Integrated MSc Physics

Vision

- Excel in quality-based Physics education by searching truth.

Mission

1. Provide quality Physics education for the holistic development of students.
2. Empower its stakeholders to face the challenges of life in the modern world.
3. Develop student's sensitivity to contribute for the betterment of society though acquiring knowledge in Physics.
4. Impart quality Physics education with special emphasis on 'learning by doing' for socio-economic growth.

Programme outcomes (PO)

PO1	Domain Knowledge
PO2	Communicative competence
PO3	Proficiency in using Modern Technologies
PO4	Reflective response to ethical and social issues
PO5	Sustainability values
PO6	Critical thinking and Problem Solving
PO7	Entrepreneurship and Leadership
PO8	Teamwork and cooperation.
PO9	Self-Directed and Lifelong Learning

Programme specific outcomes (PSO)

PSO1	Develop in depth knowledge of various branches of Physics.
PSO2	Demonstrate skills and competencies to conduct a wide range of scientific experiments and research in Physics.
PSO3	Capable of analysing and solving problems using reasoning skills based on concepts of Physics
PSO4	Develop the knowledge, skills and attitudes necessary to pursue further studies in Physics and research in Physics.
PSO5	Demonstrate understanding of the concepts from basic and applied branches of mathematics to solve problems in Physics.
PSO6	Demonstrate proficiency in problem-solving techniques using computation techniques.
PSO7	Develop the fundamental theories, concepts and applications in different basic areas of chemistry
PSO8	Ability to apply fundamentals of electronics in various domains of electronic systems.
PSO9	Understand the diverse applications of various fields of applied science and carry the knowledge and applications of basic sciences to the community.
PSO10	Develop in-depth knowledge in the specialization area Quantum Nanostructures.
PSO11	Develop communication skills for reporting the results in journals and oral presentations.

Course Code	Course name	Course outcomes	No. of lectures and credits
		Semester I	
IPH2201	**Mechanics**	**COIPH2201.01:** Apply particle dynamics, conservation laws and the theories of collisions. **COIPH2201.02**: Analyze inverse square law of force and apply concepts of particle dynamics in central force motion. **COIPH2201.03**: Apply the principles of harmonic motion to different types of oscillators.. **COIPH2201.04**: Apply the concepts of elasticity and fluid dynamics **COIPH2201.05**: Analyze the basics of classical mechanics and apply lagrangian concepts in particle dynamics	Lecture : 72 Credit : 4
IPH2202	**Thermal Physics**	**COIPH2202.01:** Apply the laws of thermodynamics -zeroth law, first law and second low **COIPH2202.02:** Apply the laws of thermodynamics in physical situations **COIPH2202.03:** Analyze the concept of Ideal gas and heat engine. **COIPH2202.04:** Understand and apply the concepts of thermodynamics based on entropy and Maxwell's equations. **COIPH2202.05:** Analyze the basics of heat radiation laws and statistical formulations.	Lecture : 72 Credit : 3
IPH2203	**Basic Electronics**	**COIPH2203.01**: Apply the fundamentals of diodes, circuits and its applications **COIPH2203.02:** Apply the basics of transistor properties, biasing and basic applications. **COIPH2203.03**: Apply the theory and working of amplifiers and Oscillator circuits. **COIPH2203.04:** Apply the principle, working and application of devices like FET, UJT and operational amplifiers **COIPH2203.05**: Illustrate the AM, SSB and FM modulation and demodulation.	Lecture : 72 Credit : 3
IPH2204:	**Mathematics- I Trigonometry, Differential Calculus and Matrices**	**COIPH2204.01**: Examine the consistency and solve system of linear equations. **COIPH2204.02:.** Evaluate Eigen values and Eigen vectors of a square matrix. **COIPH2204.03:.** Apply the concept of derivatives to solve problems in calculus. **COIPH2204.04**:. Find the partial derivatives of various functions.	Lecture : 54 Credit : 3

		COIPH2204.05:. Apply different methods to separate the real and imaginary part of complex valued functions.	
IPH2205:	Chemistry - I Basic Theoretical and Analytical Chemistry	**COIPH2205.01**: Apply the structure of the atom, chemical bonding and intermolecular forces such as hydrogen bonding. **COIPH2205.02:** Apply the periodic properties of atoms and the concept of chemical equilibrium. **COIPH2205.03:** Apply the basic concepts of radioactivity and nuclear chemistry. **COIPH2205.04:** Analyse 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. **COIPH2205.05**: Analyse various chromatographic techniques.	Lecture : 72 Credit : 3
IPH2206	Physics Lab I- Mechanics and Thermal Physics	**COIPH2206.01:** Investigate experiments in Mechanics and Properties of matter **COIPH2206.02:** Investigate experiments in Thermal Physics	Lecture : 54 Credit : 2
ICE2201:	English Language Skills – I	**COICE2201.01:** Identify the distinct sounds in English words **COICE2201.02:** Choose the right words while writing/talking about everyday life **COICE2201.03**: Use expressions appropriate for various social occasions **COICE2201.04**: Articulate words and sentences clearly stressing the right syllables	Lecture : 54 Credit : 3
IPH2207	Latex Programming	**COIPH2207.01:** Write ordinary text, mathematical formulae as equations **COIPH2207.02:** Organize texts using formatting **COIPH2207.03**: Illustrate insertion of symbols and operators in texts **COIPH2207.04**: Create array, table, header, font bibliography. **COIPH2207.05**: Prepare sample documents such as letter, report or books and prepare slides using beamer	Lecture : 36 Credit : 0
IPH2208	Python Programming -I	**COIPH2208.01:** Understand the structure of a python program and how it works **COIPH2208.02:** Understand the basic control structures **COIPH2208.03**: Apply the structure of a python program and how it works, basic control structures	Lecture : 36 Credit : 1

		Semester II	
IPH2209	**Relativity, Waves and Optics**	**COIPH2209.01**: Analyse inertial, non-inertial and rotating frames of references and related dynamic systems. **COIPH2209.02**: Understand and apply the essence of special theory and general theory of relativity. **COIPH2209.03:** Acquire basic knowledge of harmonic oscillations and superposition of oscillations. **COIPH2209.04:** Apply the concepts of oscillations and waves in a continuous medium and analyse the characteristics. **COIPH2209.05:** Understand basic optical phenomena and apply those principles in working of various optical instruments.	Lecture : 72 Credit : 3
IPH2210	**Basic Electrodynamics**	**COIPH2210.01**: Analyse the electrostatic fields & electrostatic potentials of physical systems Analyse the electric properties of matter. **COIPH2210.02:** Analyse the properties of electric steady current. Analyse the properties of different DC network theorems. Analyse the properties of time dependent electric circuits **COIPH2210.03**: Analyse the magneto static field associated with a steady current. Analyse the magnetic properties of matter **COIPH2210.04:** Analysis of boundary value problem in electrostatics. **COIPH2210.05:** Analyse the properties of electromagnetic induction, time dependent fields. Analyse the properties of Maxwell's equations and electromagnetic waves	Lecture : 72 Credit : 4
IPH2211	**Mathematics-II Integral Calculus and Fourier Series**	**COIPH2211.01:** Apply different techniques to solve the problems of integration. **COIPH2211.02**: Evaluate the areas of plane regions using integral calculus. **COIPH2211.03**: Find the length of plane curves, volumes and surface of revolution using integral calculus. **COIPH2211.04:** Evaluate multiple integrals and its applications. **COIPH2211.05**: Convert periodic functions into Fourier series.	Lecture : 54 Credit : 3
IPH2212	**Chemistry - II Basic Organic Chemistry**	**COIPH2212.01**: Apply the fundamental concepts in organic chemistry and structure of organic molecules. **COIPH2212.02**: Apply the methods of preparation and important reactions of alkanes, alkenes, alkynes and alkyl halides.	Lecture : 72 Credit : 3

		COIPH2212.03: Apply the various types of organic reactions and their mechanisms I. COIPH2212.04: Explain stereochemistry and conformation of some simple organic molecules COIPH2212.05: Use and familiarize with natural and synthetic polymers, biodegradability and environmental hazards.	
IPH2213	Physics Lab II-Waves, Optics, Electricity & Magnetism	COIPH2213.01: Demonstrate and analyse experiments in waves and optics COIPH2213.02: Demonstrate and analyse experiments in Electricity& magnetism and electrical circuits	Lecture : 54 Credit : 2
IPH2214	Chemistry Lab- I Volumetric Analysis & Organic Chemistry	COIPH2214.01: Perform quantitative analysis using volumetric estimations. COIPH2214.02: Carry out characterization of organic compounds using physical and chemical methods.	Lecture : 54 Credit : 2
ICE2202	English Language Skills-II	COICE2202.01: Write sentences adhering to tense rules COICE2202.02: Correct common errors such as punctuation and capitalization COICE2202.03: Identify the key points in a piece of writing COICE2202.04: Write CVs and cover letters	Lecture : 36 Credit : 2
IPH2215	Environmental Science	COIPH2215.01: Identify the multidisciplinary nature of environmental studies, importance of public awareness and different natural resources. COIPH2215.02: Analyse and explain the importance of ecosystems, biodiversity and its conservation. COIPH2215.03: Acquire the details of environmental pollution, waste management techniques and the role of an individual in prevention of pollution. COIPH2215.04: Illustrate the urban problems related to energy, environmental ethics, climate change and issues related to public awareness. COIPH2215.05: Identify different types of non-renewable and renewable energy sources, their merits and demerits.	Lecture : 36 Credit : 2
IPH2216	Practice on Arduino Microcontroller	COIPH2216.01: Familiarize with Arduino processor, components software installation. COIPH2216.02: IDE programming and different buttons & menus. COIPH2216.03: Implement different minor projects using Arduino	Lecture : 36 Credit : 2

IPH2217	Python Programming -II	**COIPH2217.01**: Demonstrate how Python can handle data using statistical methods **COIPH2217.02**: Describe how set theory operations can be done using python **COIPH2217.03**: Perform representative task in practice. **COIPH2217.04**: Apply the structure of a python program and handle data using statistical methods ,set theory operations	Lecture : 36 Credit : 1
		Semester III	
IPH2218	Mathematical Physics – I Differential Equations - 1	**COIPH2218.01:** Discuss the solution of first and second order differential equations **COIPH2218.02**:Demonstrate the skills of modelling physical problems in terms of differential equations. **COIPH2218.03**: Describe the theoretical framework of the existence and uniqueness of Solutions **COIPH2218.04:** Describe the behavior nonlinear systems and its stability **COIPH2218.05**: Solve numerically initial value problems described by differential equations.	Lecture : 72 Credit : 3
IPH2219	Classical Electrodynamics	**COIPH2219.01**: Analyse the properties of EMW. **COIPH2219.02:** Analyse the EMW interaction in a medium and at interface. **COIPH2219.03**: Explain the details relativistic electrodynamics. **COIPH2219.04:** Analyse the properties and behaviour of different sources of radiation. **COIPH2219.05**: Analyse the properties of wave guide, transmission line and guided wave.	Lecture : 72 Credit : 4
IPH2220	Modern Optics	**COIPH2220.01**: Analyze the details of interference and interferometry. **COIPH2220.02**: Analyze the details of Fresnel's and Fraunhofer diffraction and its applications. **COIPH2220.03**: Explain the polarization of light and associated properties. **COIPH2220.04**: Explain the coherence nature of optical sources **COIPH2220.05**: Illustrate matrix method for the analysis of optical systems.	Lecture : 72 Credit : 4
IPH2221	Physics Lab III- Computational Physics – I	**COIPH2221.01**: Apply the mathematical concepts to formulate a computational problem **COIPH2221.02**: Demonstrate skills in writing computer programs, executing it and interpreting the results.	Lecture : 54 Credit : 2

Note: Above the IPH2217 row, a partial cell reads: **COIPH2216.04:** Setup projects using light, temperature and mechanical sensors.

IPH2222	Physics Lab IV- Electronics, Modern Optics and Electrodynamics	**COIPH2222:.01**: Demonstrate and analyse the experiments using semiconducting diodes, transistors, ICs 555, 741 **COIPH2222:.02:** Demonstrate and analyse the experiments of optics and electromagnetic waves.	Lecture : 54 Credit : 2
IPH2223	Mathematics- III Vector Calculus, Analytic Geometry and Abstract Algebra	**COIPH2223.01**: Apply vector valued functions in the application of physics. **COIPH2223.02**: Apply integrals in physics related applications. **COIPH2223.03**: Explain the properties of analytic geometry and use analytic geometry in physical systems. **COIPH2223.04**: Identify vector spaces over set of all real numbers. **COIPH2223.05**: Find out work, circulation, flux and curl using line and surface integrals.	Lecture : 54 Credit : 3
IPH2224: Chemistry - III	Advanced Physical Chemistry – I	**COIPH2224.01**: Analyze the solid state chemistry including symmetry, crystal structure, magnetic, conductivity and optical properties of solids. **COIPH2224.02**: Apply the chemistry of the liquid state, colligative properties and properties of liquid crystals. **COIPH2224.03**: Apply the behaviour of gases and gas laws. **COIPH2224.04:** Illustrate surface phenomena such as adsorption and properties & applications of colloids. **COIPH2224.05**: Illustrate the phase equilibria, distribution law and its applications.	Lecture : 72 Credit : 3
IPH2225A	Summer Project – I	**COIPH2225A.01**: Identification of research/industrial/academic problems, preparation of methodology of work, time bound planning. **COIPH2225A.02**: Report the use of sophisticated instrumentation/software and enhance academic scenario through practical experience. **COIPH2225A.03**: Develop the ability to analysis data collection, interpretation of observation and capability to make inferences **COIPH2225A.04:** Develop new knowledge and experience to contribute to the start-up programs.	Credit : 36
IPH2226	Yoga Exercises for Sound Health	**COIPH2226.01**: Apply idea about Yoga **COIPH2226.02**: Illustrate limits and methods in five aspects: Food, Work, Sleep, Sex and Thought **COIPH2226.03**: Practice a whole-body exercise and Kayakalpa **COIPH2226.04:** Practice different Pranayama and Mudras	Lecture : 36 Credit : 0

IPH2227	Machine Learning using Python-I	**COIPH2227.01:** Understand the general features of machine learning **COIPH2227.02:** Understand how python tools necessary for numeric, visualization and manipulation of data **COIPH2227.03:** Apply the general features of machine learning, python tools necessary for numeric, visualization and manipulation of data	Lecture : 36 Credit : 1
		Semester IV	
IPH2228	Mathematical Physics – II Differential Equations - II	**COIPH2227.01**: Demonstrate the method of power series to solve differential equations **COIPH2227.02**: Discuss the properties of special function **COIPH2227.03**: Understand various partial differential equations in physics and their solutions. **COIPH2227.04**: Demonstrate the skills in applying the methods of Fourier series and Laplace transforms. **COIPH2227.05**: Understand the variational problem and Euler's equation and its applications in physics	Lecture : 72 Credit : 3
IPH2229	Basic Quantum Mechanics	**COIPH2229.01**: Analyse the transition from classical to quantum mechanics **COIPH2229.02**: Evaluate the basic postulates of quantum mechanics **COIPH2229.03**: Demonstrate the mathematical basics for interpreting Schrodinger equation **COIPH2229.04**: Apply the concept of quantum mechanics to one dimensional problems. **COIPH2229.05**: Apply the mathematical techniques for solving problems in solid state physics	Lecture : 90 Credit : 4
IPH2230	Physics Lab V- Computational Physics – II	**COIPH2230.01**: Apply the mathematical concepts to formulate a computational problem **COIPH2230.02**: Demonstrate skills in writing computer programs, executing it and interpreting the results.	Lecture : 54 Credit : 2
IPH2231	Physics Lab VI- Mechanics and Basic Quantum Mechanics	**COIPH2231.01**: Demonstrate and analyse the experiments in Mechanics **COIPH2231.02**: Demonstrate and analyse the experiments in modern physics and basic concepts of quantum mechanics	Lecture : 54 Credit : 2
IPH2232	Chemistry - IV Advanced Physical Chemistry – II	**COIPH2232.01**: Apply the principle and applications of various spectroscopic methods such as rotational, uv-visible and infrared spectroscopy. **COIPH2232.02**: Apply the first, second and third laws of thermodynamics including their significance.	Lecture : 72 Credit : 3

		COIPH2232.03: Apply the fundamental concepts of kinetics and catalysis. COIPH2232.04: Apply the laws of photochemistry and distinguish between fluorescence and phosphorescence. COIPH2232.05: Illustrate the principles of electrochemistry including conductance in solutions, conductometric titrations, galvanic cells, fuel cells, emf measurements and potentiometric titrations.	
IPH2233	Chemistry Lab- II Physical Chemistry	COIPH2233.01: Do chemical characterization of substances using various physico-chemical parameters such as viscosity, CST, transition temperature, heat of solution etc. COIPH2234.02: Perform various instrumental techniques such as potentiometry, conductometry and colorimetry	Lecture : 54 Credit : 2
IPH2234	Mathematics- IV Differential Equations, and Complex Analysis	COIPH2234.01: Solve first order first degree ordinary differential equations. COIPH2234.02: Solve first order higher degree ordinary differential equations. COIPH2234.03: Illustrate the properties and application of special functions. COIPH2234.04: Explain the properties of partial differential equation and solve problems using it. COIPH2234.05: Demonstrate analyticity of a complex function and its applications.	Lecture : 54 Credit : 3
IPH2235	Health & Emergency Care	COIPH2235.01: Understand the importance of physical activities on health. COIPH2235.02: Observe and identify different types of injuries. COIPH2235.03: Able to do different life saving first aids like 1. CPR, 2. Heimlich Maneuver.	Lecture : 36 Credit : 0
IPH2236	Machine Learning Using Python-II	COIPH2236.01: Apply Scikit-lear dataset COIPH2236.02: Describe how linear and polynomial reUression is performed COIPH2236.03: Perform representative computational task in practice. COIPH2236.04: Apply the general features of machine learning, linear and polynomial regression is performed	Lecture : 36 Credit : 1
		Semester V	
IPH2237	Mathematical Physics – III Complex Variables	COIPH2237.01: Define complex numbers and their properties COIPH2237.02: Describe the fundamental properties of analytical functions	Lecture : 72 Credit : 3

		COIPH2237.03: Demonstrate the skills in applying contour integrals COIPH2237.04: Demonstrate skills in applying Taylor and Laurent series COIPH2237.05: Demonstrate the skills in applying residue theorem	
IPH2238	Solid State Physics	COIPH2238.01:Explain the basic idea about crystal structures and X-ray diffraction. COIPH2238.02: Identify theories of interatomic forces and thermal properties in metals. COIPH2238.03: Explain the free electron model, Bloch's theorem & energy bands COIPH2238.04: Explain the theory and properties of semiconductors. COIPH2238.05: Explain the dielectric & magnetic properties of materials and superconductivity.	Lecture : 90 Credit : 4
IPH2239	Atomic and Molecular Physics	COIPH2239.01: Explain the early developments of different atom models and atomic spectra. COIPH2239.02: Explain the concept of molecular structure. COIPH2239.03: Explain the origin and properties of molecular spectra. COIPH2239.04: Illustrate the theory of Raman Spectroscopy COIPH2239.05: Illustrate NMR and ESR spectroscopy and its instrumentation.	Lecture : 72 Credit : 4
IPH2240	Physics Lab VII-Computational Physics – III	COIPH2240.01: Apply the mathematical concepts to formulate a computational problem COIPH2240.02: Demonstrate skills in writing computer programs, executing it and interpreting the results.	Lecture : 54 Credit : 2
IPH2241	Physics Lab VIII-Solid State Physics and Atomic & Molecular Physics	COIPH2241.01: Demonstrate and analyse the experiments in solid state physics, semiconductors, conductors & insulators., COIPH2241.02: Demonstrate and analyse the experiments in atomic and molecular spectroscopy.	Lecture : 54 Credit : 2
IPH2242	Research Methodology in Science	COIPH2242.01: Analyse the development of science, philosophy of science and scientific facts. COIPH2242.02: Analyse the meaning of research, design, development and analysis of research and also hypothesis and research methods. COIPH2242.03: Do data collection, sampling and statistical analysis COIPH2242.04: Prepare scientific reports, journal papers and project proposals. COIPH2242.05: Analyse the environmental and ethical impacts, IPR, plagiarism citation and acknowledgement.	Lecture : 54 Credit : 3

IPH2243	Human Rights	**COIPH2243.01**: Analyse the development of human rights and **COIPH2243.02:** Analyse different human right act in UN **COIPH2243.03**: Analyse the human rights in Indian scenario **COIPH2243.04**: Analyse the impact of environment and human rights. **COIPH2243.05:** Analyse the Conservation of natural resources and human rights	Lecture : 54 Credit : 2
IPH2225B	Summer Project – II	**COIPH2225B.01**: Identification of research/industrial/academic problem, preparation of methodology of work, time bound planning. **COIPH2225B.02**: Report the use of sophisticated instrumentation/software and enhance academic scenario through practical experience. **COIPH2225B.03:** Develop the ability to analysis data collection, interpretation of observation and capability to make inferences **COIPH2225B.04:** Develop new knowledge and experience to contribute in the start-up programs.	Credit : 0
IPH2244	Foundation Course in Reasoning	**COIPH2244.01**: Develop the logical reasoning ability of students. **COIPH2244.02**: Develop the arithmetic reasoning ability of students. **COIPH2244.03**: Develop the verbal reasoning ability of students. **COIPH2244.04**: Improves the non-verbal reasoning ability of students	Lecture : 36 Credit : 0
IPH2245	Machine Learning using Python - III	**COIPH2245.01**: Describe classification problem **COIPH2245.02**: Understand Classification using support vector machines **COIPH2245.03**: Apply Classification using support vector machines	Lecture : 36 Credit : 1
		Semester VI	
IPH2246	Mathematical Physics – IV Linear Algebra and Tensors	**COIPH2246.01**: Discuss basic properties of matrices and linear transformation **COIPH2246.02**: Determine eigenvalues and eigenvectors and its applications **COIPH2246.03**: Understand the definition of tensors and their properties **COIPH2246.04:** Demonstrate skills in describing four vectors in special relativity **COIPH2246.05**: Describe basic framework of tensor calculus and general relativity.	Lecture : 72 Credit : 3

IPH2247	Nuclear and Particle Physics	COIPH2247.01: Analyse the interior of the nucleus and interaction between nucleons. COIPH2247.02: Analyse the theory of radioactivity. COIPH2247.03: Analyse the interaction of radiation with matter. COIPH2247.04: Explain the fundamentals of particle accelerator and nuclear energy. COIPH2247.05: Explain particle physics.	Lecture : 72 Credit : 3
IPH2248	Classical Mechanics	COIPH2248.01: Apply Hamiltonian mechanics, variational principle and Lagrange's equations COIPH2248.02: Apply small oscillations and rigid body dynamics COIPH2248.03: Analyse Canonical Transformations, COIPH2248.04: Apply Hamilton-Jacobi theory and - central force problems COIPH2248.05: Analyse the Fluid dynamics	Lecture : 90 Credit : 4
IPH2249	Physics Lab IX-Computational Physics – IV	COIPH2249.01: Apply the mathematical concepts to formulate a computational problem COIPH2249.02: Demonstrate skills in writing computer programs, executing it and interpreting the results.	Lecture : 54 Credit : 2
IPH2250	Physics Lab X-Classical mechanics and Nuclear Physics	COIPH2250.01: Demonstrate and analyse the nuclear physics experiments and problems by numerical techniques COIPH2250.02: Demonstrate and analyse the experiments in mechanics and computational analysis of mechanical systems.	Lecture : 54 Credit : 2
IPH2251A	Flexible Electronics	COIPH2251A.01: Categorize the printed electronics and its possibilities in the industry COIPH2251A.02: Explain varies flexible electronics products and its challenges COIPH2251A.03: Establish about different derivatives in the process and methods used in flexible electronics COIPH2251A.04: Describe the opportunities of various flexible electronics applications and products	Lecture : 72 Credit : 3
IPH2251B	Nanoscience and Nanotechnology	COIPH2251B.01: Develop the basics of nanomaterials. COIPH2251B.02: Apply the synthesis of zero, one, two dimensional nanomaterials. COIPH2251B.03: Analyse the electronic application of nanomaterials. COIPH2251B.04: Analyse the photonic application of nanomaterials. COIPH2251B.05: Illustrate the nanomaterial characterization techniques.	Lecture : 72 Credit : 3

IPH2252	Minor project	COIPH2252.01: Develop the depth of knowledge in Physics . COIPH2252.02: Evaluate an independent research project. COIPH2252.03: Focus the knowledge of contemporary issues in their chosen field of research. COIPH2252.04: Produce an ability to present and defend their research work to a panel of experts.	Lecture : 36 Credit : 1
IPH2253	Plant Propagation	COIPH2253.01: Identify and assess the quality of different types of soils. COIPH2253.02: Develop an understanding of propagation techniques. COIPH2253.03: Practice different types of artificial propagation techniques like layering, grafting and budding.	Lecture : 36 Credit : 0
IPH2254	Machine Learning Using Python - IV	COIPH2254.01: Apply classification using K-means COIPH2254.02: Describe Unsupervised learning using K-means COIPH2254.03: Perform typical computational task related to the units practically COIPH2254.04: Apply Classification using support vector machines	Lecture : 36 Credit : 1
		Semester VII	
IPH2255	Advanced Electronics	COIPH2255.01: Analyse the fundamentals of op-amp and properties & effect of negative feedback COIPH2255.02: Analyse the various applications of Op amp and circuits COIPH2255.03: Analyse the properties of different transducers and devices using it. COIPH2255.04: Analyse the properties of active filters and signal circuits COIPH2255.05: Analyse the properties of digital instruments	Lecture : 72 Credit : 4
IPH2256	Statistical Mechanics	COIPH2256.01: Understand the foundations of statistical mechanics. COIPH2256.02: Explain the classification of identical particles and Maxwell distribution. COIPH2256.03: Illustrate the Planck distribution and quantum statistics. COIPH2256.04: Explain the characteristics of Phase transitions, fluctuations and interacting systems.	Lecture : 72 Credit : 4

IPH2257	Advanced Quantum Mechanics - I	**COIPH2257.01:** Explain the basic mathematical tools of Quantum Mechanics **COIPH2257.02**: Explain the theoretical frame work of quantum mechanics **COIPH2257.03:** Illustrate the angular momenta and its addition **COIPH2257.04:** Describe the necessity of approximation methods and time independent techniques	Lecture : 90 Credit : 4
IPH2258	Condensed Matter Physics	**COIPH2258.01**: Illustrate crystal structure and symmetry **COIPH2258.02:** Explain free electron theory, band theory of materials **COIPH2258.03**: Illustrate imperfections and dislocations in crystals **COIPH2258.04**: Explain Lattice dynamics of solid and magnetic properties of solids. **COIPH2258.05**: Explain details of nanomaterials.	Lecture : 72 Credit : 4
IPH2259	Physics Lab XI- Advanced Electronics	**COIPH2259.01**: Demonstrate experiments using transistors, ICs and simulation of electronic circuits.	Lecture : 72 Credit : 3
IPH2260	Physics Lab XII- Statistical Mechanics	**COIPH2260.01:** Demonstrate simulations of statistical systems.	Lecture : 72 Credit : 3
IPH2225C	Summer Project – III	**COIPH2225C.01:** Identification of research/industrial/academic problem, preparation of methodology of work, time bound planning. **COIPH2225C.02:** Report the use of sophisticated instrumentation/software and enhance academic scenario through practical experience. **COIPH2225C.03:** Develop the ability to analysis data collection, interpretation of observation and capability to make inferences **COIPH2225C.04:** Develop new knowledge and experience to contribute in the start-up programs.	Credit : 0
IPH2261	Observational Astronomy	**COIPH2261.01**: Visualize an idea about astronomy and optical telescopes **COIPH2261.02:** Visualize an idea about celestial objects like Stars, Galaxies and the Universe **COIPH2261.03**: Visualize the evolution of universe. **COIPH2261.04:** Practice to identify different planets, stars and constellations	Lecture : 36 Credit : 0

		Semester VIII	
IPH2262	**Mathematical Physics – V Advanced topics**	**COIPH2262.01**: Understanding of advanced methods of solution of differential equations **COIPH2262.02**: Demonstrate the skills in applying the concepts of special functions. **COIPH2262.03**: Describe partial differential equation in physics and their solutions **COIPH2262.04**: Demonstrate skills in formulating integral equations and their solutions. **COIPH2262.05**: Describe the properties of probability distributions apply statistical tools	Lecture : 72 Credit : 4
IPH2263	**Advanced Atomic and Molecular Physics**	**COIPH2263.01:** Explain the theory atomic spectroscopy. **COIPH2263.02**: Explain the theory and application of microwave and IR spectroscopy. **COIPH2263.03:** Explain the theory and instrumentation of Raman spectroscopy and Electronic Spectroscopy of molecules. **COIPH2263.04:** Explain the theory and instrumentation of ESR and Mossbauer Spectroscopy	Lecture : 72 Credit : 4
IPH2264	**Advanced Quantum Mechanics - II**	**COIPH2264.01**: Explain the principles of time dependent perturbations. **COIPH2264.02:** Explain the phenomena of scattering in quantum mechanical view. **COIPH2264.03**: Explain relativistic formulations of quantum mechanics. **COIPH2264.04**: Explain the second quantization principles	Lecture : 90 Credit : 4
IPH2265	**Astronomy and Astrophysics**	**COIPH2265.01**: Observe different constellations and classify stars accordingly. **COIPH2265.02:** Explain the basics of seasonal changes. **COIPH2265.03:** Interpret the fundamental equations in stellar evolution. **COIPH2265.04**: Analyze basic theories of formation of solar system. **COIPH2265.05:** Discuss criterion, formation and evolution of stellar objects. **COIPH2265.06:** Understand basics of Milky Way and other extra galactic systems.	Lecture : 72 Credit : 4
IPH2266	**Physics Lab XIII-Condensed Matter Physics**	**COIPH2266.01**: Demonstrate experiments in solid state physics	Lecture : 72 Credit : 3
IPH2267	**Physics Lab XIV-Quantum Mechanics**	**COIPH2267.01:** Demonstrate simulations of quantum mechanical systems and principles.	Lecture : 72 Credit : 3

IPH2268	Finishing School	**COIPH2268.01**: Develop the capacity to confidently face interviews, GD and secure placements in reputed companies **COIPH2268.02:** Develop the essential professional skills that will help students to lead a successful career.	Lecture : 36 Credit : 0
		## Semester IX	
IPH2269	Quantum Heterostructures	**COIPH2269.01**: Describe the structure and properties of semiconductor heterostructures **COIPH2269.02**: Apply quantum mechanical ideas to construct band structure. **COIPH2269.03:** Describe the electronic structure of low dimensional systems **COIPH2269.04**: Illustrate the background information for studying quantum transport.	Lecture : 72 Credit : 4
IPH2270	Transport in Nanostructures	**COIPH2270.01:** Describe the physics of modern nanoelectronic devices. **COIPH2270.02:** Discuss in detail the transport properties of mesoscopic systems. **COIPH2270.03:** Prepare the student to use advanced computational tools in nanoelectronics. **COIPH2270.04:** Prepare the student to understand the research works in this area.	Lecture : 72 Credit : 4
IPH2271	Nano-Optics and Nanophotonics	**COIPH2271.01**: Explain the optical properties of nanao-structures. **COIPH2271.02**: Explain detailed study of emerging areas like photonic crystals and plasmonics **COIPH2271.03:** Develop skills needed to apply computational methods for designing Nano-optical structures. **COIPH2271.04**: Illustrate the research work in Nanophotonics	Lecture : 72 Credit : 4
IPH2272	Physics Lab XV- Synthesis and Characterization of Nanomaterials	**COIPH2272.01**: Report characterization of nanomaterials. **COIPH2272.02:** Design characterization of nanomaterials.	Lecture : 54 Credit : 2
IPH2273	Physics Lab XVI- Nanostructures	**COIPH2272.01**: To learn the skills needed to solve essential practical problems at research level using computational method	Lecture : 54 Credit : 2

		Semester X	
IPH2274	Major Project	**COIPH2274.01:** Develop the depth of knowledge in Physics. **COIPH2274.02:** Evaluate an independent research project. **COIPH2274.03:** Focus the knowledge of contemporary issues in their chosen field of research. **COIPH2274.04**: Produce an ability to present and defend their research work to a panel of experts.	Lecture : 576 Credit : 14
IPH2275	Viva Voce	**COIPH2275.01**: Illustrate the Integrated understanding of the knowledge gathered from the various courses in the programme. **COIPH2275.02:** Justify the current knowledge in research and academic fields. **COIPH2275.03:** Justify information from different domains and show capability to apply it to research and teaching. **COIPH2275.04:** Produce professional communication skills.	Credit : 2