

**Shri Shivaji Science and Arts College, Chikhli.**  
**Department of Physics**  
**Program Outcome, Program Specific Outcome and Course Outcome**

**Programme Outcomes**

	At the time of graduation, Students will be able to
	<p><b>PO-1:</b> Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.</p> <p><b>PO-2:</b> Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.</p> <p><b>PO-3:</b> Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.</p> <p><b>PO-4:</b> Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.</p> <p><b>PO-5:</b> Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.</p> <p><b>PO-6:</b> Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.</p> <p><b>PO-7:</b> Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes</p>
	<p style="text-align: center;"><b>Programme Specific Outcomes</b></p> <p><b>PSOs:</b>  Upon completion of the Programme successfully, students would be able to</p> <p><b>PSO-1:</b> acquire a comprehensive knowledge and sound understanding of fundamentals of Physics</p> <p><b>PSO-2:</b> develop laboratory skills, enabling them to take measurement in a physic laboratory and analyze the measurements to draw valid conclusions.</p> <p><b>PSO-3:</b> be prepared to acquire a range of general skills, to solve problems, to evaluate information, to use computers productively, to communicate with society effectively and learn independently.</p> <p><b>PSO-4:</b> Develop good oral and written scientific communication skill.</p>

## Course Outcomes B. Sc. Physics

### Semester – I

Course/Unit	Outcomes
	On successful completion of the course students would have;
<b>Unit-I</b>	<b>CO:</b> Discuss the basic concepts of rotational dynamics.
<b>Unit-II</b>	<b>CO:</b> Examine the phenomenon of simple harmonic motion and distinction between undamped, damped and force oscillations and the concept of resonance.
<b>Unit-III</b>	<b>CO:</b> Explain the superposition of simple harmonic motion and acquire the knowledge of Ultrasonic waves, their production, detection and applications in different field.
<b>Unit-IV</b>	<b>CO:</b> Understand fundamentals the elastic properties of matter. Determine the constants of elasticity and relate it with appropriate things.
<b>Unit-V</b>	<b>CO:</b> Interpret the postulates of special theory of relativity. Know the concept of Global positioning system (GPS)
<b>SEM: Skill Enhancement Module</b>	After completion of this course students will able to <b>CO-1:</b> Apply the principles of measurement and error analysis. <b>CO-2:</b> Develop the skills to handle various instruments with precision.
<b>Physics Practicals</b>	On successful completion of this practical course, the students would be able to <b>CO-1:</b> List out, identify and handle various equipment likes different types of pendulums. <b>CO-2:</b> Learn the procedures of operation of various oscillating objects. <b>CO-3:</b> Acquire skills in observing and measuring different types of errors. <b>CO-4:</b> Perform procedures and techniques related to experiments based on mechanics. <b>CO-5:</b> Conduct experiments collaboratively and ethically.

## Course Outcomes B. Sc. Physics

### Semester – II

Course/Unit	Outcomes
	On successful completion of the course students would have;
<b>Unit-I</b>	<b>CO:</b> Discuss the concept of scalars & vectors and their properties
<b>Unit-II</b>	<b>CO:</b> Develop an understanding of Gauss law and its applications to obtain electric field in different cases.
<b>Unit-III</b>	<b>CO:</b> Formulate the relationship between electric displacement vector, electric polarization and dielectric constant.
<b>Unit-IV</b>	<b>CO:</b> Distinguish between the magnetic effect of electric current, electromagnetic induction and the related laws in appropriate circumstances
<b>Unit-V</b>	<b>CO:</b> Simplify electrical circuits by applying various network theorems.
<b>SEM: Skill Enhancement Module</b>	After completion of this course students would be able to <b>CO-1:</b> Make use of Multimeter for the measurement of electrical parameters and get the knowledge of electronic components and their applications. <b>CO-2:</b> Estimate the power consumption of domestic appliances and carry out energy audit.
<b>Physics</b>	On successful completion of this practical course, the students would be able to

<b>Practicals</b>	<b>CO-1:</b> Simplify various electrical circuits by using network theorems. <b>CO-2:</b> Learn the procedures of operation of electrical components like capacitor, resistor and inductor. <b>CO-3:</b> Acquire skills in measuring dielectric constants of different materials. <b>CO-4:</b> Perform procedures and techniques related to experiments based on electrical and electronic circuits. <b>CO-5:</b> Conduct experiments collaboratively and ethically.
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<b>Course Outcomes B. Sc. Physics Semester – III</b>	
<b>Course/Unit</b>	<b>Outcomes</b> After completion of these courses students should be able to;
<b>Mathematical Background and Electrostatics</b>	<b>CO1:</b> To understand concept of Mathematical Physics such as Gradient, divergence and curl of a vector fields, line, surface and volume integral. To study Gauss divergence theorem, Stocks theorem. <b>CO2:</b> Know basic concept of Electrostatics & its applications.
<b>Magnetostatics and Maxwell's Equations</b>	<b>CO1:</b> To study Faraday's Law, Maxwell's Equations & wave equations for electromagnetic wave. <b>CO2:</b> To understand Poynting vector and Poynting theorem.
<b>Solid State Electronics Devices-I</b>	<b>CO1:</b> To know semiconductors, charge carriers & electrical conduction, Fermi level & energy level diagrams, mobility and conductivity. <b>CO2:</b> To understand Hall effect, Hall coefficient, Semiconductor diode & its biasing, LED and Varactor diode.
<b>Solid State Electronics Devices-II</b>	<b>CO1:</b> Study BJT, its construction & working, modes of operation, current gains & their relation & CB & CE characteristics <b>CO2:</b> To study JFET- construction & working & it's Characteristics. <b>CO3:</b> Gain knowledge of Basic concept of Difference amplifier & to study the Operational Amplifier and their types.
<b>Special Theory of Relativity</b>	<b>CO1:</b> To understand the Special of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, relativistic addition of velocities, relativity of mass, Einstein's Mass - energy relation. <b>CO2:</b> To solve Numericals for better understanding.
<b>Atmosphere and Geophysics</b>	<b>CO1:</b> To study structure of earth, Earthquakes, composition of atmosphere. <b>CO2:</b> To understand Radiation in the atmosphere, moisture and clouds.
<b>Physics Practicals</b>	<b>CO:1</b> Design circuit & study characteristics of CB & CE transistor. <b>CO:2</b> Design circuit & study characteristics of FET & FET as voltmeter. <b>CO:3</b> Design circuit & study p-n diode as a rectifier. <b>CO:4</b> Design circuit & study characteristics of p-n junction. <b>CO:5</b> Study of OP AMP as an inverting amplifier, noninverting amplifier, adder & subtractor. <b>CO:6</b> To determine characteristics of Phototransistor. <b>CO:7</b> Design circuit & study Zener regulated power supply.

**Course Outcomes B. Sc. Physics  
Semester – IV**

<b>Course/Unit</b>	<b>Outcomes</b> After completion of these courses students should be able to;
<b>Geometrical Optics and Interference</b>	<b>CO1:</b> Understand optical lens system. <b>CO2:</b> Learn interference in thin films due to reflected and transmitted light, interference in wedge shaped thin film, <b>CO3:</b> Understand formation Newton's ring, measurement of wavelength of monochromatic light & refractive index of liquid by Newton's.
<b>Diffraction</b>	<b>CO1:</b> Understand diffraction phenomenon such as Fresnel diffraction, Fraunhofer diffraction, single & double slit diffraction <b>CO2:</b> Understand construction and theory zone plate & plane transmission grating <b>CO3:</b> Know resolution of images, Rayleigh's criteria for resolution and R. P. of grating.
<b>Polarization</b>	<b>CO1:</b> Know about the basic concepts of polarization & phase retardation plates. <b>CO2:</b> Study of production of elliptically and circularly polarized light. <b>CO3:</b> Study Half shade polarimeter
<b>Laser</b>	<b>CO1:</b> Know the history of LASERS and its basic concepts. <b>CO2:</b> Understand the basic principle and working of different types of lasers such as Ruby laser He-Ne laser, Semiconductor laser etc. <b>CO3:</b> Know the applications of lasers in various fields.
<b>Fiber optics</b>	<b>CO1:</b> Study basic concept of fiber optics, structure and classification of optical fiber. <b>CO2:</b> Understand propagation of light wave in an optical fiber, <b>CO3:</b> Know acceptance angle and numerical aperture, dispersion, fiber losses, fiber optic communication. <b>CO4:</b> Gain information of advantages and disadvantages of optic fibers, application of fiber optics.
<b>Renewable Energy Sources</b>	<b>CO1:</b> Know various renewable energy sources <b>CO2:</b> Know Solar energy & To gain knowledge of Solar Energy Storage. <b>CO3:</b> Study Solar Photovoltaic systems-Operating principle, photovoltaic cell concepts & solar PV panel its applications.
<b>Physics Practicals</b>	<b>CO:1</b> Design circuit & study (a) half wave rectifier (b) full wave bridge rectifier & investigate the effect if C, L & $\pi$ filter. <b>CO:2</b> Learn how to determine refractive index & dispersive power of prism. <b>CO:3</b> Learn how to determine resolving power of plane transmission grating & telescope. <b>CO:4</b> Learn how to determine wavelength of monochromatic light by Newton's rings & plane transmission grating. <b>CO:5</b> To study & plot characteristics of solar cell. <b>CO:6</b> To determine frequency & phase by CRO. <b>CO:7</b> Learn how to determine number of lines per centimeter of given grating & resolving power.

**Course Outcomes B. Sc. Physics****Semester – V**

<b>Origin of Quantum Mechanics</b>	<b>CO1:</b> To Understand origin of quantum mechanics. Describe concept of wave packet. <b>CO2:</b> Know Davisson Germer experiment <b>CO:3</b> To understand Heisenberg's Uncertainty principle& its verification using Thought experiment and Gamma ray microscope.
<b>The Schrodinger Equation and Its Applications</b>	<b>CO1:</b> To understand concept of wave function & its significance. <b>CO2:</b> Know the Schrodinger equations and its applications. <b>CO3:</b> To understand Eigen functions and Eigen values and qualitative analysis of zero point energy.
<b>Atomic and Molecular Spectroscopy</b>	<b>CO1:</b> Understand vector atom model & study Stern-Gerlach experiment and different types of coupling. <b>CO2:</b> Know the properties and types of X-ray <b>CO:3</b> To study for Raman Effect & its basic principal
<b>Nuclear Physics</b>	<b>CO:1</b> Know about detection of charge particles by using G. M. counter. <b>CO:2</b> Understand concept of nuclear physics like, Alpha decay, Beta decay, Concept of nuclear fission and fusion. <b>CO:3</b> Study construction & working of nuclear reactors.
<b>Hybrid parameters &amp; Amplifier</b>	<b>CO:1</b> Understand hybrid parameter, CE amplifier, Bias stability & Thermal runaway <b>CO2:</b> Study RC coupled amplifier & its variation in gain with frequency <b>CO:3</b> Study noise & distortion in electronic circuits.
<b>Feedback in amplifiers &amp; Oscillators</b>	<b>CO:1</b> Know properties, advantage and applications of negative feedback. <b>CO:2</b> <b>CO:2</b> Describe the construction and working of various types of oscillators and multivibrators.
<b>Physics Practicals</b>	<b>CO1:</b> Construct regulated power supply using Zener diode and draw the regulation curve. <b>CO:2</b> Determine hybrid parameters& its practical applications <b>CO:3</b> Design circuits for RC coupled amplifier and study the frequency response. <b>CO:4</b> Construct Hartley, Colpitt's, Weins Bridge Oscillator and measure the frequency of oscillations. <b>CO:5</b> Identify elements in optical line spectrum. <b>CO:6</b> Design the circuit to study characteristics of LED & to determine plank constant using LED <b>CO:7</b> Determine 'e' by Thomson's method.

**Course Outcomes B. Sc. Physics**  
**Semester – VI**

<b>Statistical Mechanics</b>	<p><b>CO:1</b> Understand the concept of Phase space, unit cell, microstates, and macrostate.</p> <p><b>CO:2</b> Study concept of probability, principle of equal priori probabilities &amp; most probable distribution</p> <p><b>CO:3</b> Maxwell Boltzmann statistics, and its applications.</p>
<b>Statistical Mechanics</b>	<p><b>CO:1</b> Study Distinguishable &amp; indistinguishable particles &amp; understand concepts of boson &amp; fermions.</p> <p><b>CO:2</b> Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics and derive it's outcomes</p> <p><b>CO:3</b> Understand Fermi function, Fermi energy &amp; Fermi temperature.</p>
<b>Crystallography</b>	<p><b>CO:1</b> Distinguish between crystalline and amorphous solids.</p> <p><b>CO:2</b> Study how to calculate atomic packing factor for Cubic structure.</p> <p><b>CO:3</b> Explain symmetry elements and Bravais lattice.</p> <p><b>CO:4</b> Distinguish between various types of crystal imperfection.</p>
<b>Electrical Properties of Materials</b>	<p><b>CO:1</b> Analyze the success and failure of free electron theory.</p> <p><b>CO:2</b> Study origin of band gap &amp; classification of materials on the basis of bands structure</p> <p><b>CO:3</b> Understand Hall effect &amp; its applications.</p>
<b>Magnetic Properties of Materials</b>	<p><b>CO:1</b> Understand different types of magnetic materials</p> <p><b>CO:2</b> Study classical &amp; quantum mechanical treatment of paramagnetism;</p> <p><b>CO:3</b> Study Curie's law, Weiss's law, Hysteresis and Energy Loss.</p>
<b>Superconductivity &amp; Nano Technology</b>	<p><b>CO:1</b> Understand superconductors and its type, Meissner effect &amp; Applications of superconductors.</p> <p><b>CO:2</b> Understand nanomaterials, its physical properties &amp; applications of nanomaterials in different fields.</p>
<b>Physics Practicals</b>	<p><b>CO:1</b> Understand basic laws, theory, characteristics of photocell and can be determine Plank's constant using photocell.</p> <p><b>CO:2</b> Design the circuit to study characteristics of Photo diode.</p> <p><b>CO:3</b> Determine activation energy of thermistor and energy gap of semiconductor.</p> <p><b>CO:4</b> Understand basic laws, theory and determine Hysteresis losses in transformer core &amp; plot B-H curve.</p> <p><b>CO:5</b> Determine lattice parameter by using X-ray diffraction pattern.</p> <p><b>CO:6</b> Understand various crystal structure using crystal models &amp; identify of crystal planes.</p> <p><b>CO:7</b> Design the circuit to study characteristics of Zener Diode</p> <p><b>CO:8</b> To study thermo emf using thermocouple.</p>