# Department of Physics

| PO's. No. | **Program Outcomes : B.Sc. Physics**<br>**Upon completion of this programme the student will able to** |
|---|---|
| **PO1** | Demonstrate a comprehensive understanding of the fundamental principles and theories in classical mechanics, electromagnetism, quantum mechanics, and thermodynamics. |
| **PO2** | Understand the principles of electronics and be able to design and analyze basic electronic circuits. |
| **PO3** | Conduct experiments and use laboratory equipment to collect, analyze, and interpret experimental data accurately. |
| **PO4** | Utilize modern computational tools and techniques to model and simulate physical phenomena and solve complex physics problems. |
| **PO5** | Communicate scientific concepts effectively through oral presentations, technical reports, and scientific writing. |
| **PO6** | Apply physics knowledge and skills to real-world problems, including technological advancements and societal challenges. |
| **PO7** | Develop critical thinking skills to analyze and evaluate scientific literature and research findings in the field of physics. |

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# Program Specific Outcomes (PSO's) for B.Sc. Physics

| PSO's. No. | **Program Specific Outcomes : B.Sc. Physics**<br>**Upon completion of this programme the student will able to** |
|---|---|
| **PSO1** | Comprehensive Understanding of Classical and Modern Physics |
| **PSO2** | Proficiency in Electronics and Circuit Design |
| **PSO3** | Laboratory Skills and Experimental Techniques |
| **PSO4** | Computational and Modeling Skills |
| **PSO5** | Communication and Documentation of Scientific Knowledge |

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| **PSO6** | Application of Physics in Technological and Societal Contexts |
| **PSO7** | Critical Thinking and Research Analysis |

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| **F.Y.B.Sc. SemesterI** | | |
|---|---|---|
| **Title of the Course and Course Code** | **Mechanics and Properties of matter (PHY111)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Identify fundamental principles in mechanics. | 1 |
| CO2 | Illustrate Newton's laws of gravitation and Kepler's laws of planetary motion. Explain viscosity of Fluid, law of energy conservation and applications of Bernoulli's theorems with examples. | 2 |
| CO3 | Apply the physical principles of moment of inertia in terms of the mass distribution from the rotational axis to various symmetrical bodies. | 3 |
| CO4 | Analyze the properties and applications of elasticity with experiments. | 4 |
| CO5 | Justify the quantitative problem-solving skills in all the topics covered. | 5 |
| CO6 | Develop an intuition towards problems solving and design realistic applications in the physical world. | 6 |
| | | |
| **Title of the Course and Course Code** | **Physics principle & its Applications (PHY112)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | To understand the general structure of atom, spectrum of hydrogen atom | 1 |
| CO2 | To understand the atomic excitation and LASER principles. | 2 |
| CO3 | To understand the bonding mechanism and its different types. | 3 |

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|---|---|---|
| CO4 | To demonstrate an understanding of electromagnetic waves and its spectrum. | 4 |
| CO5 | To demonstrate an understanding of electromagnetic waves and its spectrum. | 5 |
| CO6 | To demonstrate quantitative problem solving skills in all the topics covered. | 6 |
| | | |
| **Title of the Course and Course Code** | **Physics Practical –I(PHY113)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Identify various components, devices, instruments and tools for specific applications. Recall the theory associated with each experiment. | 1 |
| CO2 | Illustrate skill of proper use of tools and test and measuring instruments. | 2 |
| CO3 | Calculate the values of physical quantities using suitable instruments. | 3 |
| CO4 | Explain the results by integrating the theory with experimental observations. | 4 |
| CO5 | Evaluate various physical quantities and measure the errors therein. | 5 |
| CO6 | Perform the experiments using proper procedures and specify the outcomes. Integrate the measuring instrumentation system with the experimental circuit as required. | 6 |
| **F.Y.B.Sc. Semester II** | | |
| **Title of the Course and Course Code** | **Heat and Thermodynamics (PHY121)** | **Number of Credits:02** |

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| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
|---|---|---|
| CO1 | Recall the concepts of Thermodynamics. | 1 |
| CO2 | Discuss the behavior of real gases. | 2 |
| CO3 | Compute the thermodynamic quantities associated with different types of processes. | 3 |
| CO4 | Explain the working of heat engine, different types of thermometers.<br>Compare types of heat engines and their working; temperature scales. | 4 |
| CO5 | Determine work done, efficiency of heat engines and coefficient of performance of refrigerators, temperatures using different scales and principles of thermometers. | 5 |
| CO6 | Specify the different types of thermodynamic processes in daily life | 6 |
| | | |
| **Title of the Course and Course Code** | **Electricity and Magnetism (PHY122)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive** |

| | | **level** |
|---|---|---|
| CO1 | Recall the concepts associated with stationary charges. | 1 |
| CO2 | Discuss the atomic view of polarization of matter. Explain the correlation in electricity and magnetism. | 2 |
| CO3 | Compute the boundary conditions and calculate quantities like current, voltage, power, phase, impedance, etc in DC and AC circuits. | 3 |
| CO4 | Classify the phase relations in AC circuits. | 4 |
| CO5 | Compare the growth and decay of current in DC circuits. | 5 |
| CO6 | Write the phase relations between different parameters (like current, voltage, power and impedance) in simple electronic circuits comprising of resistors, inductors and capacitors. | 6 |

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|---|---|---|
| **Title of the Course and Course Code** | **Physics Practical-II(PHY123)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Identify various components, devices, instruments and tools for specific applications. Recall the theory associated with each experiment. | 1 |
| CO2 | Illustrate skill of proper use of tools and test and measuring instruments. | 2 |
| CO3 | Calculate the values of physical quantities using suitable instruments. | 3 |
| CO4 | Explain the results by integrating the theory with experimental observations. | 4 |
| CO5 | Evaluate various physical quantities and measure the errors therein. | 5 |
| CO6 | Perform the experiments using proper procedures and specify the outcomes. Integrate the measuring instrumentation system with the experimental circuit as required. | 6 |
| **S.Y.B.Sc.Semester IV** | | |
| **Title of the Course and Course Code** | **Oscillations, Waves and Sound(PHY241)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define and describe concepts of undamped, damped and forced | 1 |
| | Oscillations with rigorous mathematical treatment. | |
| CO2 | Exemplify mathematical models for analysis of longitudinal and transverse waves. | 2 |

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|---|---|---|
| CO3 | Solve problems in wave mechanics, Doppler Effect and acoustic measurements. | 3 |
| CO4 | Explain the concept of reverberation of sound and reverberation time. | 4 |
| CO5 | Discriminate between undamped, damped and forced oscillations. | 5 |
| CO6 | Develop mathematical treatment for wave motion in different modes. | 6 |
| | | |
| **Title of the Course and Course Code** | **Optics(PHY 242)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define terms interference, diffraction and polarization. | 1 |
| CO2 | Articulate concepts of polarization of light, types of polarization, generation of polarized light. Illustrate concepts of Fresnel and Fraunhofer's diffraction. | 2 |
| CO3 | Solve problems based on wavelength and refractive index measurement using Newton's ring, Michelson interferometer for closely spaced wavelength, anti reflection coating, resolving power of telescope and grating, Malus law, retarders. | 3 |
| CO4 | Explain the concept of thin film interference for uniform and non uniform film and their potential applications. Analyze different types of polarized light. | 4 |
| CO5 | Consider different examples of Fresnel and Fraunhofer's diffraction. Compare resolving power of different telescopes. | 5 |
| CO6 | Specify the potential applications of thin film interference and resolving power of grating and telescope. | 6 |
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| **Title of the Course and Course Code** | **Practical course III(PHY243)** | **Number of Credits:02** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define the objectives of a given experiment. Identify various components, devices, instruments and tools for specific applications. | 1 |
| CO2 | Exemplify proper use of tools and testing of measuring instruments.<br>Summarize the observations taken during the experimentation and tabulate the results. | 2 |
| CO3 | Demonstrate handling of tools and instruments used for taking observations | 3 |
| CO4 | Analyze the observed data. Calculate physical quantity as per the aim of experiment. | 4 |
| CO5 | Standardize method to prepare technical report writing for laboratory exercises. Evaluate errors in observed values of physical quantities. | 5 |
| CO6 | Construct circuits from drawings, the block diagrams for a given instrument / equipment. Develop skills of optical leveling, component testing and plotting of graphs with proper scale | 6 |

## S.Y.B.Sc. Semester III

| **Title of the Course and Course Code** | **Electronics I (PHY232)** | **Number of Credits:02** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Apply different theorems and laws to electrical circuits. | 1 |
| CO2 | Understand the relations in electricity. | 2 |

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|---|---|---|
| CO3 | Understand the parameters, characteristics and working of transistors. | 3 |
| CO4 | Understand the functions of operational amplifiers. | 4 |
| CO5 | Design circuits using transistors and applications of operational amplifiers. | 5 |
| CO6 | Understand the Boolean algebra and logic circuits and to build the different circuits. | 6 |
| | | |
| **Title of the Course and** | **Mathematical methods in physics -I (PHY231)** | **Number of Credits:02** |

| **Course Code** | | |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Understand the complex algebra useful in physics courses. | 1 |
| CO2 | Understand the concept of partial differentiation. | 2 |
| CO3 | Understand the role of partial differential equations in physics. | 3 |
| CO4 | Understand vector algebra useful in mathematics and physics. | 4 |
| CO5 | Understand the concept of singular points of differential equations. | 5 |
| CO6 | Compile the data and verify the results obtained. | 6 |
| | | |
| **Title of the Course and Course Code** | **Practical course IV(PHY233)** | **Number of Credits:02** |

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| On completion of the course, the students will be able to: | | Bloom's Cognitive level |
|---|---|---|
| CO1 | Define the objectives of a given experiment. Identify Various components, devices, instruments and tools for specific applications. | 1 |
| CO2 | Exemplify proper use of tools and testing of measuring instruments.<br>Summarize the observations taken during the experimentation and tabulate the results. | 2 |
| CO3 | Demonstrate handling of tools and instruments used for taking observations. Use computer software for data generation and plotting | 3 |
| CO4 | Analyze the observed data, calculate physical quantity as per the aim of experiment. | 4 |
| CO5 | Standardize method to prepare technical report writing for laboratory exercises. Evaluate errors in observed values of physical quantities. | 5 |
| CO6 | Construct circuits from drawings, block diagrams for a given instrument / equipment. Develop skills of optical leveling, component testing and plotting of graphs with proper scale. | 6 |
| **T.Y.B.Sc. Semester V** | | |
| **Title of the Course and Course Code** | **Mathematical Methods in Physics- II (PHY351)** | **Number of Credits:02** |

| On completion of the course, the students will be able to: | | Bloom's Cognitive level |
|---|---|---|
| CO1 | Recall the knowledge of calculus, vectors, vector calculus. | 1 |
| CO2 | Illustrate methods of solving partial differential equations with the examples of important partial differential equations in Physics. | 2 |
| CO3 | Apply the various methods for solving differential equations in various physical problems such as in quantum mechanics, which they will learn in future courses in detail. | 3 |

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|---|---|---|
| CO4 | Explain the Fourier analysis of periodic Functions and reconstruct physical problems such as vibrating strings etc. | 4 |
| CO5 | Determine transformation equations and construct various coordinate systems. Compare Cartesian, spherical and cylindrical coordinate systems. | 5 |
| CO6 | Formulate the special functions, such as the Hermite polynomials, the Legendre polynomials and Bessel functions and their differential equations. | 6 |
| | | |
| **Title of the Course and Course Code** | **Classical Electrodynamics (PHY 352)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define electric fields, electric potential, displacement vector, electric Polarization. | 1 |
| CO2 | Articulate concepts of evaluating electric fields due to line charge, surface charge and volume charge using Coulomb's law and Gauss's law. Explain mechanism of polarization in dielectrics. | 2 |
| CO3 | Demonstrate special techniques to calculate potential due to some charge distribution. | 3 |
| CO4 | Explain motion of charged particles in the electromagnetic field. Deduce Biot Savart's law from Ampere's law. | 4 |
| CO5 | Compare magnetic properties of material on the basis of total spin of electrons in atoms. Distinguish between diamagnetic and paramagnetic materials. | 5 |
| CO6 | Compile Maxwell's set of equations and develop electromagnetic plane wave equations. | 6 |
| | | |
| **Title of the Course and Course Code** | **Classical Mechanics (PHY353)** | **Number of Credits:02** |

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| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
|---|---|---|
| CO1 | Describe methods of solving equations of motions. | 1 |
| CO2 | Explain the necessity of considering constraints. | 2 |
| CO3 | Apply different techniques to find solutions to problems in Mechanics. | 3 |
| CO4 | Compare and contrast Newtonian, Lagrangian and Hamiltonian approaches. | 4 |
| CO5 | Determine the constraint equations and decide the generalized coordinates to be used. | 5 |
| CO6 | Hypothesize rotating frames of references. | 6 |
| | | |
| **Title of the Course and Course Code** | **Atomic and Molecular Physics (PHY354)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Recall and recognize the gradual development of the Atomic theory and distinguish between various atomic models. | 1 |
| CO2 | Explain the effect of magnetic field on atomic spectra. | 2 |
| CO3 | Solve the problems in Atomic theory. | 3 |
| CO4 | Relate atomic theory to analyze spectra. | 4 |
| CO5 | Evaluate spectroscopic data to identify elements using atomic spectra. | 5 |
| CO6 | Develop mathematical treatment for the Bohr atom, Zeeman effect and Raman spectra. | 6 |
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| **Title of the Course and Course Code** | **Computational Physics (PHY355)** | **Number of Credits:03** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Develop the ability to write, debug, and optimize code in programming languages commonly used in scientific computing, such as Python, C++, or MATLAB. | 1 |
| CO2 | Utilize numerical techniques like finite difference methods, Monte Carlo simulations, and iterative algorithms to solve physics problems that are difficult or impossible to solve analytically. | 2 |
| CO3 | Use computational tools to simulate and analyze complex physical systems, such as particle interactions, fluid dynamics, and quantum mechanical systems. | 3 |
| CO4 | Apply computational methods to interdisciplinary problems, collaborating with experts from other fields to tackle challenges at the intersection of physics and other sciences. | 4 |
| CO5 | Develop skills in generating visual representations of simulation results, allowing for better understanding and communication of complex physical concepts. | 5 |
| CO6 | Create and implement computational models to represent real-world physical phenomena, and analyze the resulting data to extract meaningful insights. | 6 |
| | | |
| **Title of the Course and Course Code** | **Elements of Material Science (PHY 356)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Describe types of materials, their properties and identify types of defects. | 1 |
| CO2 | Explain functional properties of ceramic bulk materials and different nano materials. | 2 |

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| CO3 | Apply knowledge of mathematics and advanced science and engineering principles to materials systems. | 3 |
| CO4 | Explain applications of Polymers for research and industrial applications; determine concentration, purity of material and molecular weight. | 4 |
| CO5 | Select materials for design and construction. Test materials using different characterization methods with the fundamental principles underlying and connecting the structure and properties. | 5 |
| CO6 | Design and construct different Phase Diagrams under different combinations and thermodynamic states. | 6 |
| | | |
| **Title of the Course and Course Code** | **Physics Practical Paper –I (PHY357)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Describe different experimental techniques to determine values of various constants, coefficients, parameters. | 1 |
| CO2 | Arrange the apparatus as per the requirements of the aims and objectives of the experiment. | 2 |
| CO3 | Demonstrate the procedure to perform the experiments and the skills required for the particular experiment. | 3 |
| CO4 | Explain the theory behind the formulae used and Validate the hypotheses. | 4 |
| CO5 | Standardize the entire procedure to obtain reliable, repeatable results. | 5 |
| CO6 | Perform the experiment, tabulate the data, identify the sources of errors, and show how to minimize the errors. | 6 |
| | | |
| **Title of the Course and Course Code** | **Physics Practical Paper–II-(PHY358)** | **Number of Credits:03** |

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| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
|---|---|---|
| CO1 | Describe different experimental techniques to determine values of various constants, coefficients, parameters. | 1 |
| CO2 | Arrange the apparatus as per the requirements of the aims and objectives of the experiment. | 2 |
| CO3 | Demonstrate the procedure to perform the experiments and the skills required for the particular experiment | 3 |
| CO4 | Explain the theory behind the formulae used and Validate the hypotheses. | 4 |
| CO5 | Standardize the entire procedure to obtain reliable, repeatable results. | 4, 5 |
| CO6 | Perform the experiment, tabulate the data, identify the sources of errors, and show how to minimize the errors. | 6 |
| | | |
| **Title of the Course and Course Code** | **Project I- (PHY 359)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Develop the ability to formulate research questions, design experiments or studies, and conduct thorough investigations in a specific area of physics. | 1 |
| CO2 | Apply critical thinking skills to analyze and interpret experimental or theoretical data, identify patterns, and propose solutions to complex physics problems. | 2 |
| CO3 | Acquire hands-on experience with experimental setups, data collection methods, and laboratory equipment relevant to the chosen project topic. | 3 |
| CO4 | Learn techniques for processing, analyzing, and interpreting data, including statistical methods and visualization tools. | 4 |
| CO5 | Develop effective communication skills through the creation of project reports, presentations, and potentially scientific posters or papers. | 5 |

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| CO6 | Showcase creativity and innovation by proposing novel approaches or solutions to physics-related challenges. | 6 |

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| **Title of the Course and Course Code** | **Introduction to Arduino - (PHY 3510J)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Students will be able to understand and use various Arduino Boards, and its various components, Input / Output Pins, Input / Output Devices. | 1 |
| CO2 | Understand general concepts of Programming Arduino Boards. | 2 |
| CO3 | Apply the knowledge gain to design applications using Arduino in different domains. | 3 |
| CO4 | To analyze and evaluate the performance of various Arduino based devices | 4 |
| CO5 | Learn and understand about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types. | 5 |
| CO6 | To create automotive ideas and project based on internet of things. | 6 |

| | | |
|---|---|---|
| **Title of the Course and Course Code** | **Physics Workshop skills (PHY 3511L)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Develop proficiency in using common laboratory equipment and tools used in physics experiments, including measurement devices, oscilloscopes, power supplies, and data acquisition systems. | 1 |

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| CO2 | Gain the ability to set up and calibrate experimental apparatus for various physics experiments, demonstrating an understanding of experimental design and instrument operation. | 2 |
| CO3 | Acquire skills in collecting accurate data during experiments, followed by proper data analysis using appropriate statistical methods and software tools. | 3 |
| CO4 | Develop effective scientific communication skills by preparing clear and concise laboratory reports, including proper formatting, data presentation, and analysis. | 4 |
| CO5 | Apply creative thinking to design experiments, propose modifications to existing setups, and suggest novel approaches to address scientific questions. | 5 |
| CO6 | Create organized and detailed experimental documentation, which may include photographs, diagrams, and notes, for future reference and presentation. | 6 |

## T.Y.B.Sc. Semester VI

| **Title of the Course and Course Code** | **Solid State Physics (PHY361)** | **Number of Credits:02** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | List seven crystal systems. | 1 |
| CO2 | Explain free electron theory and band theory. | 2 |
| CO3 | Calculate lattice parameter from given XRD pattern. | 3 |

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| CO4 | Identify the structure of materials. | 4 |
| CO5 | Evaluate the density of the state equation in 3D. | 5 |
| CO6 | Specify the importance of magnetic materials. | 6 |
| | | |
| **Title of the Course and Course Code** | **Quantum Mechanics (PHY362)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Describe and learn theoretical aspects at Quantum Level. | 1 |
| CO2 | Clarify more about the insight of the microscopic world. | 2 |
| CO3 | Apply Schrodinger's equation for different cases of potential (V). | 3 |
| CO4 | Explain the concept of operators and apply it in Quantum mechanics. | 4 |
| CO5 | Review Hydrogen atom model and quantum numbers n, l, $m_l$, $m_s$and degeneracy etc. | 5 |
| CO6 | Write Schrodinger's equation in a Spherically symmetric polar coordinate system. | 6 |
| | | |
| **Title of the Course and Course Code** | **Thermodynamics and Statistical physics (PHY3603)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define thermodynamic quantities and functions. | 1 |

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|---|---|---|
| CO2 | Estimate the probabilities in statistical processes. | 2 |
| CO3 | Apply the knowledge of Entropy and density of states to understand the concept of temperature. | 3 |

| | | |
|---|---|---|
| CO4 | Explain the quantum statistics and differentiate between classical and quantum statistics. | 4 |
| CO5 | Compare the MB, BE and FD statistics and classify particles according to them. | 5 |
| CO6 | Design statistical tools to study thermodynamic interactions in ensembles. | 6 |
| | | |
| **Title of the Course and Course Code** | **Nuclear Physics(PHY364)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Define and describe basic properties of the nucleus. | 1 |
| CO2 | Explaintheconceptofradioactivity.Classifydifferentradiationdetectors and nuclear models. | 2 |
| CO3 | Solve problems related to nuclear and particle physics. | 3 |
| CO4 | Explain nuclear reaction dynamics, nuclear reactors and accelerators. | 4 |
| CO5 | Compare nuclear energy with other energy sources. | 5 |
| CO6 | Specify applications of accelerators and detectors. Compile knowledge of elementary particles to understand nuclear phenomena. | 6 |
| | | |
| **Title of the Course and Course Code** | **Electronics -II(PHY365)** | **Number of Credits:02** |

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| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
|---|---|---|
| CO1 | Apply advanced techniques, such as network theorems (Thevenin's and Norton's), Laplace transforms, and frequency domain analysis, to analyze and solve complex electronic circuits. | 1 |
| CO2 | Understand the principles of operation, characteristics, and applications of semiconductor devices, including diodes, bipolar junction transistors (BJTs), and field-effect transistors (FETs). | 2 |
| CO3 | Analyze the design and operation of amplifier circuits, including single-stage and multistage configurations, and comprehend concepts like gain, bandwidth, and input/output impedance. | 3 |
| CO4 | xplore the fundamentals of electronic measurement and instrumentation, including measurement accuracy, sensors, and interfacing techniques. | 4 |
| CO5 | Apply the knowledge gained throughout the course to design, build, and analyze electronic circuits or systems, demonstrating practical application of electronic principles. | 5 |
| CO6 | Design and analyze basic digital logic circuits, including combinational and sequential circuits, using appropriate design tools. | 6 |

| **Title of the Course and Course Code** | **Lasers-(PHY366)** | **Number of Credits:02** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Describe the requirements for a system to act as a laser. | 1 |
| CO2 | Explain concept of Laser fundamentals, pumping mechanism pumping schemes. | 2 |
| CO3 | Demonstrate potential applications of Lasers. | 3 |

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| CO4 | Differentiate the various types of Lasers and their means of excitation. | 4 |
| CO5 | Compare three level and four level Laser systems. | 5 |
| CO6 | Design and develop different laser systems. | 6 |
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| **Title of the Course and Course Code** | **Physics Practical Paper –I (PHY367)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Describe different experimental techniques to determine values of various constants, coefficients, parameters. | 1 |
| CO2 | Arrange the apparatus as per the requirements of the aims and objectives of the experiment. | 2 |
| CO3 | Demonstrate the procedure to perform the experiments and the skills required for the particular experiment. | 3 |
| CO4 | Explain the theory behind the formulae used and validate the hypotheses. | 4 |
| CO5 | Standardize the entire procedure to obtain reliable, repeatable results. | 5 |
| CO6 | Perform the experiment, tabulate the data, identify the sources of errors, and show how to minimize the errors. | 6 |
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| **Title of the Course and** | **Physics Practical Paper –II (PHY 368)** | **Number of Credits:02** |

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| **Course Code** | | |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |

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| CO1 | Describe different experimental techniques to determine values of various constants, coefficients, parameters. | 1 |
| CO2 | Arrange the apparatus as per the requirements of the aims and objectives of the experiment. | 2 |
| CO3 | Demonstrate the procedure to perform the experiments and the skills required for the particular experiment. | 3 |
| CO4 | Explain the theory behind the formulae used and validate the hypotheses. | 4 |
| CO5 | Standardize the entire procedure to obtain reliable, repeatable results. | 5 |
| CO6 | Perform the experiment, tabulate the data, identify the sources of errors, and show how to minimize the errors. | 6 |
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| **Title of the Course and Course Code** | **Project II (PHY 369)** | **Number of Credits:02** |
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Develop the ability to formulate research questions, design experiments or studies, and conduct thorough investigations in a specific area of physics. | 1 |
| CO2 | Apply critical thinking skills to analyze and interpret experimental or theoretical data, identify patterns, and propose solutions to complex physics problems. | 2 |
| CO3 | Acquire hands-on experience with experimental setups, data collection methods, and laboratory equipment relevant to the chosen project topic. | 3 |
| CO4 | Learn techniques for processing, analyzing, and interpreting data, including statistical methods and visualization tools. | 4 |
| CO5 | Develop effective communication skills through the creation of project reports, presentations, and potentially scientific posters or papers. | 5 |
| CO6 | Showcase creativity and innovation by proposing novel approaches or solutions to physics-related challenges. | 6 |
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| **Title of the Course and Course Code** | **Applications of Internet of things (IOT) PHY-3610(Y)** | **Number of Credits:02** |
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| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Students should have a solid understanding of the basic concepts, principles, and components of the Internet of Things, including sensors, actuators, communication protocols, data analytics, and cloud computing. | 1 |
| CO2 | Students should be familiar with various sensor types used in IoT applications, their working principles, and their applications in different fields. They should be able to select appropriate sensors for specific IoT scenarios. | 2 |
| CO3 | Students should be able to design and implement systems for data acquisition from sensors, signal processing, and noise reduction. They should understand methods for handling raw sensor data and preparing it for analysis. | 3 |
| CO4 | Students should be able to perform basic data analysis on IoT-generated data and visualize the results using appropriate tools and techniques. | 4 |
| CO5 | Students should understand the ethical and social implications of IoT, including privacy concerns, data security, and potential societal impacts. | 5 |
| CO6 | Students should have the skills to develop simple IoT applications, including setting up IoT devices, writing code to interface with sensors and actuators, and creating basic IoT applications. | 6 |

| **Title of the Course and Course Code** | **Microcontroller PHY-3611 SEC (AA)** | **Number of Credits:02** |
|---|---|---|
| **On completion of the course, the students will be able to:** | | **Bloom's Cognitive level** |
| CO1 | Students should gain a solid understanding of what microcontrollers are, how they function, and their applications in various electronic systems. | 1 |

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| CO2 | Students should be proficient in programming microcontrollers using a suitable programming language (such as C or assembly language). They should be able to write, debug, and modify code to control microcontroller peripherals and perform tasks. | 2 |
| CO3 | Understanding the concept of real-time systems and how microcontrollers are used in real-time applications. | 3 |
| CO4 | Students should be able to apply their knowledge to design and implement microcontroller-based projects. This could involve integrating multiple components and sensors, programming logic, and creating a functional prototype. | 4 |
| CO5 | Students should develop skills to troubleshoot and debug microcontroller-based systems. | 5 |
| CO6 | Students should learn how to design and develop embedded systems using microcontrollers. This includes interfacing various sensors, actuators, and communication modules with microcontrollers. | 6 |

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