

Program Outcome (PO) and Course Outcome (CO) under LOCF/NCCF

Programme Offered: B.A./B.Sc./B.Com in Physics

Programme Outcomes (PO)	
PO1:	Develop a Strong Foundation in Core Physics Concepts.
PO2:	Enhance Analytical and Problem-Solving Skills.
PO3:	Improve Computational and Programming Abilities.
PO4:	Understand Applications of Physics in Technology and Industry.
PO5:	Develop Experimental and Research Skills

Programme Specific Outcome

PROGRAMME NAME	BSc. HONOURS IN PHYSICS
PROGRAMME SPECIFIC OUTCOME (PSO)	Undergraduate program in B.Sc. (Honours in Physics) is aimed to impart a complete knowledge in the basics of Physics and its application areas. After successful completion of the course, the employability of the students is increased and they become eligible to pursue higher education and research in Physics.

SEMESTER: I (NCCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Mechanics and General properties of Matter	BSCPHYMJ101	<p>CO1: Understand vector calculus, classical mechanics of single as well as system of particles within the scope the Newtonian formulation.</p> <p>CO2: Understand the dynamics of rigid body and concept of moment of inertia. Study of moment of inertia of different bodies and its applications.</p> <p>CO3: Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor in a driven system.</p> <p>CO4: Apply Kepler's laws to describe the motion of planets and satellite in circular orbit.</p> <p>CO5: Study the properties of matter, response of the classical systems to external forces and their elastic deformation and its applications and comprehend the dynamics of Fluid and concept of viscosity and surface tension along with its applications.</p>
2	Computer Programming in C / FORTRAN/ Python/ SciLab	BSCPHYSE101	<p>CO1: Understand Computer Architecture and Scientific Computing Fundamentals.</p> <p>CO2: Apply Programming Concepts for Scientific Computation.</p> <p>CO3: Develop Modular and Object-Oriented Programming Skills.</p>

3	Mechanics and General properties of Matter	BSCPHYMN101	<p>CO1: Understand vector calculus, classical mechanics of single as well as system of particles within the scope the Newtonian formulation.</p> <p>CO2: Understand the dynamics of rigid body and concept of moment of inertia. Study of moment of inertia of different bodies and its applications.</p> <p>CO3: Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor in a driven system.</p> <p>CO4: Apply Kepler's laws to describe the motion of planets and satellite in circular orbit.</p> <p>CO5: Study the properties of matter, response of the classical systems to external forces and their elastic deformation and its applications and comprehend the dynamics of Fluid and concept of viscosity and surface tension along with its applications.</p>
4	Physical Science	MDC101	<p>CO1: On completion of this course students should be able to demonstrate a comprehensive understanding of the fundamental concepts of matter, energy, gravity, and space, as well as their applications in various fields including medicine, communication, and modern storage technology.</p> <p>CO2: Students will also be able to critically analyze the universe's structure and evolution based on the Big Bang theory.</p>

			CO3: Additionally, they should have an awareness of the role of physics in everyday life and technological advancements.
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SEMESTER: II (NCCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Electricity and Magnetism	BSCPHYMJ201	CO1: Explain the properties of (i) the electric field produced due to charges at rest; (ii) the magnetic field produced due to steady current, both in free-space and inside matter. CO2: Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves. CO3: Understand the phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.
2	Electrical Circuits and Network Skill	BSCPHYSE201	CO1: Understand Basic Electrical Principles and Circuit Analysis. CO2: Interpret and Design Electrical Circuits and Diagrams. CO3: Gain Practical Knowledge of Electrical Machines and Protection Systems. CO4: Develop Hands-on Skills in Electrical Wiring and Troubleshooting.
3	Electricity and Magnetism	BSCPHYMN201	CO1: Explain the properties of (i) the electric field produced due to charges at rest; (ii) the magnetic

			<p>field produced due to steady current, both in free-space and inside matter.</p> <p>CO2: Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.</p> <p>CO3: Understand the phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits.</p>
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SEMESTER: III (NCCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Mathematical Methods of Physics	BSCPHYMJ301	<p>CO1: Use concepts of calculus and concepts of random variables.</p> <p>CO2: Solve differential equations of various types.</p> <p>CO3: Describe special functions and their recurrence relations.</p> <p>CO4: Do Fourier expansion and use Fourier transforms and delta function.</p> <p>CO5: evaluate some special integrals.</p>
2	Optics	BSCPHYMJ302	<p>CO1: Understand Interference as superposition of waves from coherent sources derived from same parent source.</p> <p>CO2: Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from aperture, understand Fraunhofer and Fresnel Diffraction.</p> <p>CO3: In the laboratory course, student will gain</p>

			hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc.
3	Fundamentals of Optics	BSCPHYMN301	CO1: Understand Interference as superposition of waves from coherent sources derived from same parent source. CO2: Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from aperture, understand Fraunhofer and Fresnel Diffraction. CO3: In the laboratory course, student will gain hands-on experience of using various optical instruments.
4	Indian Astronomy	MDC303	CO1: Understand the Historical Development of Indian Astronomy. CO2: Familiarize with Basic Astronomical Concepts and Terminology. CO3: Explore Indian Astronomical Texts and Calendrical Systems. CO4: Analyze Modern Indian Contributions to Astronomy.

SEMESTER: IV (NCCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Classical	BSCPHYMJ401	CO1: Explain the classical mechanics of particle

	Mechanics and Special Theory of Relativity		<p>under central force.</p> <p>CO2: Understand the Lagrangian and Hamiltonian formulations of classical mechanics. CO3: Explain the necessity of replacing Newtonian relativity through Einstein's special relativity, concept of space-time and elaborate on the classical mechanics of fast particles under the special relativity.</p>
2	Heat and Thermal Physics	BSCPHSMJ402	<p>CO1: Learn interrelation between pressure and molecular motion, and the concept of temperature as kinetic energy.</p> <p>CO2: Learn distribution of velocity, energy, their dependence on randomness of molecular motion, idea about dimension of molecules</p> <p>CO3: Learn about energy and momentum transport in gases</p> <p>CO4: Get the idea about the behaviours of real gases and intermolecular forces</p> <p>CO5: Can analyse one and three dimensional heat flow</p> <p>CO6: Learn about blackbody radiation and its applications.</p>
3	Scientific writing and Documentation	BSCPHSSE402	<p>CO1: Understand the fundamentals of TeX/LaTeX as a word processor for scientific and technical documentation.</p> <p>CO2: Learn Handling Data with Excel.</p> <p>CO3: Understand Graphical Visualization and Data Plotting.</p> <p>CO4: Hands-on experience in scientific documentation, data handling, and graphical</p>

			representation, enabling them to present technical content effectively.
4	Fundamentals of Thermal Physics	BSCPHSMN401	<p>CO1: Learn interrelation between pressure and molecular motion, and the concept of temperature as kinetic energy.</p> <p>CO2: Learn distribution of velocity, energy, their dependence on randomness of molecular motion, idea about dimension of molecules.</p> <p>CO3: Learn about energy and momentum transport in gases Get the idea about the behaviors of real gases and intermolecular forces.</p> <p>CO4: Learn about blackbody radiation and its applications.</p>

SEMESTER: V (LOCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Quantum Mechanics	BSCHPHSC501	<p>CO1: Explain the failures of classical theory in explaining different experiments of early twentieth century are discussed.</p> <p>CO2: Understand ideas of wave-particle duality, matter-wave.</p> <p>CO3: Explain how the importance of Schrodinger equation (time-dependent and time-independent) to demonstrate solutions of some systems for different proto-type</p>

			<p>potentials (1d and 3d).</p> <p>CO4: Understand the concepts of quantum (hermitian) operators and basis vectors.</p>
2	Thermal Physics- II	BSCHPHSC502	<p>CO1: Demonstrate a mastery of the core knowledge in the areas of Thermal Physics.</p> <p>CO2: Explain the concept of thermodynamic as an empirical description for the thermal properties of a macroscopic system.</p> <p>CO3: Understand the applications of thermodynamics and the theory of the phase-transitions are discussed.</p>
3	Nuclear and particle Physics	BSCHPHSDSE501	<p>CO1: Explain structure and properties of nuclei, the mechanism of different radioactive decays and their applications in peaceful use of nuclear energy.</p> <p>CO2: Understand what are the elementary particles that constitute this known universe.</p> <p>CO3: Gather capability of elementary problem solving in nuclear and particle physics.</p>
4	Atomic Physics and Spectroscopy	BSCHPHSDSE503	<p>CO1: Understand the concepts of atomic spectra and its origin using the old quantum theory whose consistency can be later verified by the direct application of the quantum mechanics.</p> <p>CO2: Account for theoretical models, terminology & working methods used in atomic and molecular physics.</p> <p>CO3: Carry out experimental and theoretical studies on atomic and molecular physics with</p>

			<p>focus on structure and dynamics of atoms and molecules.</p>
5	Modern Physics	BSCPPHSDSE501	<p>CO1: Understand the root in the development of modern physics.</p> <p>CO2: Understand the relationship between the real and reciprocal space and learn the Bragg's X-ray diffraction in crystals.</p> <p>CO3: Gain a hands-on learning experience by performing experiments on these properties of materials.</p> <p>CO4: Describe the behaviour of matter and energy at atomic and subatomic level</p>
6	Technical Drawing Skills	BSCPPHSSE501	<p>CO1: Know and understand the conventions and the method of engineering drawing.</p> <p>CO2: Interpret engineering drawings using fundamental technical mathematics.</p> <p>CO3: Construct basic and intermediate geometry.</p> <p>CO4: Improve their visualization skills so that they can apply the skill in developing new products.</p> <p>CO5: Improve their technical communication skill in the form of communicative drawings.</p> <p>CO6: Comprehend the theory of projection.</p>

SEMESTER: VI (LOCF)

COURSE OUTCOMES (CO)			
Sl No.	Course Name	Course Code	Course Outcomes(CO)
1	Statistical Mechanics	BSCHPHSC601	<p>CO1: Understand how probability theory can be used to derive relations between the microscopic and macroscopic properties of matter.</p> <p>CO2: Understand classical and quantum statistics and their application in different systems enable students to develop knowledge about how Bosonic and Fermionic systems behave.</p> <p>CO3: Realize how electrons behave in metals and semiconductors, and photons in blackbody radiations or phonons in solids.</p>
2	Condensed Matter Physics	BSCHPHSC602	<p>CO1: Understand the lattice structure in crystalline solids and their different properties (viz., dielectric, magnetic, electrical transport).</p> <p>CO2: Explain elementary idea on superconductivity.</p>
3	Applied Optics	BSCHPHSDSE601	<p>CO1: Understand the geometrical / ray optics through transfer matrix-formalism</p> <p>CO2: Acquire basic knowledge on different types of optical phenomena</p> <p>CO3: Realize the technological applications of optical phenomena as a background of the fiber optics, holography, LASER and photo-detectors.</p> <p>CO4: Analyze different laser systems and its applications in various fields.</p> <p>CO5: Conceptualize optical fiber, its construction and importance in communication physics.</p>

4	Classical Dynamics	BSCPHSDSE603	<p>CO1: Understand how the formulation of the Lagrangian and Hamiltonian mechanics comes through the calculus of variation.</p> <p>CO2: Get idea how small oscillations of isolated and coupled systems are studied through normal modes.</p> <p>CO3: Understand how the formulation of (special) relativistic mechanics comes through four-vectors and Minkowski cone.</p>
5	Basic Electronics	BSCPPHSDSE601	<p>CO1: Understand both in analog and digital electronics.</p> <p>CO2: Design several electronic devices thorough the knowledge on electronic circuit, semiconductor and its properties</p>
6	Computational Physics	BSCPPHSSE601	<p>CO1: Use computer programming language FORTRAN for solving the problems in physics through programming.</p> <p>CO2: Prepare manuscript for scientific publication using Latex.</p> <p>CO3: Visualize numerical data using Gnuplot software.</p>

Durgapur Government College						
Mapping/Co-relation Program Outcome(PO) & Course Outcome(CO)						
Department : Physics Academic Session : 2024-25						
CO details	PO details					
Sl. No.	Course Code	PO1	PO2	PO3	PO4	PO5
1.	Mechanics and General properties of Matter	✓	✓	✓		✓
2.	Computer Programming in C / FORTRAN/ Python/ SciLab	✓	✓	✓	✓	✓
3.	Mechanics and General properties of Matter		✓	✓	✓	✓
4.	Physical Science	✓	✓	✓		✓
5.	Electricity and Magnetism	✓		✓	✓	✓
6.	Electrical Circuits and Network Skill		✓	✓	✓	✓
7.	Electricity and Magnetism	✓	✓	✓	✓	✓
8.	Mathematical Methods of Physics		✓	✓	✓	✓
9.	Optics	✓	✓	✓		✓
10.	Fundamentals of Optics	✓	✓	✓	✓	✓
11.	Indian Astronomy		✓	✓	✓	✓
12.	Optics	✓	✓	✓		✓
13.	Classical Mechanics and Special Theory of Relativity	✓		✓	✓	✓
14.	Heat and Thermal Physics	✓	✓	✓		✓

Sl. No.	Course Code	PO1	PO2	PO3	PO4	PO5
15.	Scientific writing and Documentation	✓	✓	✓	✓	✓
16.	Fundamentals of Thermal Physics		✓	✓	✓	✓
17.	Quantum Mechanics	✓	✓	✓	✓	✓
18.	Thermal Physics- II		✓	✓	✓	✓
19.	Nuclear and particle Physics	✓	✓	✓		✓
20.	Atomic Physics and Spectroscopy	✓	✓	✓	✓	✓
21.	Modern Physics		✓	✓	✓	✓
22.	Technical Drawing Skills	✓	✓	✓		✓
23.	Statistical Mechanics	✓	✓	✓	✓	✓
24.	Condensed Matter Physics		✓	✓	✓	✓
25.	Applied Optics	✓	✓	✓		✓
26.	Classical Dynamics	✓	✓	✓	✓	✓
27.	Basic Electronics		✓	✓	✓	✓
28.	Computational Physics	✓	✓	✓		✓