

PROGRAM SPECIFIC OUTCOMES (PSOS)

B.Sc. II (Physics Major and Minor)

Shivaji University, Kolhapur

After successfully completing the B.Sc. II Physics program, the students will be able to:

PSO1: Conceptual Understanding of Thermal and Optical Physics

Apply fundamental concepts of thermodynamics, heat transfer, wave optics, and laser physics to interpret and analyze natural phenomena and practical devices such as heat engines, diffraction gratings, optical fibers, and polarimeter.

PSO2: Proficiency in Experimental and Laboratory Techniques

Develop experimental skills by conducting practical's related to thermal conductivity, interference and diffraction of light, spectrometry, and laser-based measurements, thereby gaining hands-on experience with modern physics instruments.

PSO3: Application of Physics in Modern Technologies

Understand and apply the principles of semiconductor devices, transistor amplifiers, digital electronics, and Python programming, enabling them to solve real-world electronics problems and perform basic coding operations in scientific computing.

PSO4: Exploration of Advanced and Applied Physics Domains

Demonstrate knowledge of modern physics, atomic models, astronomy, and astrophysics, and relate them to practical applications such as X-ray generation, photoelectric effect, solar observation, and galactic structures.

PSO5: Community and Career Readiness

Utilize physics knowledge and vocational training in physics laboratory techniques, skill development, energy auditing, environmental monitoring, and digital literacy to contribute meaningfully to society and prepare for careers in education, research, or industry

❖ COURSE OUTCOMES

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Sr.No.	Course Name	Course Outcomes
1.	Major V: Thermal Physics	1. Student understands basic laws of thermodynamics. Student is able to describe the laws of thermodynamics from both microscopic and macroscopic point of view. Student can also apply these laws to understand real physical systems. 2. Students know the concept of heat engine and refrigerator. Students are able to compute efficiency of Carnot heat engine and coefficient of performance of refrigerator. 3. Students understand theory of transport phenomena. Students are able to derive expressions related to transport of momentum, transport of thermal energy and transport of mass. 4. Students understand the concept of fourth thermodynamic variable that is entropy. Students learn use of entropy to define third law of thermodynamics.
2.	Major VI: Waves and Optics	1. Understand the Fundamentals of Diffraction, Interference & Polarization & to apply the Principles of Polarization and analyse Interference Patterns. 2. Correlate Resolving Power with Wave Optics. 3. Recognize Advanced Applications and Future Trends in LASERS. 4. Recognize the Role of Fiber Optics in Emerging Technologies.
3.	PHYSICS Practical – III(Major): Thermal	1. Measure thermal conductivity, specific heat, and radiation constants accurately.

	Physics and Waves & Optics	2. Verify laws of thermodynamics and thermoelectric effects using thermocouples. 3. Analyze temperature variations and thermal emf behavior. 4. Demonstrate wave superposition, interference, and diffraction patterns. 5. Determine optical constants like wavelength and refractive index using spectrometers, gratings, or Newton's rings. 6. Handle optical components with correct alignment and error minimization.
4.	SEC Practical -I: Physics Laboratory Techniques I	1. Handle and operate various instruments in Physics laboratory. 2. Perform experiments in General Physics and Optics. 3. Develop practical skill, instruments handling skills, observational skills and problem-solving skills. 4. Record experimental observations scientifically.
5.	PHYSICS Minor V: Thermodynamics	1. Understand Real gases and validity of the laws of thermodynamics. 2. Visualize Merits and demerits of thermometers. 3. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process. 4. Understand concept of entropy.
6.	PHYSICS Minor VI: Applications of Physics	1. Understand concepts of geometrical optics. 2. Understand the production of Laser Light and its diverse significant applications. 3. Know X-rays as diagnostic tools and nuclear phenomena in cure of dreadful disease.

		4. Know how to address or overcome the challenges of climate change.
7.	PHYSICS Minor Practical III: Thermodynamics & Applications of Physics	1. Measure thermal properties like the coefficient of thermal conductivity and Stefan's constant. 2. Calibrate and use temperature sensors and thermocouples accurately. 3. Analyze phase changes, heat transfer, and mechanical equivalent of heat. 4. Apply laws of thermodynamics to interpret experimental data. 5. Estimate experimental errors and graph thermal variables. 6. Link macroscopic heat observations with microscopic behaviours.
8.	Vocational Skill Course –I (Practical): Skills in Physics	1. Handle and operate various instruments in Physics laboratory. 2. Develop practical skill, instruments handling skills, observational skills.
9.	Major VII: Modern Physics	1. Understand the basic ideas of special theory of relativity like space and time are relative depending on the observer's motion. Fundamentally changing our perception of space and time depending on the reference frame. 2. Develop critical understanding of dual nature of radiation by comprehending the significant phenomena that turned to be the milestones in the development of modern physics. 3. Explain the significance of matter waves that led to the invention of electron microscopy and also to quantify the uncertainty in the probabilistic measurements.

		4. Understand the refinements in conventional atomic models that led to the modern vector atomic model. In future to develop an insight into atomic spectra exhibited by different elements.
10.	Major VIII: Analog & Digital Electronics	1. Student will be able to discuss the construction and working of CRO and various applications of CRO and illustrate it with suitable examples. 2. Student will be able to discuss single stage common emitter amplifier with ac and dc load line. 3. Student will be able to design different types of oscillator circuits of desired frequency. 4. Student will be able to list basic logic gates and derived logic gate. 5. Student will be able to understand basics of Python programming language.
11.	B.Sc. Part-II Semester IV PHYSICS Practical -IV (Major) Modern Physics and Analog & Digital Electronics	1. Able to perform experiments in Modern Physics and Electronics. 2. Develop practical skill, instruments handling skills, observational skills and problem-solving skills. 3. Able to solve problems in Python programming language.
12	OE Practical -IV: Physics of Everyday Life	1. Understand and Apply Basic Physical Concepts: Students will be able to understand and apply fundamental physics concepts. 2. Conduct Simple Experiments: Students will be able to conduct basic experiments to measure physical quantities, observe phenomena, and collect data.

		3. Appreciate the Relevance of Physics: Students will be able to appreciate the relevance of physics in their daily lives and its applications in various fields. 4. Develop Critical Thinking Skills: Students will be able to critically analyse and evaluate information related to physics and its applications. 5. Foster Interest in Science: Students will be able to develop an interest in science and its applications in the real world.
13.	SEC Practical -II: Physics Laboratory Techniques II	1. Handle and operate various instruments in Physics laboratory. 2. Perform experiments in Electronics. 3. Record experimental observations scientifically. 4. Solve problems in Python programming language.
14.	PHYSICS Minor VII: Semiconductor Physics	1. Explain the fundamental properties of semiconductors, distinguish between intrinsic and extrinsic semiconductors, and describe the behaviour of majority and minority carriers in a p-n junction. 2. Analyse the properties of a p-n junction under forward and reverse bias and interpret the V-I characteristics of the junction. 3. Demonstrate the ability to design and analyse rectifier circuits (half-wave, full-wave, and bridge), calculate ripple factors, and understand the role of filter circuits in reducing ripples. They will also evaluate the operation of a Zener diode as a voltage stabilizer. 4. Students will understand the working principles of NPN and PNP transistors, explain the transistor configurations (CE, CB) and evaluate the

		characteristics of transistors in these configurations.
15	PHYSICS Minor VIII: Astronomy & Astrophysics	1. Understand the fundamentals laws and theories of Astronomy. 2. Discuss the star evolution and related basic concepts. 3. Compare the characteristics of the Galaxy 4. Explain various activities of the Sun