Raiganj Surendranath Mahavidyalaya

Department of Physics

Course Outcomes

The Course Outcomes are developed based on various levels of the revised Bloom's Taxonomy of Cognitive learning, as shown below.

Revised Bloom's Taxonomy of Cognitive Learning

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC1T
Course Name	Mathematical Physics-1 (Theory)
Course Type	Discipline Core Course
Semester	I
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Solve problems of calculus, including limits, continuity, differentiation, and also obtain solutions of first and second-order differential equations.	PSO-1, PSO-3	L3: Apply
CO-2	Perform vector differentiation and integration, and apply vector identities in various physical contexts.	PSO-1, PSO-3	L3: Apply
CO-3	Evaluate gradient, divergence, curl, and Laplacian, in Cartesian, spherical, and cylindrical coordinate systems.	PSO-3	L4: Analyze
CO-4	Explain the properties and applications of the Dirac delta function in solving physical problems.	PSO-1	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC1P
Course Name	Mathematical Physics-1 (Practical)
Course Type	Discipline Core Course
Semester	I
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Exhibit computational analysis, including binary and decimal arithmetic, floating point numbers, and iterative methods.	PSO-1	L1: Remember
CO-2	Perform error analysis, including truncation and round-off errors, and absolute and relative errors.	PSO-1	L2: Understand
CO-3	Plot graphs using software like gnuplot, fit data and modify graph appearances.	PSO-2, PSO-5	L3: Apply
CO-4	Write program in Python, including data types, operators, expressions, and use them for mathematical calculation.	PSO-5	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC2T
Course Name	Mechanics (Theory)
Course Type	Discipline Core Course
Semester	I
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Employ Newton's laws of motion to solve problems involving the dynamics of particles and systems of particles.	PSO-1, PSO-3	L3: Apply
CO-2	Apply the work-energy theorem and the principles of conservation of energy in various physical contexts.	PSO-1, PSO-3	L3: Apply
CO-3	Analyze the motion of bodies under central forces, including gravitational forces, and apply Kepler's laws to planetary motion.	PSO-3	L4: Analyze
CO-4	Explain the effects of non-inertial reference frames for producing fictitious forces such as centrifugal and Coriolis forces.	PSO-1	L2: Understand
CO-5	Evaluate the dynamics of rigid bodies, including the concepts of torque, angular momentum, and moment of inertia, and solve related problems.	PSO-3	L5: Evaluate
CO-6	Describe the principles of elasticity and fluid dynamics, including the behaviour of materials under stress and the flow of fluids.	PSO-1	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC2P
Course Name	Mechanics (Practical)
Course Type	Discipline Core Course
Semester	I
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Measure fundamental physical quantities accurately using appropriate instruments.	PSO-2	L2: Understand
CO-2	Conduct experiments to determine Young's modulus, modulus of rigidity, and moment of inertia of various materials.	PSO-2	L2: Understand
CO-3	Analyze experimental data, calculate errors, and interpret results to draw meaningful conclusions about physical phenomena.	PSO-2	L3: Apply
CO-4	Determine the value of gravitational acceleration using different pendulum methods.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC3T
Course Name	Electricity and Magnetism (Theory)
Course Type	Discipline Core Course
Semester	II
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Explain Coulomb's law, electric fields, Gauss' theorem, and solve problems involving charge distributions.	PSO-1, PSO-3	L3: Apply
CO-2	Illustrate Dielectric properties of material.	PSO-1	L1: Remember
CO-3	Define Biot-Savart's law, Ampere's circuital law, and apply them to calculate magnetic fields in various configurations.	PSO-1, PSO-3	L2: Understand
CO-4	Describe Faraday's laws of electromagnetic induction, Lenz's law, and use them in appropriate situations.	PSO-3	L3: Understand
CO-5	Analyze AC and DC circuits using Kirchhoff's laws, Thevenin's and Norton's theorems, and the behaviour of LCR circuits.	PSO-1	L4: Analyze
CO-6	Derive Maxwell's equations of electrodynamics, and explain its significance in electromagnetic wave propagation.	PSO-3	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC3P
Course Name	Electricity and Magnetism (Practical)
Course Type	Discipline Core Course
Semester	II
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Measure resistances, voltages, and currents using a multimeter, and demonstrate the functioning of basic circuit components.	PSO-2	L2: Understand
CO-2	Apply network theorems such as Thevenin's, Norton's, and Maximum Power Transfer to analyze and solve electrical circuits,	PSO-2	L3: Apply
CO-3	Conduct experiments to determine unknown resistances and inductances using methods like Potentiometer and Anderson's bridge.	PSO-2	L2: Understand
CO-4	Analyze the response of series and parallel LCR circuits, determining key parameters such as resonant frequency, impedance, and quality factor.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC4T
Course Name	Waves and Optics (Theory)
Course Type	Discipline Core Course
Semester	II
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Explain the principles of simple harmonic motion, damped and forced oscillations, and resonance.	PSO-1	L2: Understand
CO-2	Describe the properties of plane & spherical waves, including longitudinal & transverse waves.	PSO-1	L2: Understand
CO-3	Differentiate between interference and diffraction patterns, including Young's double slit experiment and diffraction gratings.	PSO-3	L4: Analyze
CO-4	Analyze the nature of polarized light and the methods of producing polarized light.	PSO-3	L4: Analyze
CO-5	Demonstrate the principles behind optical instruments such as Michelson interferometers and Fresnel biprisms.	PSO-1	L2: Understand
CO-6	State the principle of Holography.	PSO-3	L1: Remember

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC4P
Course Name	Waves and Optics (Practical)
Course Type	Discipline Core Course
Semester	II
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Set up and conduct experiments related to wave phenomena and optical systems.	PSO-2	L2: Understand
CO-2	Record, analyze, and interpret experimental data, enhancing their ability to draw meaningful conclusions.	PSO-2	L4: Analyze
CO-3	Handle precision instruments, such as spectrometers, interferometers, diffraction gratings etc. to perform experiments.	PSO-2	L3: Apply
CO-4	Obtain general proficiency in Optics experiments like Schuster's method, focussing of microscope etc.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC5T
Course Name	Mathematica Physics - II (Theory)
Course Type	Discipline Core Course
Semester	III
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Illustrate Fourier Series and its applications.	PSO-1	L2: Understand
CO-2	Use Frobenius method to solve second order linear differential equations including Legendre, Hermite, Bessel and Laguerre polynomials	PSO-1, PSO-3	L3: Apply
CO-3	Define beta ang gamma functions with associated integrals.	PSO-1	L1: Remember
CO-4	Apply variational principle in different Physics applications.	PSO-3	L3: Apply
CO-5	Solve partial differential equations in cartesian, spherical & cylindrical coordinates using standard techniques.	PSO-1, PSO-3	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC5P
Course Name	Mathematica Physics - II (Practical)
Course Type	Discipline Core Course
Semester	III
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Use Numpy and Scipy in Numerical Computation.	PSO-4	L2: Understand
CO-2	Find numerical solution of linear equations, perform matrix operations, and generate & plot special functions in Python.	PSO-4, PSO-5	L3: Apply
CO-3	Perform root finding, interpolation & differentiation using standard numerical methods.	PSO-4	L3: Apply
CO-4	Exhibit numerical integration, solve ODE and master 3D graph plotting using specialized tools.	PSO-4, PSO-5	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC6T
Course Name	Thermal Physics (Theory)
Course Type	Discipline Core Course
Semester	III
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Explain Zeroth, first and second laws of Thermodynamics, and their applications to Carnot's theorem and Entropy.	PSO-1, PSO-3	L4: Analyze
CO-2	Define Thermodynamic Potentials along with their applications to thermal Physics.	PSO-1	L2: Understand
CO-3	Apply Kinetic theory of gases to describe speed distribution, molecular collisions and properties of real gases.	PSO-1, PSO-3	L3: Apply
CO-4	Explain the phenomena of heat conduction.	PSO-1	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC6P
Course Name	Thermal Physics (Practical)
Course Type	Discipline Core Course
Semester	III
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Measure thermal conductivity of materials using standard methods.	PSO-2	L3: Apply
CO-2	Perform experiments related to Thermocouple.	PSO-2	L2: Understand
CO-3	Determine mechanical equivalent of heat and temperature coefficient of resistance experimentally.	PSO-4	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC7T
Course Name	Digital Systems and Applications (Theory)
Course Type	Discipline Core Course
Semester	III
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Analyze different parts and components of Integrated and Digital circuits including use of number systems and logic gates.	PSO-1, PSO-3	L4: Analyze
CO-2	Perform Boolean algebra to simplify Boolean expressions and digital circuits.	PSO-1	L2: Understand
CO-3	Explain concepts of multiplexers, de-multiplexers, decoders, encoders and applications of multivibrators in electronic circuits.	PSO-1	L2: Understand
CO-4	Illustrate arithmetic circuits including adders & subtractors and sequential circuits including flip-flops, and also differentiate between them.	PSO-1	L4: Analyse
CO-5	Examine the functions of registers and counters in digital systems.	PSO-1	L3: Apply
CO-6	Describe the organization of a digital computer.	PSO-1	L1: Remember

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC7P
Course Name	Digital Systems and Applications (Practical)
Course Type	Discipline Core Course
Semester	III
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Design combinational logic system using logic gates.	PSO-2	L2: Understand
CO-2	Use Boolean algebra to simplify logic circuits and verify the same experimentally.	PSO-2	L2: Understand
CO-3	Verify applications of adders and subtractors in digital circuits experimentally.	PSO-2	L3: Apply
CO-4	Construct sequential electronic circuits including counter & register using flip-flops.	PSO-2	L4: Analyze

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC8T
Course Name	Mathematical Physics - III (Theory)
Course Type	Discipline Core Course
Semester	IV
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Solve problems related to Complex Analysis.	PSO-1, PSO-3	L3: Apply
CO-2	Describe applications of Fourier transform in different branches of Physics.	PSO-3	L2: Apply
CO-3	Perform probabilistic calculations involving random variables, various distribution functions, etc.	PSO-3	L2: Understand
CO-4	Explain basic postulates of special relativity and study their applications in four dimensional spacetime.	PSO-1	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC8P
Course Name	Mathematical Physics - III (Practical)
Course Type	Discipline Core Course
Semester	IV
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Solve ordinary and partial differential equations using numerical methods such as Modified-Euler and Runge-Kutta methods, and apply these techniques to physical problems.	PSO-2	L2: Understand
CO-2	Explain the Dirac Delta function, its properties, and applications, including evaluating integrals involving the Dirac Delta function.	PSO-2	L2: Understand
CO-3	Compute Fourier coefficients for periodic functions, perform Fourier transforms, and apply these techniques to solve differential equations.	PSO-2	L3: Apply
CO-4	Perform complex analysis, including numerical integration and root finding for complex functions.	PSO-2	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC9T
Course Name	Elements of Modern Physics (Theory)
Course Type	Discipline Core Course
Semester	IV
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Explain Black body radiation, Photoelectric effect, Compton effect, De-Broglie's hypothesis, Heisenberg's uncertainty relation etc.	PSO-1, PSO-3	L2: Understand
CO-2	Illustrate fundamental principles of quantum mechanics, including the Schrödinger equation and its applications to simple problems.	PSO-3	L3: Apply
CO-3	Describe the structure of nucleus, nuclear forces, nuclear models etc.	PSO-1	L2: Understand
CO-4	State the principles of radioactivity, nuclear fission-fusion, and the origin & applications of LASER.	PSO-1	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC9P
Course Name	Elements of Modern Physics (Practical)
Course Type	Discipline Core Course
Semester	IV
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Determine Plank's constant using black body radiation and LEDs.	PSO-2	L2: Understand
CO-2	Study photoelectric effect and determine work function of a material.	PSO-2	L2: Understand
CO-3	Measure ionization potential of mercury and e/m of electron.	PSO-2	L2: Understand
CO-4	Measure wavelength of a LASER source using single slit, double slit and diffraction grating.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC10T
Course Name	Analog Systems and Applications (Theory)
Course Type	Discipline Core Course
Semester	IV
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Describe the properties of Semiconductor Diodes.	PSO-1	L2: Understand
CO-2	Demonstrate the use of Semiconductor Diodes in rectification, filtration and regulation.	PSO-3	L3: Apply
CO-3	Illustrate the properties and functions of transistors including BJT and FET.	PSO-1, PSO-3	L3: Apply
CO-4	Construct transistor amplifiers, feedback amplifiers, coupled amplifiers and oscillators.	PSO-1	L3: Apply
CO-5	Utilize OP-AMPs in designing essential electronic circuits.	PSO-3	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC10P
Course Name	Analog Systems and Applications (Practical)
Course Type	Discipline Core Course
Semester	IV
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Study V-I characteristics of p-n junction diodes, Zener diodes and solar cells.	PSO-2	L2: Understand
CO-2	Study BJT characteristics in CE mode and frequency response of voltage gain of an RC coupled transistor.	PSO-2	L2: Understand
CO-3	Design Wein bridge oscillator, inverting & non-inverting amplifiers using OP-AMPs.	PSO-2	L2: Understand
CO-4	Investigate use of OP-AMPs as integrator, differentiator, adder and differential amplifier.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC11T
Course Name	Quantum Mechanics and Applications (Theory)
Course Type	Discipline Core Course
Semester	V
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Analyze free particle and general bound state problems in one dimension using Schrodinger equation.	PSO-1, PSO-3	L4: Analyze
CO-2	Obtain solutions of two classic problems in quantum mechanics - Harmonic oscillator and Hydrogen atom.	PSO-1, PSO-3	L4: Analyze
CO-3	Explain the concepts of Angular momentum and Spin.	PSO-1, PSO-3	L2: Understand
CO-4	Describe the line spectra of Hydrogen atom and its dependency on Zeeman effect.	PSO-1	L3: Apply
CO-5	Illustrate the Physics of many electron atoms including fine structure splitting.	PSO-3	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC11P
Course Name	Quantum Mechanics and Applications (Practical)
Course Type	Discipline Core Course
Semester	V
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Solve Schrodinger equation for the ground and first excited states of Hydrogen atom in Coulomb potential.	PSO-4	L3: Apply
CO-2	Find solutions of Schrodinger equation for the ground and first excited states of Hydrogen atom in screened Coulomb potential.	PSO-4	L3: Apply
CO-3	Evaluate Schrodinger equation for the ground and first excited states of Hydrogen atom in anharmonic oscillator potential.	PSO-4	L3: Apply
CO-4	Obtain solution of Schrodinger equation for the vibrations of Hydrogen molecule in Morse potential.	PSO-4	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC12T
Course Name	Solid State Physics (Theory)
Course Type	Discipline Core Course
Semester	V
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Determine crystal structure of solids.	PSO-1	L2: Understand
CO-2	Describe elementary lattice dynamics.	PSO-1	L3: Apply
CO-3	Explain magnetic properties of matter.	PSO-1, PSO-3	L2: Understand
CO-4	Define dielectric and ferro-electric properties of materials.	PSO-1	L2: Understand
CO-5	Express band theory of solids including its applications.	PSO-1, PSO-3	L2: Understand
CO-5	Illustrate the origin and applications of Superconductivity.	PSO-1	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC12P
Course Name	Solid State Physics (Practical)
Course Type	Discipline Core Course
Semester	V
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Measure electric and magnetic susceptibility of given material.	PSO-2	L2: Understand
CO-2	Determine coupling constant of Piezoelectric crystal and dielectric constant of given materials.	PSO-2	L2: Understand
CO-3	Study PE hysteresis of a ferroelectric crystal and BH hysteresis of Iron.	PSO-2	L2: Understand
CO-4	Obtain the refractive index of a dielectric layer using SPR.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC13T
Course Name	Electromagnetic Theory (Theory)
Course Type	Discipline Core Course
Semester	VI
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Describe Maxwell's equations, concepts of scalar & vector potentials, gauge transformations, Poynting theorem etc.	PSO-1, PSO-3	L3: Apply
CO-2	Explain electromagnetic wave propagations in unbounded and bounded media.	PSO-1	L2: Understand
CO-3	Analyze electromagnetic origin of wave Optics including Kirchhoff's integral theorem and Fresnel-Kirchhoff integral formula.	PSO-1	L2: Understand
CO-4	Illustrate Polarization of light in uniaxial and biaxial crystals, double refraction, retardation plates and rotatory polarization.	PSO-1	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC13P
Course Name	Electromagnetic Theory (Practical)
Course Type	Discipline Core Course
Semester	VI
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Verify Malus law for plane polarized light	PSO-2	L2: Understand
CO-2	Analyze elliptically polarized light using a Babinet's compensator.	PSO-2	L2: Understand
CO-3	Determine specific rotation of sugar using a Polarimeter, and wavelength & velocity of ultrasonic waves using ultrasonic grating.	PSO-2	L2: Understand
CO-4	Study polarization by reflection to obtain polarizing angle and V-I characteristics of p-n junction diode to evaluate Boltzmann constant.	PSO-2	L2: Understand

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC14T
Course Name	Statistical Mechanics (Theory)
Course Type	Discipline Core Course
Semester	VI
Credit	4

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Define macro & micro states, micro-canonical, canonical, grand-canonical ensembles and law of equipartition of energy.	PSO-1	L2: Understand
CO-2	Explain classical and quantum theories of thermal radiation.	PSO-1	L2: Understand
CO-3	Illustrate Bose-Einstein statistics including strongly degenerate Bose gas, B-E condensation, photon gas etc.	PSO-1	L3: Apply
CO-4	Describe Fermi- Dirac statistics including strongly degenerate Fermi gas, electron gas, specific heat etc.	PSO-1	L3: Apply

Program Name	B.Sc. Physics (Honours) CBCS
Course Code	DC14P
Course Name	Statistical Mechanics (Practical)
Course Type	Discipline Core Course
Semester	VI
Credit	2

COs	Upon completion of the course, students will be able to	Mapping with PSOs	Cognitive Level
CO-1	Perform computational analysis of the behaviour of a collection of particles under various initial conditions.	PSO-4	L4: Analyze
CO-2	Compute partition function numerically and study its variation under multiple scenarios.	PSO-4	L3: Apply
CO-3	Plot Planck's law for Black Body radiation and compare it with Raleigh- Jeans law at high and low temperatures.	PSO-2, PSO-5	L2: Understand
CO-4	Study variations of specific heat of solids with different distribution functions, and plot MB, BE & FD distributions with temperature.	PSO-2, PSO-5	L2: Understand