

Department of Physics

Programme Outcomes (POs), Programme Specific Outcomes (PSOs) and Course Outcomes (COs)

Bachelor of Science in Physics

Programme Outcome (POs)

Programme Code	Programme Title	Programme Specific Outcome
BSP	Bachelor of Science in Physics	<p>For BSc courses, the major theory and practical courses that have been included across six semesters are mathematical physics, waves and optics, electricity, magnetism, electronics, thermal physics, nuclear physics, quantum mechanics, solid state physics, electromagnetic theory and statistical mechanics. In addition to these regular courses, several optional courses have also been included that the students can opt to study in the fifth and sixth semesters. Courses like digital systems and applications, basic instrument and applied optics are included for skill development of the students in such application oriented fields. The intended outcome of a bachelor's degree course is to prepare a student for his/her career in the field of study. The syllabus for this particular course caters to the said specific purpose for the students.</p> <p>Programme Outcomes (POs): After due completion of the programme students will be able to</p> <p>PO 1. Understand the concepts of physics and gain the knowledge of various physical phenomena.</p> <p>PO 2. To carry out experiments to understand the laws of nature through logic and reasoning.</p> <p>PO 3. To acquire problem solving skills, both analytical and computational and to apply them for solutions of physical problems.</p> <p>PO 4. Gain academic abilities, personal qualities and transferable skills which will make them true human resources of the society.</p>

Programme Specific Outcome (PSO)

Programme Code	Programme Title	Programme Specific Outcome
BSP	Bachelor of Science in Physics	<p>Programme Specific Outcomes (PSOs): At the end of the programme the students will be specifically able to</p> <p>PSO 1. Understand the concepts of physics, particularly in</p>

		<p>Classical Mechanics, Quantum Mechanics, Electronics, Electromagnetism, Atomic, Molecular and Laser physics, Nuclear Physics etc. and impart the knowledge how the fundamental laws of nature are realized.</p> <p>PSO 2. Gain the knowledge of certain advanced subjects such as Condensed Matter Physics, High Energy Physics, Astro and Particle Physics, Laser and Nonlinear Optics etc.</p> <p>PSO 3. Learn to carry out hands on experiments related to the subjects cited above and develop the skills to operate advance machineries.</p> <p>PSO 4. Develop the knowledge to identify cutting edge research problems and also develop methodologies to solve them.</p>
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Course Outcomes (COs)

B.Sc. Physics (Honours)

Paper Code	Title of the Paper	Course Outcomes (COs)
		Upon successful completion of the course students will be able to
BSP-101	Mathematical Physics-I	<ol style="list-style-type: none"> 1. Know about 1st and 2nd order differential equation and then method of finding complementary functions and particular integrals. 2. Understand vector algebra. Scalar and vector fields. 3. Learn the differentiation and integration of vectors. 4. Understand different vector operations such as Del, gradient and curl. 5. Know about the Orthogonal Curvilinear Coordinates
BSP-102	Mechanics	<ol style="list-style-type: none"> 1. Learn about various aspects of dynamics 2. Learn about work and energy 3. Learn about collisions 4. Learn about rotational dynamics 5. Learn about gravitational physics
BSP-103	Mathematical Physics-I Practical	<ol style="list-style-type: none"> 1. Understand the basics of scientific computing. 2. Know and compute different types of errors. 3. Know the basics of various programming languages such as C and C⁺⁺ 4. Apply the programming language to calculate sum, average, and area.
BSP-104	Mechanics Practical	<ol style="list-style-type: none"> 1. Learn about motion of spring 2. Learn about determination of moment of inertia by various methods 3. Learn about calculation of acceleration due to gravity by various methods 4. Learn to measure Young's modulus and modulus of rigidity

BSP-201	Electricity and Magnetism	<ol style="list-style-type: none"> 1. Know the basic concept of Electric field and Potential. 2. Understand polarization and dielectric properties of matter. 3. Understand magnetic force, magnetic field and be able to calculate the same in current carrying conductors of different shapes. 4. Know about the magnetic properties of matter. 5. Have a clear picture of charge and energy conservation and the phenomena of electromagnetic induction.
BSP-202	Waves and Optics	<ol style="list-style-type: none"> 1. Deep concepts of waves, Harmonic motions. 2. Knowledge on different type of vibration like free, damped, force vibrations etc. 3. Idea of defect of Image. 4. Will have deep knowledge on the concept of interference, diffraction, polarisation. 5. Learn about propagation of a stretched string with reference to longitudinal and transverse velocities.
BSP-203	Electricity and Magnetism Practical	<ol style="list-style-type: none"> 1. Learn to determine the low resistance by using potentiometer and Carrey foster bridge method. 2. Learn to calculate the magnetic field in a solenoid. 3. Will learn the property of self induction of a coil. 4. Study the response curve of LCR circuit.
BSP-204	Waves and Optics Practical	<ol style="list-style-type: none"> 1. Will know the experiments of Michelson interferometer, Newton rings, wavelength of Sodium light. 2. Will know the experiments of wavelength measurements different sources like Na, Hg etc. 3. Will know the experiments of Fresnel Bi-prism. 4. Will know the experiments of thin film. 5. Will know the experiments of measurement of dispersive power and resolving power of diffraction grating.
BSP-301	Mathematical Physics-II	<ol style="list-style-type: none"> 1. Will learn about different properties of matrices. 2. Will gain knowledge about special function viz. Beta, gamma and error function. 3. To find the solution of various partial differential equation. 4. Will learn to solve the Laplace and wave equation by using separation of variable method. 5. Learn about different aspect of Legendre polynomial and Forbenius method with application to differential equation.
BSP-302	Thermal Physics	<ol style="list-style-type: none"> 1. Learn about basics of thermodynamics 2. Learn about various quantities related to thermodynamics, such as entropy and thermodynamic potentials 3. Learn about Maxwell's thermodynamic relations 4. Learn about kinetic theory of gases and molecular collisions 5. Learn about real gases
BSP-303	Digital Systems and Applications	<ol style="list-style-type: none"> 1. Understand various number systems and their importance in digital design.

		<ol style="list-style-type: none"> 2. Understand and design different logic families. 3. Have fundamental concepts of sequential and combinational circuits. 4. Analyze and design clocked sequential circuits. 5. Understand active and passive components, integrated circuits and their importance in microprocessors.
BSP-304	Mathematical Physics-II Practical	<ol style="list-style-type: none"> 1. Learn the basic of Numerical computation software such as Scilab/MATLAB. 2. Learn Numerical methods and develop the skills of writing a program. 3. Learn different techniques such as Curve fitting, Least square fit, Goodness of fit, standard deviation using Scilab/MATLAB 4. Able to find the solution of differential equations.
BSP-305	Thermal Physics Practical	<ol style="list-style-type: none"> 1. Learn to determine mechanical equivalent of heat 2. Learn to determine thermal conductivity coefficient by various methods 3. Learn to determine temperature coefficient of resistance of platinum resistance thermometer 4. Learn to measure characteristics and various quantities related to a thermocouple
BSP-306	Basic Instrument Skill	<ol style="list-style-type: none"> 1. Concept on accuracy, precision, sensitivity and resolution of basic electronic instruments. 2. Advantage of multimeters over conventional voltmeter and ammeter. 3. Details of operation and working of CROs 4. Idea of different signal generators and their applications.
BSP-401	Nuclear Physics	<ol style="list-style-type: none"> 1. Understand the constituents and general properties of Nuclei. 2. Learn about different Nuclear Models and the condition for Nuclear Stability. 3. Know about the different types of radiation such as alpha, beta and gamma and their properties. 4. Know the different types of Nuclear Reaction and calculate the Q Value of Reaction. 5. Have a basic concept of different types of detection mechanism of nuclear radiations. 6. Know the basic of Particle Physics, types of particles and conservation laws.
BSP-402	Elements of Modern Physics	<ol style="list-style-type: none"> 1. Learn basics of quantum mechanics 2. Learn about quantum mechanical wave equations 3. Learn about special theory of relativity 4. Learn about atomic physics 5. Learn about radioactivity
BSP-403	Analog Systems and Applications	<ol style="list-style-type: none"> 1. Understand the basic process in the formation and fabrication of PN junction devices. 2. Analyze BJT as amplifiers and bias circuits for CB, CC and

		<p>CE configurations.</p> <ol style="list-style-type: none"> Understand the importance of feedback (both positive as well as negative) in amplifiers and their frequency response. Understand versatile integrated circuits such as Op-Amp and its applications. Analyze different oscillator circuits and the criteria for self sustained oscillations.
BSP-404	Nuclear and Electronics Practical	<ol style="list-style-type: none"> Know the experimental procedure to detect alpha and gamma radiations. Carry out experiments using a GM counter and calculate the operating voltage of the counter. Know about the different radio-active sources and their hazards. Understand the input and out waveform of OP-AMP. Will understand the operation of diode as rectifier and transistor as amplifier.
BSP-405	Elements of Modern Physics Practical	<ol style="list-style-type: none"> Learn to study photoelectric effect and calculate Planck's constant Learn to determine e/m value by different methods Learn to measure I-V characteristics of a tunnel diode] Learn to determine wavelength of a laser source by diffraction with single and double slits
BSP-406	Applied Optics	<ol style="list-style-type: none"> Deep understanding of the properties of lenses and mirrors. Characteristics of LASERs and working of different LASER systems Idea of Holography and their construction techniques and applications Understanding of few spectroscopic instrumentations Communication through Fiber Optics
BSP-501	Quantum Mechanics	<ol style="list-style-type: none"> Evolution of Quantum Mechanics as a new realm of nature Theories and discoveries leading to the development of Quantum Mechanics Solution of two-body and many body problems through quantum mechanics Recent advances in quantum mechanics Understand the wave function in many electron atoms.
BSP-502	Solid State Physics	<ol style="list-style-type: none"> Learn about crystal structure and phonons Learn about magnetic properties of matter Learn about dielectric properties of materials Learn about electrical properties of materials Learn about superconductivity
BSP-503 (A)	Classical Dynamics	<ol style="list-style-type: none"> Students will know the concept of Newton's laws of motion. Knowledge on Lagrangian dynamics & Hamiltonian dynamics. Knowledge on central force problem.

		<ol style="list-style-type: none"> 4. Understand the Special Theory of Relativity. 5. Know the concept of degree of freedom and generalised coordinates.
BSP-503 (B)	Applied Dynamics	<ol style="list-style-type: none"> 1. Know about the dynamical systems, the idea of phase space, trajectories and flows. 2. Compute and visualize trajectories on the computer using a software packages. 3. Understand Chaos in nonlinear finite-difference equations. 4. Learn the Nonlinear time series analysis and chaos characterization. 5. Understand Fluid Dynamics: the theoretical approach, experimental fluid dynamics, computational fluid dynamics.
BSP-504 (A)	Nanomaterials and Applications	<ol style="list-style-type: none"> 1. Learn about nanoscale systems 2. Learn about synthesis of nanostructured materials 3. Learn about various characterization methods of nanomaterials 4. Learn about properties of nanomaterials 5. Learn about applications of nanomaterials
BSP-504 (B)	Advanced Mathematical Physics	<ol style="list-style-type: none"> 1. Know about the vector spaces and sub spaces. 2. Analyse the basis and Dimensions of a Vector Space. 3. Calculate the Eigen-values and Eigen-vectors. 4. Learn about Euler's Equation, Variational Principle and its application to simple problems. 5. Understand the basics of Tensors and the algebra associated with it.
BSP-505	Quantum Mechanics & Applications Practical	<ol style="list-style-type: none"> 1. Know the problem solving technique in quantum mechanics using C/C++/scilab/Matlab. 2. Understanding of simulation techniques for solving ordinary quantum mechanical problems 3. Analytical tool for solving differential equations arising in quantum mechanics 4. Developing of software codes for solving real quantum mechanics problems.
BSP-506	Solid State Physics Practical	<ol style="list-style-type: none"> 1. Learn to measure magnetic susceptibility of solids 2. Learn to measure coupling coefficient of piezoelectric crystals 3. Learn to determine plasma frequency and complex dielectric constant of a metal by surface plasmon resonance technique 4. Learn to determine PE hysteresis loop of a ferroelectric crystal 5. Learn to measure resistivity and Hall coefficient of a semiconductor sample.
BSP-507 (A)	Introduction to Biophysics	<ol style="list-style-type: none"> 1. Understand the types of bonds in bio-molecules and molecular system. 2. Know the energy production mechanism in bio-systems 3. Understand different types of forces and flows

		<p>governing the Intracellular and Intercellular cargo transport.</p> <ol style="list-style-type: none"> 4. Have a clear concept of the electrical properties of membrane. 5. Gain knowledge about fluid properties and its movement in biological systems.
BSP-507 (B)	Applied Dynamics Practical	<ol style="list-style-type: none"> 1. Compute and visualize trajectories using software (Scilab/MATLAB/Maple/Octave/XPPAUT) based on Applied Dynamics problems. 2. Compute coupling coefficients of pendulum and oscillators. 3. Compute visualization of trajectories, visualization of fractal formations, and Flow visualization. 4. Study the rate equation for chemical reaction with the help of computational technique.
BSP-508 (A)	Nanomaterials and Applications Practical	<ol style="list-style-type: none"> 1. Learn to synthesize metal and semiconductor nanoparticles 2. Learn to study surface plasmon resonance of metal nanoparticles by UV-visible absorption method 3. Learn to fabricate nanoparticle thin films by spin coating 4. Learn to study the effect of size on colour of nanomaterials
BSP-508(B)	Advanced Mathematical Physics Practical	<ol style="list-style-type: none"> 1. Perform Scilab/ C++ based simulations experiments based on Mathematical Physics. 2. Able to calculate Eigen value and Eigen vectors. 3. Would be able to estimate the ground state energy and wave function of a quantum system. 4. Will learn to formulate Lagrangian with constrains.
BSP-601	Electromagnetic Theory	<ol style="list-style-type: none"> 1. Will gain a clear understanding of Maxwell's equations and electromagnetic boundary conditions. 2. Know that laws of reflection, refraction are outcomes of electromagnetic boundary conditions. 3. Students will grasp the idea of electromagnetic wave propagation in free space. 4. Able to describe and analyze transmission lines, wave guide. 5. Understand the basic of fiber optics. 6. Students will extend their understanding of special theory of relativity by including the relativistic electrodynamics..
BSP-602	Statistical Mechanics	<ol style="list-style-type: none"> 1. converse with correct concepts of thermodynamics and statistical mechanics. 2. Understand the need to use statistics to describe systems containing huge numbers of particles. 3. Know the 3 Laws of Thermodynamics & understand their statistical foundations and applications. 4. Have a basic understanding of the phase transitions. 5. Understand the quantum statistical physics of Fermions & Bosons.

BSP-603 (A)	Mathematical Physics III	<ol style="list-style-type: none"> 1. Apply the concept of complex function to solve Integrals. 2. Learn the expansion of periodic functions. 3. Learn to expand a function in Fourier series 4. Learn Laplace transformation of elementary function. 5. Solve heat flow equation using Laplace transformation.
BSP-603 (B)	Introduction to Earth Science	<ol style="list-style-type: none"> 1. Understand the basic concepts of our dynamic planet through Astronomy, Geology, Meteorology and Oceanography. 2. Know about The solid earth: dimensions, shape and topography, internal structure, magnetic field, geothermal energy. 3. Understand the basic of Plate tectonic theory and the origin of earthquake and earthquake belts. 4. Knowing a wide range of earth surface processes. 5. Understand the scope of geomorphology from landform to landscape to mega geomorphology
BSP-604 (A)	Astronomy and Astrophysics	<ol style="list-style-type: none"> 1. Idea of astronomical coordinates and measurements of astronomical distances 2. Will gain the knowledge on basic structure and properties of Milky Way galaxy. 3. Astronomical techniques for brightness and temperature, astronomical telescopes 4. Evolution of the universe. galaxies and stars 5. The solar family and its origin
BSP-604 (B)	Physics of Devices and Instrumentation	<ol style="list-style-type: none"> 1. Qualitative and quantitative aspects of analysis, and evolution of analytical data 2. Idea of different detectors viz. PMT, CMOS, CCD etc. and their associated electronic circuitry. 3. Knowledge of transducer and sensors, and signal transformation techniques 4. Spectroscopic instrumentation and microscopic imaging techniques. 5. Learn the basic of analog and digital communication system.
BSP-605	Electromagnetic Theory Practical	<ol style="list-style-type: none"> 1. Learn the concept of Law of Malus and to verify it for Plane Polarized Light. 2. Learn the technique to determine the Specific Rotation of cane sugar using Polarimeter. 3. Understand the method to verify the Brewster's law and to find the Brewster's angle. 4. Will have a basic concept of Optical Fibre and learn to measure the Acceptance angle and Numerical Aperture of an Optical Fibre. 5. Will learn the method to determine the wavelength of monochromatic source by Fresnel's biprism.
BSP-606	Statistical Mechanics Practical	<ol style="list-style-type: none"> 1. Use numerical simulation for solving different problems in Statistical mechanics

		<ol style="list-style-type: none"> 2. Compute physical quantities at large and small temperature 3. Compute velocity distribution of particles. 4. Plot different function viz., Maxwell-Boltzmann distribution, Fermi-Dirac distribution and Bose-Einstein distribution with energy.
BSP-607 (A)	Mathematical Physics III Practical	<ol style="list-style-type: none"> 1. Able to perform Scilab/C++ /MATLAB based simulations experiments based on Mathematical Physics. 2. Able to Solve Differential equations. 3. Able to evaluate the Fourier coefficients of a given periodic function.
BSP-607 (B)	Basic Atmospheric Physics	<ol style="list-style-type: none"> 1. Know the structures and composition of the earth's atmosphere. 2. Understand the instruments for meteorological observations. 3. Understand the dynamics of the earth's atmosphere which includes the fundamental forces, conservation laws and atmospheric oscillations etc. 4. Know various types of atmospheric radars and its applications. 5. Know several types of aerosols, its production and removal.
BSP-608	Dissertation	<ol style="list-style-type: none"> 1. Introduction to research methodology. 2. Aspects of theoretical and experimental research. 3. Idea of developments in cutting edge research of different domain. 4. Entry to research through execution of mini projects.