



Rayat Shikshan Sanstha's

# Radhabai Kale Mahila Mahavidyalaya, Ahmednagar

An ISO 9001:2015 Certified College

Affiliated to Savitribai Phule Pune University, Pune (PU/AN/ASC/034)

## Department of Physics

### Programme Outcomes

Programme Outcomes (B.Sc. in Physics)	
PO 1	<p><b>Role of Physics :</b></p> <p>The students will develop awareness and appreciation for the significant role played by physics in current societal and global issues. They will be able to address and contribute to such issues through the skills and knowledge acquired during the programme. They will be able identify/mobilize appropriate resources required for a project, and managing a project through to completion, while observing responsible and ethical scientific conduct, safety and laboratory hygiene regulations and practices.</p>
PO 2	<p><b>b) Research skills :</b></p> <p>The course provides an opportunity to students to hone their research and innovation skills through outreach / dissertation / Entrepreneurship / Academic-Project. It will enable the students to demonstrate mature skills in literature survey, information management skills, data analysis and research ethics.</p>
PO 3	<p><b>c) Hands-on/ Laboratory Skills :</b></p> <p>Comprehensive hands-on/ laboratory exercises will impart analytical, computational and instrumentation skills. The students will be able to demonstrate mature skills for the collation, evaluation, analysis and presentation of information, ideas, concepts as well as quantitative and/or qualitative data.</p>
PO 4	<p><b>d) In-depth disciplinary knowledge :</b></p>



	<p>The student will acquire comprehensive knowledge and understanding of the fundamental concepts, theoretical principles and processes in the main and allied branches of physics. The core papers will provide in-depth understanding of the subject. A wide choice of elective courses offered to the student will provide specialized understanding rooted in the core and interdisciplinary areas.</p>
PO 5	<p><b>e) Communication and IT Skills :</b></p> <p>Various DSCs, DSEs, SECs, GEs and AECs have been designed to enhance student's ability to write methodical, logical and precise reports. The courses will, in addition, guide the student to communicate effectively through oral/poster presentations, writing laboratory/ project reports and dissertations. Several IT based papers in DSCs, DSEs, SECs and AECs will enable students to develop expertise in general and subject specific computational skills.</p>
PO 6	<p><b>f) Critical and Lateral Thinking :</b></p> <p>The programme will develop the ability to apply the underlying concepts and principles of physics and allied fields beyond the classrooms to real life applications, innovation and creativity. A student will be able to distinguish between relevant and irrelevant facts and information, discriminate between objective and biased information, apply logic to arrive at definitive conclusions, find out if conclusions are based upon sufficient evidence, derive correct quantitative results, make rational evaluations, and arrive at qualitative judgments according to established rules.</p>



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### Department of Physics Programme Specific Outcomes

<b>Programme Specific Outcomes (B.Sc. in Physics)</b>	
<b>PSO 1</b>	Knowledge and skills to undertake higher studies/research in physics and related interdisciplinary areas thereby enabling students' employment/entrepreneurship.
<b>PSO 2</b>	Critical and analytical thinking, scientific reasoning, problem-solving skills, communication skills and teamwork.
<b>PSO 3</b>	Competence and skill in solving both theoretical and applied physics problems.
<b>PSO 4</b>	In-depth knowledge in physics through understanding of key physical concepts, principles, theories and their manifestations.
<b>PSO 5</b>	Exposure to the latest advances in physics, allied disciplines and research.
<b>PSO 6</b>	A conducive learning environment to ensure cognitive development of students.
<b>PSO 7</b>	Sufficient subject matter competence and enable students to prepare for various competitive examinations such as UGC-CSIR NET/JRF, GATE, GRE, IIT-JAM, and Civil Services Examinations.
<b>PSO 8</b>	Moral and ethical awareness, leadership qualities, innovation and life-long learning.



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### Course Outcomes

Sr. No	Class with Semester	Name of the Course	Course Code	Course Outcomes
<b>First Year B.Sc. (Physics)</b>				
1	F.Y. B. Sc Sem.- I	Fundamentals of Physics-I	PHY-101-T	<p><b>CO1:</b> Articulate and apply the principle of conservation of mechanical energy to solve real life problems. Show the relation between force and energy using potential-energy curves.</p> <p><b>CO2:</b> Understood the concept of center of mass and find out center of mass of systems of individual particles and of continuous distributions of matter. Apply principle of momentum conservation to systems of particles. Apply the appropriate conservation laws to analyze real world problems.</p> <p><b>CO3:</b> Calculate the rotational inertias of objects with sufficient symmetry by summing or integrating. Solve problems that involve both linear and rotational motion. Calculate rotational kinetic energy, and explain its relation to torque and work.</p> <p><b>CO4:</b> Understand relation between pressure and force; calculate pressure as a function of depth in liquids. Determine quantitatively the position of floating objects and the apparent weight of submerged objects. Use the</p>



			continuity equation and Bernoulli's equation to solve problems involving fluid dynamics.
			<b>CO5 :</b> Understand basic principles in Physics.
	<b>General Physics Lab-I</b>	<b>PHY-102-P</b>	<b>CO1:</b> The practical knowledge of mechanics doing experiments.
			<b>CO2:</b> They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.
	<b>Physics of Daily Life</b>	<b>OE-101-PHY</b>	<b>CO1:</b> Every student will be able to study physics on a deeper level and to uses basic physics concepts to navigate everyday life.
			<b>CO2:</b> Every student will be able to build essential scientific knowledge and skills for life-long learning.
	<b>Experimental Skills in Physics</b>	<b>SEC-101-PHY</b>	<b>CO1:</b> Understand the working principles of various measuring instruments.
			<b>CO2:</b> Acquire the scientific information of various physical and electrical instruments used in physics practical.
			<b>CO3:</b> Identify the errors in instrument and study their analysis.
			<b>CO1:</b> Understand the basic concepts and Laws of Thermodynamics.
			<b>CO2:</b> Identify the different states of system and their dependence on various thermodynamic



<b>F.Y. B.Sc Sem.- II</b>	<b>Fundamentals of Physics-II</b>	<b>PHY- 151-T</b>	variables.
			<b>CO3:</b> Understand different thermodynamic processes and their applications.
			<b>CO4:</b> Understand different heat engines and their working principles.
			<b>CO5:</b> Learn the heat radiation mechanism and relate this course to the daily chores through some applications.
			<b>CO6:</b> Understand concept of electricity and magnetism.
	<b>General Physics Lab-II</b>	<b>PHY- 152-P</b>	<b>CO1:</b> The practical knowledge of Thermodynamics
			<b>CO2:</b> Electricity and magnetism doing experiments: Engine, electric vibrations. They would also learn electric phenomena such as diode, CRO and do experiments related to electric devices.
	<b>LED Light Repairing and Maintenance</b>	<b>OE-151- PHY</b>	<b>CO1:</b> Understand basics of LED & semiconductor.
			<b>CO2:</b> Apply the knowledge for the repair of LEDs
			<b>CO3:</b> Identify the importance of reduction electronic waste management and Intellectual Property Rights (IPR)
	<b>Basic Lab Electric Devices and Circuits</b>	<b>SEC-154- PHY</b>	<b>CO1:</b> To expose the students to the basic concepts of electric elements and their functions.
			<b>CO2:</b> To provide adequate knowledge about the



				Industrial applications of electric instruments	
				<b>CO3:</b> To provide adequate knowledge about its applications	
				<b>CO4:</b> Students can study Electrical Engineering.	
				<b>CO5:</b> Students can understand about devices and systems that use electricity and electromagnetism.	
<b>Second Year B.Sc. (Physics)</b>					
2	S.Y.B.Sc. SEM-I	Mathematical Methods in Physics	PHY-231	<b>CO1:</b> Understand the complex algebra.	
				<b>CO2:</b> Understand the concept of partial differentiation.	
				<b>CO3:</b> Understand vector algebra useful in mathematics and physics	
				<b>CO4:</b> Understand the role of partial differential equations in physics.	
		Electronics		PHY-232	<b>CO1:</b> Apply laws of electrical circuits to different circuits.
					<b>CO2:</b> Understand the relations in electricity
	<b>CO3:</b> Understand the properties and working of transistors				
	<b>CO4:</b> Design circuits using transistors and operational amplifiers				
	Physics Practical	PHY-233	<b>CO1:</b>		



				Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
				<b>CO2:</b> Investigate the theoretical background of an experiment.
				<b>CO3:</b> Setup experimental equipment to Implement an experimental approach.
				<b>CO4:</b> Analyze the data, plot appropriate graphs and reach conclusions from data analysis
				<b>CO5:</b> Work in a group to plan, implement and report on a project/experiment.
				<b>CO6.</b> Keep a well-maintained and instructive laboratory logbook.
<b>S.Y.B.Sc. SEM-II</b>	<b>Oscillations, Waves and Sound</b>	<b>PHY-241</b>	<b>CO1.</b> Understand the physics and mathematics of Oscillations.	
			<b>CO2.</b> Solve the equations of motion for simple harmonic, damped, and forced oscillators.	
			<b>CO3.</b> Explain oscillation in terms of energy exchange, giving various examples.	
			<b>CO4.</b> Understand the mathematical description of travelling and standing waves.	
	<b>Optics</b>	<b>PHY-242</b>	<b>CO1.</b> Acquire the basic concepts of wave optics	
			<b>CO2.</b> Describe how light can constructively and destructively interfere	





				<p><b>CO3.</b> Understand optical phenomena such as polarization, birefringence, interference and diffraction in terms of the wave model</p>
				<p><b>CO4.</b> Analyze simple examples of interference and diffraction phenomena.</p>
		<b>Physics Practical</b>	<b>PHY- 243</b>	<p><b>CO1.</b> Use various instruments and equipment.</p>
				<p><b>CO2.</b> Design experiments to test a hypothesis and/or determine the value of an unknown quantity</p>
				<p><b>CO3.</b> Set up experimental equipment to implement an experimental approach</p>
				<p><b>CO4.</b> Analyze data, plot appropriate graphs and reach conclusions from your data analysis</p>
<b>Third Year B.Sc. (Physics)</b>				
3.	<b>T.Y.B.Sc. SEM-I</b>	<b>Mathematical Methods in Physics</b>	<b>PHY-351</b>	<p><b>CO1.</b> The student should be able to solve problems within these topics and describe their significance in modern physics</p>
				<p><b>CO2.</b> Be familiar with the main mathematical methods in physics</p>
		<b>Electrodynamics</b>	<b>PHY-352</b>	<p><b>CO1.</b> Be familiar with the basic phenomena in solid state physics.</p>
				<p><b>CO2.</b> Understand the models that describe these phenomena</p>
				<p><b>CO3.</b> Be able to make quantitative estimates for phenomena in solid state physics.</p>



			<p><b>CO4.</b> Understanding of the theoretical foundations of electro-magnetic phenomena.</p> <p><b>CO5.</b> Be able to solve the Maxwell equations for simple configuration</p>
		<b>Classical Mechanics</b>	<p><b>PHY-353</b></p> <p><b>CO1.</b> Have a deep understanding of Newton's law.</p> <p><b>CO2.</b> Be able to solve the Lagrangian &amp; Hamiltonians equation</p>
		<b>Atomic And Molecular Physics.</b>	<p><b>PHY-354</b></p> <p><b>CO1.</b> Understanding of the Standard Model.</p> <p><b>CO2.</b> Be able to make quantitative estimates of phenomena in elementary particle.</p>
		<b>Computational Physics.</b>	<p><b>PHY-355</b></p> <p><b>CO1.</b> Identify modern programming methods.</p> <p><b>CO2.</b> Independently program computers using leading-edge tools.</p>
		<b>Elements of Material Science</b>	<p><b>PHY-ELECTIVE-I:356(B)</b></p> <p><b>CO1.</b> An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</p> <p><b>CO2.</b> An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</p>
		<b>Energy Studies</b>	<p><b>PHY-3510 SEC (I)</b></p> <p><b>CO1.</b> Students become capable of conducting energy audits and give consultancy in that field.</p>



				<p><b>CO2.</b> Students can design different types of solar heaters for small domestic as well as large scale community level applications.</p>
				<p><b>CO3.</b> Students acquire skills to implement solar P-V systems at domestic levels as well as for office premises and educational institutions. Students become able to start their own enterprise in net metering</p>
				<p><b>CO4.</b> Students get ideas and hence become self-employed in the field of design, production, commissioning and implementation of bio-mass energy sources, bio-gas plants, gasifiers, wind mills, hybrid systems etc.</p>
				<p><b>CO5.</b> Students can go for research in the fields of super-capacitors, battery technologies, fuel cells and material synthesis for implementation of these technologies.</p>
				<p><b>CO6.</b> Students become successful entrepreneurs in the energy field.</p>
		<b>Physics Workshop Skill</b>	<b>PHY-3511 SEC (L):</b>	<p><b>CO1.</b> This course is to get exposure with various aspects of instruments and their usage through hands-on mode.</p>
				<p><b>CO2.</b> After completion of this course students will be able to handle and test various instruments.</p>
		<b>Physics Laboratory-3A</b>	<b>PHY-357</b>	<p><b>CO1.</b> Work in a group to plan, implement and report on an experiment.</p>
				<p><b>CO2.</b> Investigate the theoretical background to an experiment.</p>



	<b>Physics Laboratory-3B</b>	<b>PHY-358</b>	<p><b>CO1.</b> Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.</p> <p><b>CO2.</b> Acquire the complementary skills of collaborative learning and teamwork in laboratory settings</p>
	<b>Physics Project-I</b>	<b>PHY-359</b>	<p><b>CO1.</b> Work in a group to plan, implement and report on a project/experiment</p> <p><b>CO2.</b> Investigate the theoretical background to an project.</p>
<b>T.Y.B.Sc. SEM-II</b>	<b>Solid State Physics</b>	<b>PHY-361</b>	<p><b>CO1.</b> Be familiar with the basic phenomena in solid state physics.</p> <p><b>CO2.</b> Understand the models that describe these phenomena.</p> <p><b>CO3.</b> Be able to make quantitative estimates for phenomena in solid state physics</p>
	<b>Quantum Mechanics</b>	<b>PHY-362</b>	<p><b>CO1.</b> Understand the effect of symmetries in quantum mechanics.</p> <p><b>CO2.</b> Be able to solve the Schrödinger equation for simple configuration.</p> <p><b>CO3.</b> Have a deep understanding of the mathematical foundations of quantum mechanics.</p>
	<b>Thermodynamics &amp; Statistical Physics</b>	<b>PHY-363</b>	<p><b>CO1.</b> You can master basic statistical methods and concepts like probability, expected value variance.</p>



			<p><b>CO2.</b> Has thorough knowledge on different Classical and quantum mechanical distribution functions.</p>
	<b>Nuclear Physics</b>	<b>PHY-364</b>	<p><b>CO1.</b> Demonstrate knowledge and understanding of laws definitions concepts scientific vocabulary, Scientific quantities and there determination.</p> <p><b>CO2.</b> Understand the fundamental principles and concepts governing classical nuclear physics.</p>
	<b>Electronics</b>	<b>PHY-365</b>	<p><b>CO1.</b> Analyze simple electronics circuits based on diodes and transistors with special focus on designing amplifiers with discrete components.</p> <p><b>CO2.</b> Perform Analysis at AC of Amplifiers based on BJTs and FETs using weak signal models</p>
	<b>LASERS</b>	<b>PHY-ELECTIVE-II:366(S)</b>	<p><b>CO1.</b> Understanding the scientific and clinical principles of lasers in dentistry.</p> <p><b>CO2.</b> Learn basic concepts of laser physics and segmentation of wavelengths.</p> <p><b>CO3.</b> Become familiar with different types of laser used in dentistry.</p> <p><b>CO4.</b> Understand the basic elements of the laser.</p>
	<b>Calibration Techniques</b>	<b>PHY-3610 SEC (Z)</b>	<p><b>CO1.</b> To make students familiar with the constructions and working principle of different types of Instruments</p> <p><b>CO2.</b></p>



			<p>To make students aware about the measuring instruments and Calibration of Instrument.</p> <p><b>CO3.</b> Calibrate hydraulic, pneumatic and mechanical measuring and control equipment: setting, adjustment, validation or verification of mechanical, pneumatic, hydraulic, measuring and control instruments using reference standards in accordance with predetermined procedures.</p> <p><b>CO4.</b> Calibrate electrical and electronic measuring and control equipment: setting, adjustment, validation or verification of electrical, electronic measuring and control instruments using reference standards in accordance with predetermined procedures.</p> <p><b>CO5.</b> Carryout maintenance activities on instrumentation and control panel</p>
	<b>Radiation Physics</b>	<b>PHY-3611 SEC (AC)</b>	<p><b>CO1.</b> Students can use the knowledge in the applications of Radiation Physics in the fields like radio carbon dating, medical diagnostic tools.</p> <p><b>CO2.</b> Students acquire skill in operating different types of radiation detectors to detect and measure radiation levels in different places.</p> <p><b>CO3.</b> Students can work as advisers in maintenance of radiation safety standards and following of strict protocols at various places like Hospitals, Industry, and Laboratories etc.</p> <p><b>CO4.</b> Students become able to employ their skills to develop applications of radio activity in the fields like agriculture, hospitals etc.</p>



	<b>Physics Laboratory-4A</b>	<b>PHY-367</b>	<b>CO1.</b> Set up experimental equipment to implement an experimental approach. <b>CO2.</b> Demonstrate a deeper understanding of abstract concepts and theories gained by Experiencing and visualizing them as authentic phenomena.
	<b>Physics Laboratory-4B</b>	<b>PHY-368:</b>	<b>CO1.</b> Demonstrate an understanding of laboratory procedures including safety, and scientific methods. <b>CO2.</b> Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
	<b>Physics Project-II</b>	<b>PHY-369</b>	<b>CO1.</b> Acquire the complementary skills of collaborative learning and teamwork in laboratory settings <b>CO2.</b> Acquire technical and manipulative skills in using laboratory equipment, tools

**Head**  
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