

DEPARTMENT OF PHYSICS

BSc PROGRAMME WITH HONOURS IN PHYSICS

(CBCS)

COURSE OUTCOME

COURSE CODE	COURSE TITLE	OBJECTIVE	COURSE OUTCOMES
PHYSICS-C-I	MATHEMATICAL PHYSICS – I	<ol style="list-style-type: none">1. Write a problem in Physics in the language of Mathematics.2. Identify a range of diverse mathematical techniques to formulate and solve a problem in basic Physics.3. Analyze some of the basic mathematical concepts and methods.4. Apply the knowledge and understanding of these mathematical methods to solve problems in a number of elementary branches of Physics like mechanics, electromagnetic theory, statistical Physics, thermal Physics etc.5. Learn computer programming and numerical analysis and know its role in solving problems in Physics.6. Construct a problem in	<ol style="list-style-type: none">1. Develop the requisite mathematical skills of a student to understand the fundamental topics in Physics.2. Develop the ability of a student to critically analyze a topic.3. Prepare a student for more advanced topics in Physics by providing a solid grip over the fundamental concepts in Physics.4. Demonstrate the use and importance of computational methods in Physics and enable a student to construct a Physics problem computationally.

		Physics computationally	
PHYSICS-C-II	MECHANICS	<p>1. Understand the basic concepts and ideas in mechanics- e.g. motion, force and torque, mass and moment of inertia, linear and angular momentum, kinetic energy and potential energy etc. by parallel studies of linear dynamics and rotational dynamics.</p> <p>2. Understand the basic conservation laws by studying them in various mechanical systems including collisions, oscillations, gravitational systems etc.</p> <p>3. Analyze simple harmonic oscillator in detail</p> <p>4. Study planetary motions as a central force problem.</p> <p>5. Understand the concept of frame of reference, importance of relative transformations and invariance of laws of Physics.</p> <p>6. Realize the consequences of non-inertial frame in our real physical world.</p> <p>7. Know about the peculiar</p>	<p>1. Introduce the students to the basic concepts of mechanics.</p> <p>2. Enable the students to understand conservation laws as they are the fundamental laws of nature and will help them in realizing a crucial phenomenon of nature- symmetry.</p> <p>3. Enable the students to understand simple harmonic oscillator as it is a unique mechanical problem and will help them to understand the advanced treatment in quantum mechanics and modern Physics.</p> <p>4. Develop knowledge of special relativity to understand relativistic formulation of modern theories.</p> <p>5. Develop knowledge of mechanics which will help students in their everyday life.</p>

		phenomena of special relativity which are not seen in Newtonian relativity and to understand the concept of space-time.	
PHYSICS-C-III	ELECTRICITY AND MAGNETISM	<ol style="list-style-type: none"> 1. Gain basic knowledge of electricity and magnetism. 2. Understand the electrical and magnetic properties of matter in brief. 3. Understand the effect of electric field on magnetic field and the effect of magnetic field on current. 4. Understand the basic principle of the electrical circuit (AC) circuit and electrical networking. 5. Acquire the basic theoretical as well as experimental skill on electrical networking. 	<ol style="list-style-type: none"> 1. Develop the basic theoretical knowledge as well as experimental skills of the students on electrical networking. 2. Train the students to handle and repair instruments based on electric and magnetic field effects.
PHYSICS-C-IV	WAVES AND OPTICS	<ol style="list-style-type: none"> 1. Learn the basics of wave motion. 2. Know about the behaviour of light due to its wave nature. 3. Identify and understand different phenomena due to the interaction of light with light and matter. 4. Analyze some of the 	<ol style="list-style-type: none"> 1. Enable the students to analyze different phenomena due to the interaction of light with light and matter. 2. Train the students to use different optical instruments. 3. Help the students to understand various natural phenomena using different

		fundamental laws and principles of light which is used in many important optical instruments.	apparatus in the laboratory.
PHYSICS-C-V	MATHEMATICAL PHYSICS – II	<ol style="list-style-type: none"> 1. Write a problem in Physics (slightly more advanced than those in Mathematical Physics I) in the language of Mathematics. 2. Identify a range of diverse mathematical techniques to formulate and solve a problem in basic Physics. 3. Analyze some of the useful mathematical methods. 4. Apply the knowledge and understanding of these mathematical methods to solve problems in a number of fundamental topics in Physics. 5. Construct a problem in Physics computationally. 	<ol style="list-style-type: none"> 1. Develop the requisite mathematical skills to understand some of the fundamental topics (slightly more advanced than those in Mathematical Physics I) in Physics. 2. Develop the ability of a student to critically analyze a topic. 3. Prepare a student for more advanced topics in Physics by providing a solid grip over the fundamental concepts in Physics. 4. Enable a student to understand the use and importance of computational / numerical methods in Physics and enable a student to construct a Physics problem computationally.
PHYSICS-C-VI	THERMAL PHYSICS	<ol style="list-style-type: none"> 1. Develop knowledge on the classical laws of thermodynamics and their application 2. Use the knowledge of 	<ol style="list-style-type: none"> 1. Apply the laws of thermodynamics in real world problems. 2. Conduct scientific problems and experiments on thermodynamics and allied disciplines.

		<p>thermodynamics in various applications in allied fields like Materials science, Condensed matter Physics, Atmospheric Physics, Solar Physics, etc.</p> <p>3. Probe questions in varied fields of Physics, chemistry and biology based on principles of Thermal Physics.</p> <p>4. Use the concept of thermodynamics in real world experiences</p> <p>5. Develop critical and analytical thinking of the student on thermodynamics and allied disciplines</p>	<p>3. Demonstrate a working knowledge of the physical principles in Thermal Physics.</p>
PHYSICS-C-VII	DIGITAL SYSTEMS AND APPLICATIONS	<p>1. Know about the basic laboratory equipment electronics.</p> <p>2. Understand basic digital electronics concepts and devices.</p> <p>3. Analyze digital circuits.</p>	<p>1. Identify and understand digital electronic principles and systems.</p> <p>2. Apply the knowledge to analyze and apply digital circuits in solving circuit level problems.</p> <p>3. Build real life applications using digital systems.</p>
PHYSICS-C-VIII	MATHEMATICAL PHYSICS-III	<p>1. Write a problem in Physics (slightly more advanced than</p>	<p>1. Develop mathematical skills of a student to understand some of the fundamental</p>

		<p>those in Mathematical Physics I and II) in the language of mathematics.</p> <p>2. Identify a range of diverse mathematical techniques/ideas to formulate, simplify and solve some problems in Physics.</p> <p>3. Analyze some of the useful mathematical ideas and techniques.</p> <p>4. Apply the knowledge and understanding of these mathematical methods to solve problems in a number of fundamental topics in Physics.</p> <p>5. Construct a problem in Physics computationally and use simulations to design an experiment.</p>	<p>topics (slightly more advanced than those in Mathematical Physics I and II).</p> <p>2. Develop the ability of a student to critically analyze a topic.</p> <p>3. Prepare a student for more advanced topics in Physics by providing a solid grip over the fundamental concepts in Physics.</p> <p>4. Enable a student to understand the use and importance of computational/numerical methods in Physics and to construct a problem computationally.</p> <p>5. Help a student to pursue advanced studies in Physics.</p>
PHYSICS-C-IX	ELEMENTS OF MODERN PHYSICS	<p>1. Understand the theoretical basis for the understanding of quantum Physics as the basis for dealing with microscopic phenomena.</p> <p>2. Apply concepts of 20th Century Modern Physics to</p>	<p>1. Understand and appreciate the theory of modern physics</p> <p>2. Develop the ability to apply it in solving simple problems in Quantum Mechanics (QM), structure of atoms, Laser, and Nuclear Physics.</p>

		<p>deduce the structure of atoms.</p> <p>3. Explain the wave-particle duality of the photon.</p> <p>4. Analyze the structure of matter at its most fundamental.</p> <p>5. Develop insight into the key principles and applications of Nuclear Physics</p>	
PHYSICS-C-X	ANALOG SYSTEMS AND APPLICATIONS	<p>1. Know about the basics of semiconductor PN junction, its various types and its application to different electronic circuits.</p> <p>2. Understand bipolar junction transistor and its applications as amplifier and oscillators.</p> <p>3. Familiarize with operational amplifiers, its applications and analysis.</p> <p>4. Develop knowledge about analog to digital and digital to analog conversion techniques</p>	<p><input type="checkbox"/> <input type="checkbox"/> Learn the foundation knowledge of analog electronic systems.</p> <p>2. Learn the working and applications of PN junction and bipolar junction transistors (BJT).</p> <p>3. Learn to analyze circuits containing PN junction and BJT along with the application of BJT as amplifiers and oscillators.</p> <p>4. Develop basic knowledge of operational amplifier and its applications</p>
PHYSICS-C-XI	QUANTUM MECHANICS AND APPLICATIONS	<p>1. Know about the development of modern</p>	<p>1. Learn how to apply quantum mechanics to solve physical systems in different areas</p>

		<p>Physics and the theoretical formulation of quantum mechanics.</p> <p>2. Know the applications of quantum mechanics in solving physical problems.</p>	<p>of science.</p> <p>2. Know about the physical behavior of materials.</p> <p>3. Learn how the scientific behavior of materials can be used for human applications.</p>
PHYSICS-C-XII	SOLID STATE PHYSICS	<p>1. Familiarize with fundamentals of Solid State Physics.</p> <p>2. Know about the structural, electronic and lattice vibration dependent behaviour of solids.</p> <p>3. Learn the basic concepts in hands on mode through laboratory experiments associated with the course.</p>	<p>1. Equip a student with basic concepts of solid state Physics so that the knowledge can be applied for further development of the subject.</p> <p>2. Enable a student to work in both theoretical and experimental aspects of solid state Physics.</p> <p>3. Help the students in thorough learning of the concepts associated to the course through the laboratory experiments.</p>
PHYSICS-C-XIII	ELECTROMAGNETIC THEORY	<p>1. Understand the physical and mathematical principles to provide in-depth analysis of the behavior of electricity and magnetism in matter.</p> <p>2. Apply Maxwell's equations to explain the properties of the electromagnetic wave and its interaction with matter.</p> <p>3. Analyze the principles and</p>	<p>1. Solve problems relevant to interfaces between media with defined boundary conditions.</p> <p>2. Use Maxwell's equations to describe the behaviour of electromagnetic waves in vacuum as well as medium.</p> <p>3. Describe states and methods of polarization and analyze the polarization state of a light source.</p>

		processes related to polarization, interference, and diffraction along with their applications to the development of wave-guide and optical fibers.	
PHYSICS-C-XIV	STATISTICAL MECHANICS	<p>1. Introduce the basic concepts of Statistical Mechanics so that students will be able to cope-up with higher level of such course in future.</p> <p>2. Develop the critically thinking ability of students to understand the diverse physical phenomena.</p> <p>3. Develop the interest and ability among students to solved challenging physical problems by the application of techniques of Statistical Mechanics in future.</p>	<p>1. Equip the students with basic knowledge of the Statistical Mechanics and hence will be able to look critically for analyzing any physical phenomena.</p> <p>2. Create interest to the subject to pursue further higher study in future.</p> <p>3. Enable the students to solve any challenging physical problem in statistical mechanics</p>
PHYSICS DSE -I	CLASSICAL DYNAMICS	<p>1. Understand the underlying facts in the development of classical mechanics and the advantages of its formulation over Newtonian mechanics.</p> <p>2. Describe mechanics of a system in terms of equation of motion.</p>	<p>1. Prepare for the study of modern Physics.</p> <p>2. Develop basic theoretical ingredients necessary to study advanced theoretical courses like quantum mechanics.</p> <p>3. Learn a number of mathematical techniques applicable to Physics problems in different areas.</p>

		<p>3. Understand Lagrangian formulation and Hamiltonian formulation of mechanics and their applications in mechanical problems.</p> <p>4. Study the theoretical analysis of systems oscillating with small amplitudes.</p> <p>5. Observe the peculiar phenomena when transformed from Newtonian relativity to special relativity and to understand the concept of space-time.</p>	<p>4. Develop knowledge of special relativity which is essential to understand the relativistic formulation of modern theories.</p>
PHYSICS DSE -2	PHYSICS OF DEVICES AND INSTRUMENTS	<p>1. Know about various devices like UJT, FET, MOSFET, CMOS etc. and its application to different electronic circuits.</p> <p>2. Design rectifiers, passive and active filters, multivibrators etc.</p> <p>3. Familiarize with the IC fabrication techniques.</p> <p>4. Learn about digital data communication standards and</p>	<p>1. Develop knowledge about various devices like UJT, FET etc. and to use these devices for different applications.</p> <p>2. Design and analyse filter circuits, power supply FET amplifiers etc.</p> <p>3. Develop the basic knowledge of IC fabrications, data communication standards and communication systems.</p>

		also about communication systems.	
	ASTRONOMY AND ASTROPHYSICS	<ol style="list-style-type: none"> 1. Introduce the fundamental concepts of Astrophysics to the interested students. 2. Motivate students to pursue the further study in future in these challenging, fascinating and important fields of Physics. 	<ol style="list-style-type: none"> 1. Equip the students with basic knowledge of the Astrophysics. 2. Create interest to the subjects of Astrophysics and to pursue further higher studies in the subject concerned in future. 3. Develop the critically analyzing ability, which may motivate the students to solve any challenging physical problem in future.
	PHYSICS OF EARTH	<ol style="list-style-type: none"> 1. Acquire knowledge on origin and evolution of the Earth and Universe 2. Acquire knowledge on structure, composition and dynamics of the Earth from crust up to space. 3. Understand the interaction among different components of the Earth. 4. Get familiar with the weather and climate systems, climate change. 5. Increase people awareness of the scientific process of the 	<ol style="list-style-type: none"> 1. Develop critical and quantitative thinking of scientific issues related to the study of cosmology and Earth Sciences. 2. Understand the basic principles of various processes of the Earth. 3. Apply the acquired knowledge on the study of the Universe 4. Pursue career in Earth Sciences, Cosmology etc. 5. Understand the contemporary dilemmas on Earth and Environmental issues like climate change, air pollution, deforestation etc.

		Earth and its role in the exploration of the Universe.	
PHYSICS DSE -3	NUCLEAR AND PARTICLE PHYSICS	<p>1. Understand various concepts in Nuclear Physics.</p> <p>2. Emphasize on the existing connections with other domains of Physics, in particular Quantum Mechanics, Mathematical Physics and Particle Physics.</p>	<p>1. Develop knowledge regarding nuclear and elementary particle as well as properties and phenomena related to them.</p> <p>2. Successfully apply the same knowledge in solving problems in the field of nuclear and particle Physics.</p>
PHYSICS DSE -4	NANO MATERIALS AND APPLICATION	<p>1. Provide a systematic coverage and insight into the promising area of nano materials in order to facilitate the understanding of the nature and prospects for the field.</p> <p>2. Provide information about various synthesis and characterization techniques of nano materials.</p> <p>3. Discuss optical and electronic transport properties of nano materials.</p> <p>4. Discuss applications of</p>	<p>1. Gather sufficient knowledge about the fascinating behaviour of nanomaterials and tuning of such properties for different applications.</p> <p>2. Obtain information on experimental methodologies with necessary theoretical background, which may be useful for pursuing further study on the areas of nanoscience and technology.</p>

		nano materials.	
	EXPERIMENTAL TECHNIQUES	<p>1. Enhance experimental knowledge.</p> <p>2. Develop the theoretical as well as experimental knowledge of different instruments and instrumentation.</p> <p>3. Enhance the knowledge of some measurement techniques and data and error analysis technique.</p>	<p>1. Develop the theoretical as well as experimental knowledge on different instruments and instrumentation.</p> <p>2. Develop the knowledge of some measurement techniques and data and error analysis technique, which is very essential for a Physics student.</p> <p>3. Handle different electrical network based instruments.</p>

BSc PROGRAMME WITH HONOURS IN OTHER SUBJECT
AND
PHYSICS AS GENERIC ELECTIVE
(CBCS)
COURSE OUTCOME

COURSE CODE	COURSE TITLE	OBJECTIVE	COURSE OUTCOMES
PHYSICS-GE-1	MECHANICS	<p>1. Understand the basics of vector algebra and the techniques of solving ordinary differential equations.</p>	<p>1. Develop basic knowledge of mechanics as it is helpful to study any other course in science discipline.</p> <p>2. Develop knowledge of vector algebra</p>

		<p>2. Understand the basic components of mechanics- e.g. motion, force and torque, mass and moment of inertia, linear and angular momenta, kinetic energy and potential energy etc. and the conservation theorems.</p> <p>3. Study the mechanics of gravitational systems and simple harmonic motion.</p> <p>4. Study the elastic behaviour of materials.</p> <p>5. Realize the idea of frame of reference and its implications in the study of special relativity.</p>	<p>and differential equations which will help students in the study of theoretical courses in science.</p> <p>3. Acquire useful knowledge about material science.</p> <p>4. Explain the abstract idea of 4-dimensional world to students which are not from physics discipline.</p>
PHYSICS-GE-2	ELECTRICITY AND MAGNETISM	<p>1. Understand basic knowledge of electricity and magnetism.</p> <p>2. Understand basic knowledge of electrical and magnetic properties of matter in brief.</p> <p>3. Understand the basic knowledge of the effect of electric field on magnetic</p>	<p>1. Perform quantitative analyses of basic problems in Electrostatics and Magnetodynamics.</p> <p>2. Apply Gauss's Law, Ampere's Law, and Biot-Savart Law to solving practical problems in electricity and magnetism.</p> <p>3. Apply the fundamental laws of electromagnetism to solve problems of electrostatics, magnetostatics, and electromagnetic induction</p>

		<p>field and the effect of magnetic field on current.</p> <p>4. Understand the basic principle of the electrical circuit (AC) circuit and electrical networking.</p> <p>5. Develop the basic theoretical as well as experimental skill on electrical networking.</p>	<p>4. Explain and analyze the behaviour of alternating currents in LCR circuits.</p> <p>5. Perform and interpret the results of simple experiments and demonstrations of physical principles.</p> <p>6. Solve problems relevant to interfaces between media with defined boundary conditions.</p>
PHYSICS-GE-3	THERMAL PHYSICS AND STATISTICAL MECHANICS	<p>1. Develop the working knowledge of the laws and methods of thermodynamics and elementary statistical mechanics.</p> <p>2. Provide insight to the postulates of Statistical Mechanics and statistical interpretation of thermodynamics</p> <p>3. Understand the laws of radiation and acquire knowledge for their applications in various disciplines in Physics, Chemistry, Biology, Earth and Atmospheric Sciences.</p> <p>4. Develop application</p>	<p>1. Apply laws of thermodynamics and statistical mechanics to a range of situations in real world problems.</p> <p>2. Conduct scientific problems and experiments on thermodynamics and allied disciplines .</p> <p>3. Demonstrate a working knowledge of the physical principles describing the thermal physics..</p> <p>4. Explain thermal physics as logical consequences of the postulates of statistical mechanics</p>

		<p>oriented knowledge on laws of statistical mechanics in selected problems</p> <p>5. Use the methodologies, conventions and tools of thermal and statistical physics to test and communicate ideas and explanation</p>	
PHYSICS-GE-4	WAVES AND OPTICS	<p>1. Learn the basic ideas of the behaviour of light based on its wave nature.</p> <p>2. Develop the knowledge of the different phenomena due to the interaction of light among them and with mater.</p> <p>3. Learn about some fundamental principles of light which is used in different optical instrument which very essential for Physics student.</p>	<p>1. Justify different phenomena due to light and the interaction of light among them and with matter.</p> <p>2. Use different optical instruments.</p> <p>3. Produce different natural phenomena using different apparatus in the laboratory</p>