Dr.D.Y.Patil College of Computer and Business Studies Shahunagar Pune

Department of Physics

After successful completion of three year degree program in physics a student should be able to;

Course outcomes

Class	Course Name and Course code	Course Outcome
F.Y.B.Sc. SEM-I	**Mechanics and Properties of Matter PHY-111**	**CO1.** Demonstrate an understanding of Newton's laws and applying them in Calculations of the motion of simple systems. **CO2.** Understand the concepts of energy, work, power, the concepts of conservation of energy elasticity and be able to perform calculations using them. **CO3.** Understand the Concept of Viscosity ,Viscous Force, Equation of Continuity, Bernoulli's Principle. **CO4.** Understand the Concept of Surface Tension. **CO5.** To Learn the Properties of Matter like Stress and Strain. **CO6.** Demonstrate quantitative problem solving skills in all the topics covered.
F.Y.B.Sc. SEM-I	**Physics Principles and Applications PHY-112**	**CO1.** Understand the general structure of atom. **CO2.** Understand the atomic excitation and LASER principles. **CO3.** Understand the bonding mechanism and its different types. **CO4.** Demonstrate an understanding of electromagnetic waves and its spectrum. **CO5.** Demonstrate quantitative problem solving skills in all the topics covered. **CO6.** Understand the Propertise of Laser like Divergence.

F.Y.B.Sc. SEM-I	**Physics Practical PHY-113**	**CO1**. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. **CO2**. understand the Different types of Measuring Instruments Like Vernier calliper and Micrometer Screw gauge. **CO3**. understanding of Physical Properties of Material Like Modulus of Rigidity and youngs Modulus. **CO4**. To Understand the Propertise of Laser like Divergence. CO5. To Study motion of spring and calculate spring constant and value of g CO6. Demonstrate an ability to collect data through observation,
F.Y.B.Sc SEM-II	**Heat and Thermodynamics PHY 121**	CO1. Restate defination of system, surrounding, closed and open system, extensive and intensive properties. CO2. To understand the Fundamentals of thermodynamics. CO3. To Learn the Heat transfer Mechanism and to understand the different types Heat engine. CO4. To understand the concept of heat and temperature to Study the Principle of thermometry. CO5. Demonstrate quantitative problem solving skills in all the topics covered. CO6. Solve problems using the properties and relationships of thermodynamic fluids.
F.Y.B.Sc SEM-II	**Electricity and MagnetismCourse Code -** **PHY 122**	CO1. To understand the concept of the electric force, electric field and electric potential for stationary charges. CO2. Able to calculate electrostatic field and potential of charge distributions using Coulomb law and Gauss's law. CO3. To understand the dielectric phenomenon and effect of electric field on dielectric. CO4. To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws. CO4. To study magnetic materials and its properties. CO5. Demonstrate quantitative problem solving skills in all the

		topics covered. CO6. Understand the relationship between electric and magnetic field's
F.Y.B.Sc SEM-II	**Physics Practical PHY-123**	**CO1.** Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. **CO2.** To understand P-V Diagram and theorotical Study of Carnots Cycle. **CO3**. To Understand Propertise Like thermal Conductivity, Specific Heat. **CO4**. To Study Charging Discharging of Capacitor and Kirchhoff's Laws. **CO5**. To Study Different Circuit like LR, LCR. CO6. to Study Characteristic of Diode.
S.Y.B.Sc. SEM-III	**Mathematical Methods in Physics PHY-231**	CO1. Understand the complex algebra. CO2. Understand the concept of partial differentiation. CO3. Understand vector algebra useful in mathematics and physics CO4. Understand the role of partial differential equations in physics. CO5. Apply Matrices in the study of electrical circuits, Quantum Mechanics and Optics. CO6. Solve differential equations like Legendre, Bessel and Hermite that are common in physical sciences.
S.Y.B.Sc. SEM-III	**Electronics PHY-232**	CO1. Apply laws of electrical circuits to different circuits. CO2. Understand the relations in electricity CO3. Understand the properties and working of transistors. CO4. Design circuits using transistors and operational amplifiers. CO5. Design and Analyze synchronous and asynchronous sequential circuits. CO6. Acquire knowledge of operational amplifier circuits and their applications.
S.Y.B.Sc.	**Physics Practical**	CO1.

SEM-III	**PHY-233**	Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
		CO2. Investigate the theoretical background of an experiment.
		CO3. Setup experimental equipment to Implement an experimental approach.
		CO4. Analyze the data, plot appropriate graphs and reach conclusions from data analysis.
		CO5. Work in a group to plan, implement and report on a project/experiment.
		CO6. Keep a well-maintained and instructive laboratory logbook.
S.Y.B.Sc. SEM-IV	**Oscillations, Waves and Sound PHY-241**	CO1. Understand the concepts of mechanics, acoustics and the properties of matter
		CO2. Understand the physics and mathematics of Oscillations.
		CO3. Solve the equations of motion for simple harmonic, damped, and forced oscillators.
		CO4. Explain oscillation in terms of energy exchange, giving various examples.
		CO5. Understand the mathematical description of travelling and standing waves.
		CO6. Solve wave equation to easily understand significance of transverse waves.
S.Y.B.Sc. SEM-IV	**Optics PHY-242**	CO1. Acquire the knowledge on various theories of light
		CO2. Describe how light can constructively and destructively interfere
		CO3. Understand optical phenomena such as polarization, birefringence, interference and diffraction in terms of the wave model.
		CO4. Analyze simple examples of interference and diffraction phenomena.
		CO5. Acquire the basic concepts of wave optics.
		CO6. Understand the concept of resolving power of different optical instruments..
S.Y.B.Sc. SEM-IV	**Physics Practical PHY- 243**	CO1. Use various instruments and equipment.

		CO2. Design experiments to test a hypothesis and/or determine the value of an unknown quantity. CO3. Set up experimental equipment to implement an experimental approach. CO4. Analyze data, plot appropriate graphs and reach conclusions from your data analysis. CO5. Study to handle oscilloscope and variety of electrical circuits. CO6. Understand the concepts of amplifier by using real life experience in laboratory.
T.Y.B.Sc. SEM-V	**Mathematical Methods in Physics-II** **PHY-351**	CO1. Convert the transformations of physical quantities in different systems of units. CO2. Understand the concept of differential equations like Legendre, Bessel and Hermite that are common in physical sciences. CO3. Solve the different partial differential equations encountered in physical problems and draw inferences from solutions. CO4. transfer functions in Instrumentation using Laplace transforms. CO5. Apply the knowledge of Tensors to understand phenomenon like stress and strain. CO6. the solving of problems in physics with matrices.
T.Y.B.Sc. SEM-V	**Electrodynamics** **PHY-352**	CO1. Understand the concept of Maxwell's equations. CO2. Acquire the knowledge of Gauge transformations. CO3. Investigate the theory behind Concept of retarded potentials. CO4. Gain significance of electromagnetic radiation from both localized and moving source. CO5. Solve the problems on Covariant formulation of Electrodynamics. CO6. Study the various aspects of wave propagation in plasma.
T.Y.B.Sc. SEM-V	**Classical Mechanics** **PHY-353**	CO1. Have a deep understanding of Newton's law.

		CO2.
		Be able to solve the Lagrangian & Hamiltonians equation.
		CO3.
		Solve advanced problems involving the dynamic motion of classical mechanical system.
		CO4.
		Explore the application of Hamilton's equations in solving the equation of motion of a particle in a central force field, projectile motion of a body.
		CO5.
		To know how to impose constraints on a system in order to simplify the methods to be used in solving physics problems.
		CO6.
		To know the importance of concepts such as generalized coordinates and constrained motion.
T.Y.B.Sc. SEM-V	**Atomic And Molecular Physics. PHY-354**	CO1.
		Understand evolution in structure of atom.
		CO2.
		Be able to make quantitative estimates of phenomena in elementary particle.
		CO3.
		Study and develop the Bohr theory of the hydrogen atom.
		CO4.
		Understand the significance that describe these phenomena of sodium doublet.
		CO5.
		Derive expressions for the energy levels of a rigid and a non rigid rotor.
		CO6.
		Rationalize the role selection rules in vibrational and rotational spectra.
T.Y.B.Sc. SEM-V	**Computational Physics. PHY-355**	CO1.
		Identify modern programming methods.
		CO2.
		Independently program computers using leading-edge tools.
		CO3.
		Writing programs in to solve numerical analysis programme.
		CO4.
		Solve the algebraic and polynomial equations.
		CO5.
		Acquire skills to apply different computational techniques to a different field of physics.
		CO6.
		The student will be able to formulate a strategy to solve a given problem using one or more computational methods.
T.Y.B.Sc.	**Renewable Energy**	CO1.

SEM-V	**Sources PHY-ELECTIVE-I:356(D)**	Describe the challenges and problems associated with the use of various energy sources. CO2. Know the need of renewable energy resources, historical and latest developments. CO3. Compare Solar, Wind and bioenergy systems, Their prospects, Advantages and limitations. CO4. Understand the various forms of conventional energy resources. CO5. Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications. CO6. Analyse the environmental aspects of renewable energy resources.
T.Y.B.Sc. SEM-V	**Python Programming PHY-3510 SEC (H)**	CO1. Use variables to store, retrieve and calculate information. CO2. Utilize core programming tools such as functions and loops. CO3. To write code for complex scientific computational requirement. CO4. Use Libraries like NumPy for numeric computation . CO5. Use Library SciPy for scientific and technological calculations CO6. Develop own functions for Physics or mathematics.
T.Y.B.Sc. SEM-V	**Physics Workshop Skill PHY-3511 SEC (L):**	CO1. After completion of this course students will able to handle and test various electrical instruments. CO-2: To know the concept of study of measurement. CO-3: To gain the knowledge of electrical and electronic skill. CO4: Study of introduction of prime mover(machine). CO5: Study of use bread board for designing the basic gates. CO6. Acquire the knowedge of circuit designs,errors in circuit used for daily purpose.
T.Y.B.Sc. SEM-V	**Physics Laboratory-3A PHY-357**	CO1. Work in a group to plan, implement and report on a experiment. CO2. Investigate the theoretical background to an experiment. CO3.

		Investigate value of 'g' by Kater's pendulum .
		CO4. Determine the Moment of Inertia by Bifilar suspension
		CO5. Determine Resolving Power of grating by using constant deviation spectrometer.
		CO6. Calculation of value of wavelength by Constant deviation spectrometer.
T.Y.B.Sc. SEM-V	**Physics Laboratory-3B PHY-358**	CO1. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena. CO2. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings CO3. Study the difference between Charging and discharging of Capacitor and RC time constant CO4 Calculate the value of factorial of a number by simple and Recursive method by the use of C-Programming. CO5. Understand and formulate Position time data using kinematic equations by the use of C-Programming. CO6. Aquire the knowledge of computational physics to find Roots of polynomial (Newton Raphson) ,Numerical Integration by Trapezoidal rule , Numerical Integration by Simpson's 1/3 rule etc.
T.Y.B.Sc. SEM-V	**Physics Project-I PHY-359**	CO1. Work in a group to plan, implement and report on a project/experiment CO2. Investigate the theoretical background to an project. CO3. Understand research methodology CO4. Understand and formulate a research project CO5 Design and implement a research project . CO6 Identify and enumerate the scope and limitations of a research project.
T.Y.B.Sc. SEM-VI	**Solid State Physics PHY-361**	CO1. Study different types of crystal structures in terms of the crystal lattice and the basis of constituent atoms. CO2. Acquire the knowledge on theory of X-ray diffraction in the reciprocal lattice (k-space) formalism. CO3. Apply the theory of lattice vibrations (phonons) to

		determine thermal properties of solids. CO4. Study the problem of electrons in a periodic potential, examine its consequence on the band-structure of the solids. CO5. Gain knowledge about the experimental techniques for crystal growth from solution and melt. CO6. Be familiar with the basic phenomena in solid state physics.
T.Y.B.Sc. SEM-VI	**Quantum Mechanics PHY-362**	CO1. Understand the effect of symmetries in quantum mechanics. CO2. Be able to solve the Schrödinger equation for simple configuration. CO3. Study and understand the differences between classical and quantum mechanics CO4. Learn operator formalism for observables and basic commutation relations. CO5. Solve Schrödinger equation for simple potentials like linear Harmonic oscillator and Hydrogen atoms. CO6. Understand the space, time and displacement symmetries.
T.Y.B.Sc. SEM-VI	**Thermodynamics & Statistical Physics PHY-363**	CO1. You can master basic statistical methods and concepts like probability, expected value variance. CO2. Has thorough knowledge on different distribution functions. CO3. Can explain the procedures for deriving the relation between thermodynamic parameters such as pressure,temperature, entropy and heat capacity from the distribution functions. CO4. The discussion of thermodynamics of mixtures and multi-phase systems . CO5. Ability to conduct experiments regarding the measurement and calibration of temperatures and pressures in groups. CO6. Ability to apply the first Law of Thermodynamics on closed and control volume systems..
T.Y.B.Sc. SEM-VI	**Nuclear Physics PHY-364**	CO1. Demonstrate knowledge and understanding of

		laws definitions concepts scientific vocabulary, Scientific quantities and there determination. CO2. Understand the fundamental principles and concepts governing classical nuclear physics. CO3. Express the basic concepts of nuclear physics. CO4. Understand the fundamental principles of some quantities characterizing the decay such as half-life, decay constant. CO5. Express nuclear binding energy and nuclear masses. CO6. List the types of beta decays and can express reaction equations and related Q values and energy of beta particles
T.Y.B.Sc. SEM-VI	**Electronics PHY-365**	CO1. Know the special purpose Diode and Transistor Amplifier. CO2. Understand the FET, JFET,MOSFET. CO3. To study the Operational Amplifier and their types. CO4. Know the Timer IC- 555 and its classification. CO5. To study the Regulated Power supply. CO6. Understand the Sequential Logic Circuits
T.Y.B.Sc. SEM-VI	**Physics of Nanomaterials PHY-ELECTIVE-II:366(Q)**	CO1. Explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials at nanoscale. CO2. Choose appropriate synthesis technique to synthesize quantum nanostructures of desired size, shape and surface properties. CO3. Correlate properties of nanostructures with their size, shape and surface characteristics. CO4. Appreciate enhanced sensitivity of nanomaterial based sensors and their novel applications in industry. CO5. Manipulating or arranging matter at the nanoscale to provide better coatings, composites, or additives. CO6. Appreciate enhanced sensitivity of nanomaterial based sensors and their novel applications in industry.
T.Y.B.Sc. SEM-VI	**Scientific Data Analysis using Python PHY-3610 SEC (W)**	CO1. Know basic notions and definitions in data analysis. CO2. Know standard methods of data analysis and information retrieval. CO3. Be able to formulate the problem of knowledge extraction as combinations of data filtration, analysis and

		exploration methods. CO4. Be able to translate a real-world problem into mathematical terms. CO5. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. CO6. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
T.Y.B.Sc. SEM-VI	**Photography PHY-3611 SEC (AD)**	CO1. Understand the basic principle, structure and handling techniques in digital photography. CO2. Including digital editing, saving, sizing, and posting of the images Student gets proficient at the technical aspect of photographing with a digital camera. CO3. Students can identify and apply appropriate business practices specific to the self-employed CO4. Students will be able to develop and apply photographic skills using digital photography tools. CO5. Students will be able to clearly communicate the content and context of their work visually, orally and in writing. CO6. Students will have sufficient mastery of one or more media to complete the technical and formal challenges pertinent to a body of original work.
T.Y.B.Sc. SEM-VI	**Physics Laboratory-4A PHY-367**	CO1. Set up experimental equipment to implement an experimental approach. CO2. Demonstrate a deeper understanding of e/m by Thomson method CO3. Learn the concept of Viscosity of Liquid by rotating cylinder method. CO4. Try to understand the theory behind Hall Effect and measure the Hall coefficient 6. Energy gap of a semiconductor CO5. Study of XRD spectrum of any material . CO6. Verify Stefan's fourth power law by bulb filament .
T.Y.B.Sc. SEM-VI	**Physics Laboratory-4B**	CO1. Demonstrate an understanding of laboratory procedures

	PHY-368	including safety, and scientific methods. CO2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data Characteristics of JFET. CO3. Design and built astable multivibrator using IC 555/IC 741. CO4. Demonstrate and understand instrumental amplifier using three op-amps. CO5. Study concept of diffraction using a transmission/reflection grating (metal ruler) CO6. Study the characteristics of a laser beam and Determination of the diameter of a thin wire using a laser beam.
T.Y.B.Sc. SEM-VI	**Physics Project-II PHY-369**	CO1. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings. CO2. Acquire technical and manipulative skills in using laboratory equipment, tools CO3. Understand the concept of measurement in research. CO4. Understand the significance and limitations of experimentation in research. CO5. Understand and formulate a research project, ethics and responsibility of scientific research. CO6. Study the different characterization techniques that are applied to material confirmation.