



Sanjivani Rural Education Society's
SANJIVANI ARTS, COMMERCE AND SCIENCE COLLEGE

At: Sahajanandnagar, Post: Shingnapur, Tal: Kopargaon,
Dist: Ahmednagar (M.S.) Pin:423603

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F.Y.B.Sc. Semester I		
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
Physics principle & its Applications (PHY112)		
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
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Title of the Course and Course Code	Physics Practical –I(PHY113)	Number of Credits:02
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On completion of the course, the students will be able to:		Bloom's Cognitive level
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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		
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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. 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		
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. 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. 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
Classical Electrodynamics (PHY 352)		
Title of the Course and Course Code		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
Classical Mechanics (PHY353)		
Title of the Course and Course Code		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
Elements of Material Science (PHY 356)		
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
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On completion of the course, the students will be able to:		Bloom's Cognitive level
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CO1	Students will be able to understand and use various Arduino Boards, and its various components, Input / Output Pins, Input / Output Devices.	1
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CO2	Understand general concepts of Programming Arduino Boards.	2
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CO3	Apply the knowledge gain to design applications using Arduino in different domains.	3
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CO4	To analyze and evaluate the performance of various Arduino based devices	4
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CO5	Learn and understand about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types.	5
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CO6	To create automotive ideas and project based on internet of things.	6
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Title of the Course and Course Code	Physics Workshop skills (PHY 3511L)	Number of Credits:02
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On completion of the course, the students will be able to:		Bloom's Cognitive level
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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
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On completion of the course, the students will be able to:	Bloom's Cognitive level
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CO1	Define and describe basic properties of the nucleus.	1
CO2	Explain the concept of radioactivity. Classify different radiation detectors 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	Explore 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

Lasers-(PHY366)		
Title of the Course and Course Code		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

Title of the Course and Course Code	Physics Practical Paper –I (PHY367)	Number of Credits:02
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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

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
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
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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