and Abstract Algebra	CO1: Apply vector valued functions in the application of physics. CO2: Apply integrals in physics related applications. CO3: Explain the properties of analytic geometry and use analytic geometry in physical systems. CO4: Explain the abstract algebraic functions.	Lecture: 54 Credit: 3
IPH2024	Chemistry - III Advanced Physical Chemistry – I	CO1: Explain solid state chemistry including symmetry, crystal structure, magnetic, conductivity and optical properties of solids. CO2: Understand chemistry of the liquid state, colligative properties and properties of liquid crystals. Explain the behaviour of gases and gas laws. CO3: Illustrate surface phenomena such as adsorption and properties & applications of colloids. CO4: Explain phase equilibria, distribution law and its applications.	Lecture: 72, Credit: 3
IPH2025A	Summer Project - I	CO1. Identification of research/industrial/academic problem, preparation of methodology of work, time bound planning. CO2. Report the use of sophisticated instrumentation/software and enhance	Hours 170 Credit 0

		<p>academic scenario through practical experience.</p> <p>CO3. Develop the ability to analysis data collection, interpretation of observation and capability to make inferences</p> <p>CO4. Develop new knowledge and experience to contribute in the start-up programs.</p>	
IPH2026	Yoga Exercises for Sound Health	<p>CO1. Apply idea about Yoga</p> <p>CO2. Illustrate limits and methods in five aspects: Food, Work, Sleep, Sex and Thought</p> <p>CO3. Practice a whole body exercise and Kayakalpa</p> <p>CO4. Practice different Pranayam and Mudras</p>	<p>Lecture: 18</p> <p>Lab: 18</p> <p>Credit: 0</p>
IPH2027	Machine Learning using Python - I	<p>CO1: Understand the general features of machine learning</p> <p>CO2: Understand how python tools necessary for numeric, visualization and manipulation of data</p> <p>CO3: Apply the general features of machine learning, python tools necessary for numeric, visualization and manipulation of data</p>	<p>Lecture: 18</p> <p>Lab: 18,</p> <p>Credit: 1</p>
Semester IV			
IPH2028	Mathematical Physics – II (Differential Equations - 2)	<p>CO1: Demonstrate the method of power series to solve differential equations</p> <p>CO2: Discuss the properties of special function</p> <p>CO3: Understand various partial differential equations in physics and their solutions.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>

		<p>CO4: Demonstrate the skills in applying the methods of Fourier series and Laplace transforms.</p> <p>CO5: Understand the variational problem and Euler's equation and its applications in physics</p>	
IPH2029	Basic Quantum Mechanics	<p>CO1: Analyse the development of quantum mechanics.</p> <p>CO2: Explain the basics and postulates of quantum mechanics.</p> <p>CO3: Interpret Schrodinger equation and harmonic oscillators.</p> <p>CO4: Observe the application of quantum mechanics.</p>	Lecture: 90 Credit: 4
IPH2030	Physics Lab- Computational Physics Lab – II	<p>CO1: Apply the mathematical concepts to formulate a computational problem</p> <p>CO2: Demonstrate skills in writing computer programs, executing it and interpreting the results.</p>	Lab: 54 Credit: 2
IPH2031	Physics Lab - Mechanics and Basic Quantum Mechanics	<p>CO1: Demonstrate experiments in Mechanics.</p> <p>CO2: Demonstrate experiments in Modern physics and basic concepts of quantum mechanics</p>	Lab: 54 Credit: 2
IPH2032	Chemistry - IV Advanced Physical Chemistry – II	<p>CO1: Understand principle and applications of various spectroscopic methods such as rotational, uv-visible and infrared spectroscopy.</p> <p>CO2: Explain first, second and third laws of thermodynamics including their significance.</p> <p>CO3: Explain fundamental concepts of kinetics, catalysis and photochemistry.</p>	Lecture: 72 Credit: 4

		CO4: Understand principles of electrochemistry including conductance in solutions, conductometric	
IPH2033	Chemistry Lab- II Physical Chemistry Practical	CO1: Do chemical characterization of substances using various physico-chemical parameters such as viscosity, CST, transition temperature, heat of solution etc. CO2: Perform various instrumental techniques such as potentiometry, conductometry and colorimetry	Lab: 54 Credit: 2
IPH2034	Research Methodology in Science	CO1: Explain the history of science, philosophy of science and scientific facts. CO2: Explain the meaning of research, design, development and analysis of research. CO3: Define hypothesis and research methods.. CO4: Do to data collection, sampling and statistical analysis CO5: Prepare scientific reports, journal papers and project proposals. CO6: Explain the environmental and ethical impacts, IPR, plagiarism citation and acknowledgement.	Lecture: 54 Credit: 3
IPH2035	Health & Emergency Care	Course outcomes After the completion of this course students will able to: CO1: Understand the importance of physical activities on health. CO2: Observe and identify different types of injuries.	Lecture: 18 Lab: 18 Credit: 0

		CO3: Able to do different life saving first aids like 1. CPR, 2. Heimlich Maneuver.	
IPH2036	Machine Learning using Python - II	<p>Course outcomes:</p> <p>After the completion of the course the students shall be able to:</p> <p>CO1: Apply Scikit-learn dataset</p> <p>CO2: Describe how linear and polynomial regression is performed</p> <p>CO3: Perform representative computational task in practice.</p> <p>CO4: Apply the general features of machine learning, linear and polynomial regression is performed</p>	<p>Lecture: 18</p> <p>Lab: 18</p> <p>Credit: 2</p>
Semester V			
IPH2037	Mathematical Physics – III (Complex Variables)	<p>CO1: Define complex numbers and their properties</p> <p>CO2: Describe the fundamental properties of analytical functions</p> <p>CO3: Demonstrate the skills in applying contour integrals</p> <p>CO4: Demonstrate skills in applying Taylor and Laurent series</p> <p>CO5: Demonstrate the skills in applying residue theorem</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2038	Solid State Physics	<p>CO1: Explain the basic idea about crystal structures and X-ray diffraction.</p> <p>CO2: Identify theories of inter-atomic forces and thermal properties in metals.</p> <p>CO3: Explain the free electron model, Bloch's theorem & energy bands and theory of semiconductors.</p>	<p>Lecture: 90</p> <p>Credit: 4</p>

		<p>CO4: Explain the dielectric & magnetic properties of materials and superconductivity.</p> <p>Prerequisites: Basic concepts of Quantum Mechanics and basic mathematics.</p>	
IPH2039	Atomic and Molecular Physics	<p>CO1: Explain the early developments of different atom models and atomic spectra.</p> <p>CO2: Explain the concept of molecular structure.</p> <p>CO3: Explain the origin and properties of molecular spectra.</p> <p>CO4: Illustrate the theory of Raman Spectroscopy</p> <p>CO5: Illustrate NMR and ESR spectroscopy and its instrumentation.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2040	Physics Lab- Computational Physics Lab – III	<p>CO1: Apply the mathematical concepts to formulate a computational problem</p> <p>CO2: Demonstrate skills in writing computer programs, executing it and interpreting the results.</p>	<p>Lab: 54</p> <p>Credit: 2</p>
IPH2041	Physics Lab- Solid State Physics and Atomic & Molecular Physics	<p>CO1: Demonstrate experiments in solid state physics, semiconductors, conductors, insulators</p> <p>CO2: Demonstrate experiments in atomic and molecular spectroscopy.</p>	<p>Lab: 54</p> <p>Credit: 2</p>
IPH2042	Mathematics- IV	<p>CO1: Explain ordinary differential equation and use it in physics problems.</p>	<p>Lecture: 54</p> <p>Credit: 3</p>

	Differential Equations, and Complex Analysis	CO2: Illustrate the properties and application of special functions. CO3: Explain the properties of partial differential equation and solve problems using it. CO4: Explain the function of complex numbers and its applications.	
IPH2043	Human Rights	CO1: Analyse the development of human rights and different human right act in UN CO2: Analyse the human rights in Indian scenario CO3: Analyse the and impact of environment and human rights. CO4: Analyse the Conservation of natural resources and human rights	Lecture:54 Credit: 2
IPH2025B	Summer Project - II	CO1. Identification of research/industrial/academic problem, preparation of methodology of work, time bound planning. CO2. Report the use of sophisticated instrumentation/software and enhance academic scenario through practical experience. CO3. Develop the ability to analysis data collection, interpretation of observation and capability to make inferences CO4. Develop new knowledge and experience to contribute in the start-up programs.	Hours 170 Credit 0
IPH2044	Foundation Course in Reasoning	CO1. Develop proficiency in formulating and solving problems in diverse fields.	Lecture: 18 Lab: 18, Credit:0

		<p>CO2. Develop the logical reasoning ability of students.</p> <p>CO3. Develop the arithmetic reasoning ability of students.</p> <p>CO4. Develop the verbal reasoning ability of students.</p> <p>CO5: Improves the non-verbal reasoning ability of students</p>	
IPH2045	Machine Learning using Python - III	<p>Course outcomes:</p> <p>After the completion of the course the students shall be able to:</p> <p>CO1: Describe classification problem</p> <p>CO2: Understand Classification using support vector machines</p> <p>CO3: Apply Classification using support vector machines</p>	<p>Lecture: 18</p> <p>Lab: 18,</p> <p>Credit: 0</p>
Semester VI			
IPH2046	Mathematical Physics – IV (Linear Algebra and Tensors)	<p>CO1: Discuss basic properties of matrices and linear transformation</p> <p>CO2: Determine eigenvalues and eigenvectors and its applications</p> <p>CO3: Understand the definition of tensors and their properties</p> <p>CO4: Demonstrate skills in describing four vectors in special relativity</p> <p>CO5: Describe basic framework of tensor calculus and general relativity</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2047	Nuclear and Particle Physics	<p>CO1: Understand the interior of nucleus and interaction between nucleons.</p> <p>CO2: Explain the theory of radioactivity.</p> <p>CO3: Understand the interaction of radiation with matter.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>

		CO4: Explain the fundamentals of particle accelerator and nuclear energy. CO5: Explain on particle physics.	
IPH2048	Classical Mechanics	CO1: Explain Hamiltonian mechanics, variational principle and Lagrange's equations CO2: Apply small oscillations and rigid body dynamics CO3: Explain Canonical Transformations, Hamilton-Jacobi theory and -central force problems CO4: Illustrate Fluid dynamics	Lecture: 90 Credit: 4
IPH2049	Physics Lab- Computational Physics Lab – IV	CO1: Apply the mathematical concepts to formulate a computational problem CO2: Demonstrate skills in writing computer programs, executing it and interpreting the results.	Lab: 54 Credit: 2
IPH2050	Physics Lab- Classical mechanics and Nuclear Physics	CO1: Demonstrate experiments using GM counter and verification of problems in nuclear physics by numerical techniques and demonstrate experiments in mechanics and computational analysis of mechanical systems. CO2: Demonstrate experiments in mechanics and computational analysis of mechanical systems.	Lab: 54 Credit: 2
IPH2051A	Flexible Electronics	CO1: Categorize the printed electronics and its possibilities in the industry CO2: Explain various flexible electronics products and its challenges	Lecture: 72 Credit: 4

		<p>CO3: Establish about different derivatives in the process and methods used in flexible electronics</p> <p>CO4: Describe the opportunities of various flexible electronics applications and products</p>	
IPH2052A	Physics Lab- Flexible Electronics	<p>CO1: Develop characterization of optoelectronic devices.</p> <p>CO2: Design and perform fabrication of energy saving/efficient flexible lamp devices.</p>	<p>Lab: 36 Credit: 1</p>
IPH2051B	Nanoscience and Nanotechnology	<p>CO1: Develop the basics of nanomaterials.</p> <p>CO2: Illustrate the synthesis of zero, one, two dimensional nanomaterials.</p> <p>CO3: Illustrate the electronic and photonic application of nanomaterials.</p> <p>CO4: Illustrate the nanomaterial characterization techniques</p>	<p>Lecture: 72 Credit: 4</p>
IPH2052B	Physics Lab- Nanomaterials	<p>CO1: Report characterization of nanomaterials.</p> <p>CO2: Design characterization of nanomaterials.</p>	<p>Lab: 36 Credit: 1</p>
IPH2053	Plant Propagation	<p>Course out comes.</p> <p>After the completion of the course students will be able to</p> <p>CO1. Identify and asses the quality of different types of soils.</p> <p>CO2. Develop an understanding of propagation techniques.</p> <p>CO3. Practice different types of artificial propagation techniques like layering, grafting and budding.</p>	<p>Lecture: 18 Lab: 18 Credit: 0</p>

IPH2054	Machine Learning using Python - IV	<p>Course outcomes:</p> <p>After the completion of the course the students shall be able to:</p> <p>CO1: Apply classification using K-means</p> <p>CO2: Describe Unsupervised learning using K-means</p> <p>CO3: Perform typical computational task related to the units practically</p> <p>CO4: Apply Classification using support vector machines</p>	<p>Lecture: 18</p> <p>Lab: 18,</p> <p>Credit: 1</p>
Semester VII			
IPH2055	Advanced Electronics	<p>CO1: Studies the fundamentals of op-amp and properties & effect of negative feedback</p> <p>CO2: .Studies the various applications of Op amp and circuits</p> <p>CO3: Studies the properties of different transducers and devices using it.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2056	Statistical Mechanics	<p>CO1: Understand the foundations of statistical mechanics.</p> <p>CO2: Explain the classification of identical particles and Maxwell distribution.</p> <p>CO3: Illustrate the Planck distribution and quantum statistics.</p> <p>CO4: Explain the characteristics of Phase transitions, fluctuations and interacting systems.</p>	<p>Lecture: 72</p> <p>Credit: 4</p>
IPH2057	Advanced Quantum Mechanics - I	<p>CO1: Explain the basic mathematical tools of Quantum Mechanics</p> <p>CO2: Explain the theoretical frame work of quantum mechanics</p>	<p>Lecture: 90</p> <p>Credit: 4</p>

		<p>CO3: Illustrate the angular momenta and its addition</p> <p>CO4: Describe the necessity of approximation methods and time independent techniques</p>	
IPH2058	Condensed Matter Physics	<p>CO1: Illustrate crystal structure and symmetry</p> <p>CO2: Explain free electron theory, band theory of materials</p> <p>CO3: Illustrate imperfections and dislocations in crystals</p> <p>CO4: Explain Lattice dynamics of solid and magnetic properties of solids.</p> <p>CO5: Explain details of nanomaterials.</p>	Lecture: 72 Credit: 4
IPH2059	Physics Lab- Advanced Electronics	<p>CO1: Demonstrate experiments using transistors, ICs</p> <p>CO2: Demonstrate experiments using simulation of electronic circuits.</p>	Lab: 72 Credit: 2
IPH2060	Physics Lab- Statistical Mechanics Lab (Simulations)	<p>CO1: Demonstrate simulations of statistical systems.</p>	Lab: 72, Credit: 2
IPH2025C	Summer Project - III	<p>CO1. Identification of research/industrial/academic problem, preparation of methodology of work, time bound planning.</p> <p>CO2. Report the use of sophisticated instrumentation/software and enhance academic scenario through practical experience.</p> <p>CO3. Develop the ability to analysis data collection, interpretation of observation and capability to make inferences</p>	Hours 170 Credit 0

		CO4. Develop new knowledge and experience to contribute in the start-up programs.	
IPH2061	Observational Astronomy	<p>Course outcomes.</p> <p>After the completion of the course students will be able to</p> <p>CO1. Visualize an idea about astronomy and optical telescopes</p> <p>CO2. Visualize an idea about celestial objects like Stars, Galaxies and the Universe</p> <p>CO3. Visualize the evolution of universe.</p> <p>CO4. Practice to identify different planets, stars and constellations</p>	Lecture: 18 Lab: 18, Credit: 0
Semester VIII			
IPH2062	Mathematical Physics – V (Advanced topics)	<p>CO1: Understanding of advanced methods of solution of differential equations</p> <p>CO2: Demonstrate the skills in applying the concepts of special functions.</p> <p>CO3: Describe partial differential equation in physics and their solutions</p> <p>CO4: Demonstrate skills in formulating integral equations and their solutions.</p> <p>CO5: Describe the properties of probability distributions apply statistical tools</p>	Lecture: 72 Credit: 4
IPH2063	Advanced Atomic and Molecular Physics	<p>CO1: Explain the theory atomic spectroscopy.</p> <p>CO2: Explain the theory and application of microwave and IR spectroscopy.</p> <p>CO3: Explain the theory and instrumentation of Raman</p>	Lecture: 72 Credit: 4

		<p>spectroscopy and Electronic Spectroscopy of molecules.</p> <p>CO4: Explain the theory and instrumentation of ESR and Mossbauer Spectroscopy</p>	
IPH2064	Advanced Quantum Mechanics - II	<p>CO1: Explain the principles of time dependent perturbations.</p> <p>CO2: Explain the phenomena of scattering in quantum mechanical view.</p> <p>CO3: Explain relativistic formulations of quantum mechanics.</p> <p>CO4: Explain the second quantization principles.</p>	<p>Lecture: 90</p> <p>Credit: 4</p>
IPH2065	Astronomy and Astrophysics	<p>CO1: Observe different constellations and classify stars accordingly.</p> <p>CO2: Explain the basics of seasonal changes.</p> <p>CO3: Interpret the fundamental equations in stellar evolution.</p> <p>CO4: Analyze basic theories of formation of solar system.</p> <p>CO5: Discuss criterion, formation and evolution of stellar objects.</p> <p>CO6: Understand basics of Milky Way and other extra galactic systems.</p>	<p>Lecture: 72,</p> <p>Credit: 4</p>
IPH2066	Physics Lab- Condensed Matter Physics	<p>CO1: Demonstrate experiments in solid state physics</p>	<p>Lab: 72</p> <p>Credit: 2</p>
IPH2067	Physics Lab- Quantum Mechanics (Simulations)	<p>CO1: Demonstrate simulations of quantum mechanical systems and principles.</p>	<p>Lab: 72</p> <p>Credit: 2</p>
IPH2068	Finishing School	<p>CO1. Develop the capacity to confidently face interviews, GD and</p>	<p>Lecture: 18</p> <p>Lab: 18,</p> <p>Credit: 0</p>

		secure placements in reputed companies CO2. Develop the essential professional skills that will help students to lead a successful career	
Semester IX			
IPH2069A	Quantum Heterostructures	CO1: Describe the structure and properties of semiconductor heterostructures CO2: Apply quantum mechanical ideas to construct band structure. CO3: Describe the electronic structure of low dimensional systems CO4: Illustrate the background information for studying quantum transport.	Lecture: 72 Credit: 4
IPH2070A	Transport in Nanostructures	CO1: Describe the physics of modern nanoelectronic devices. CO2: Discuss in detail the transport properties of mesoscopic systems. CO3: Prepare the student to use advanced computational tools in nanoelectronics. CO4: Prepare the student to understand the research works in this area.	Lecture: 72 Credit: 4
IPH2071A	Nano-Optics and Nanophotonics	CO1.Explain the optical properties of nanao-structures. CO2.Explain detailed study of emerging areas like photonic crystals and plasmonics CO3. Develop skills needed to apply computational methods for designing Nano-optical structures.	Lecture: 72Credit: 4

		CO4.Illustrate the research work in Nanophotonics	
IPH2072A	Physics Lab-Synthesis and Characterization of Nanomaterials	CO1: Report characterization of nanomaterials. CO2: Design characterization of nanomaterials.	Lab: 54 Credit: 1
IPH2073A	Physics Lab-Nanostructures	CO: To learn the skills needed to solve essential practical problems at research level in nanostructures using computational method	Lab: 54 Credit: 1
IPH2069B	Flexible Electronics Technology		Lecture: 72 Credit: 4
IPH2070B	Device Printing Technology		Lecture: 72 Credit: 4
IPH2071A	Flexible Displays Devices		Lecture: 72 Credit: 4
IPH2072B	Device Printing Technology Lab –I		Lab: 54 Credit: 1
IPH2073A	Device Printing Technology Lab –li		Lab: 54 Credit: 1
IPH2074	Project	CO1. Develop the depth of knowledge in Physics . CO2. Evaluate an independent research project. CO3. Focus the knowledge of contemporary issues in their chosen field of research.	Lab 126

		CO4. Produce an ability to present and defend their research work to a panel of experts.	
Semester X			
IPH2074	Project	<p>CO1. Develop the depth of knowledge in Physics .</p> <p>CO2. Evaluate an independent research project.</p> <p>CO3. Focus the knowledge of contemporary issues in their chosen field of research.</p> <p>CO4. Produce an ability to present and defend their research work to a panel of experts.</p>	<p>Lab 450</p> <p>Credits: 13</p>
IPH2075	Viva Voce	<p>CO1. Illustrate the Integrated understanding of the knowledge gathered from the various courses in the programme.</p> <p>CO2. Justify the current knowledge in research and academic field.</p> <p>CO3. Justify information from different domains and show capability to apply it to research and teaching.</p> <p>CO4. Produce professional communication skills.</p>	<p>Credit: 2</p>