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## **PROGRAMME, PROGRAMME SPECIFIC & COURSE OUTCOMES 2016-17**

### **B.Sc. (Physics)**

#### **Programme Outcomes (PO)**

1. Students will demonstrate an understanding of core knowledge in physics, including the major premises of mechanics, E&M, and Modern Physics.
2. Students will demonstrate written and oral communication skills in communicating physics-related topics.
3. Students will design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes.
4. Students will demonstrate a thorough understanding of the analytical approach to modeling physical phenomena.

#### **Programme Specific Outcomes (PSO)**

1. Understand the core concept of physics subjects.
2. Acquire analytical and logical skill for higher education.
3. Confident to take up competitive exams.
4. Students will demonstrate an understanding of the impact of physics and science on society.

## Course Outcomes (CO)

S.NO	SEMESTER	COURSE	OUTCOME
1	I	Mechanics	<ul style="list-style-type: none"> <li>Students can recognize the different force systems, moments, and couples with which they are familiar in day-to-day life.</li> </ul>
2	II	Thermal Physics	<ul style="list-style-type: none"> <li>They will understand the principle of kinetic theory, the basic principle, and laws of thermodynamics, and also the concepts of Entropy. They will be able to use thermal and statistical principles in a wide range of applications</li> </ul>
4	III	Properties of matter and Sound	<ul style="list-style-type: none"> <li>Will gain knowledge about elasticity, surface tension, viscosity, and their physical application.</li> <li>Students will analyze and comprehend the strength of solid materials of different sizes.</li> </ul>
5		Space Science	<ul style="list-style-type: none"> <li>Students will have the concept of the stellar coordinate system, distance measurement, and stellar classification. They will understand the basics of cosmology and the dynamics of an expanding universe.</li> </ul>
6	IV	Optics	<ul style="list-style-type: none"> <li>Students will understand the physics behind the various optical phenomenon which is happening in their surroundings. Pursue knowledge about laser, holography, optical fibers, and their application will be acquired by the students.</li> </ul>
7	V	Electricity and Magnetism	<ul style="list-style-type: none"> <li>Students will acquire basic knowledge of the electric field, electrostatic energy, and magnetic field.</li> </ul>
8		Basic Electronics	<ul style="list-style-type: none"> <li>Students will learn about the significance of electric components, various devices, and how they will operate.</li> </ul>
9		Solid State Physics	<ul style="list-style-type: none"> <li>The students will know about the structure of a solid, magnetic, dielectric, and superconductivity.</li> </ul>
10		Energy Physics	<ul style="list-style-type: none"> <li>It will enable students to understand various renewable energy technologies and create awareness among students about non-conventional sources of energy technologies.</li> </ul>

11	VI	Bio - Medical Instrumentation	<ul style="list-style-type: none"> <li>This course will provide students with the knowledge necessary to understand the working of most common biomedical equipment like ECG, EEG machines, etc.</li> </ul>
12		Digital Electronics	<ul style="list-style-type: none"> <li>Students will get an insight about the basic introduction of digital electronics. They will learn to convert different type of codes and number systems which are used in digital communication and computer systems.</li> </ul>
13		Atomic Physics	<ul style="list-style-type: none"> <li>Students will learn the atoms' electron structure in-depth. They understand time-independent perturbation theory that includes derivation, Stark-Effect, and Zeeman Effect.</li> </ul>
14		Nuclear Physics	<ul style="list-style-type: none"> <li>They will gain a clear picture of the nuclear composition and various nuclear models</li> <li>They will gain deep knowledge about Radioactivity, Nuclear Fission, and Nuclear Fusion, the relevance of nuclear transformation.</li> </ul>
15		Quantum Mechanics and Relativity	<ul style="list-style-type: none"> <li>Students will be able to pinpoint the historical aspects of the development of quantum mechanics. They will Understand the idea of the wave function and the uncertainty relations.</li> <li>The students will be familiar with the fundamental principles of the general theory of relativity.</li> </ul>
16		Electronics and Communication	<ul style="list-style-type: none"> <li>They will understand and identify the fundamental concepts and various components of analog communication systems. They will learn the compenence of a communication system and the modulation and its need.</li> </ul>
17		Electrical Appliances	<ul style="list-style-type: none"> <li>Students will be able to state how different electrical appliances operate. Additionally, students will be aware of how technology has evolved.</li> </ul>
18		Microprocessor and its applications	<ul style="list-style-type: none"> <li>Students will be familiar with the architecture and the instruction set of an Intel microprocessor. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces.</li> </ul>

### Programme Outcomes (PO)

1. The students will obtain good knowledge in Physical Sciences. They will be trained to compete national level tests like UGC-CSIR NET, JEST, GATE, etc., successfully.
2. Understanding the basic concepts of physics particularly concepts in classical mechanics, quantum mechanics, statistical mechanics and electricity and magnetism to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws through logical and mathematical reasoning.
3. Learn to carry out experiments in basic as well as certain advanced areas of physics such as nuclear physics, condensed matter physics, nanoscience, lasers and electronics. Understand the basic concepts of certain sub fields such as nuclear and high energy physics, atomic and molecular physics, solid state physics, plasma physics, astrophysics, general theory of relativity, nonlinear dynamics and complex system.
4. They will be prepared to take up challenges as globally competitive physicists/researchers in diverse areas of theoretical and experimental physics.
5. They will be technically and analytically skilled enough to pursue their further studies.
6. They will have a sense of academic and social ethics.
7. They will be capable of taking up higher studies of interdisciplinary nature.
8. They will be able to recognize the need for continuous learning and develop throughout for the professional career.

## Programme Specific Outcomes (PSO)

1. Gain hands on experience to work in applied fields.
2. Gain a through grounding in the subject to be able to teach it at college as well as school lever.
3. Viewing physics as a training ground for the mind developing a critical attitude and the faculty of logical reasoning that can be applied to diverse fields.
4. Apply theoretical knowledge of principles and concepts of Physics to practical problems.
5. Use mathematical techniques and interpret mathematical models of physical behavior.
6. To equip the students for seeking suitable careers in Physics.
7. Perform basic, applied and collaborative research.
8. Enhance pedagogical and scientific writing skills through modern methods.
9. Enhance National and International competency.
10. Kindle entrepreneurial skills and lifelong learning.
11. Become socially and environmentally responsible citizens.

## Course Outcomes (CO)

S.NO	SEMESTER	COURSE	OUTCOME
1	I	Classical & Statistical Mechanics	<ul style="list-style-type: none"> <li>• Students will know the classical background of Quantum mechanics and get familiarized with Poisson brackets and Hamilton -Jacobi equation. They will able to realize model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations. They will gain the knowledge of statistical system and its co-ordinate together with application of MB, FD and BE statistics.</li> </ul>

2		Mathematical Physics	<ul style="list-style-type: none"> <li>The students will be able to understand and apply the mathematical skills to solve quantitative problems in the study of physics. The course will enable students to apply integral transform to solve mathematical problems of interest in physics.</li> </ul>
3		Quantum Mechanics-I	<ul style="list-style-type: none"> <li>The students will be capable to formulate and solve problems in quantum mechanics using Dirac representation. The students will be able to grasp the concepts of spin and angular momentum, as well as their quantization and addition rules. The students will be familiar with various approximation methods applied to atomic, nuclear and solid-state physics.</li> </ul>
4		Nano Science & Technology	<ul style="list-style-type: none"> <li>Students will be able to explain methods of fabricating nanostructures. Students will have achieved the ability to explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials at nanoscale.</li> </ul>
5		Electronics	<ul style="list-style-type: none"> <li>Students will acquire knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor and be able to use it in electronic circuits. They will elucidate and design the linear and non-linear applications of an OP-AMP.</li> </ul>
6	II	Electromagnetic Theory	<ul style="list-style-type: none"> <li>Students will gain knowledge for the calculation of electric and magnetic field due to various charge and current distributions and Knowledge of propagation of electromagnetic energy through transmission lines and the design of propagation medium based on the requirements.</li> </ul>
7		Condensed Matter Physics	<ul style="list-style-type: none"> <li>They will get clear concept of the crystal classes and symmetries and to understand the relationship between the real and reciprocal space. The students will be able to formulate basic models for electrons and lattice vibrations for describing the physics of crystalline materials and develop an understanding of relation between band structure and the electrical properties of a material.</li> </ul>

8		X-ray Crystallography & Bio Physics	<ul style="list-style-type: none"> <li>Students will become familiar with the types of information that x-ray diffraction can provide on the structure of a wide variety of samples. They will learn to interpret real data and extract structural information and will gain a greater insight into their own characterization problems.</li> </ul>
9	III	Computational Methods & Programming	<ul style="list-style-type: none"> <li>Students will learn the basics of different types of programming and understand the building blocks of the C++ program. They have developed algorithms and implemented programs using C++ language for various numerical methods</li> </ul>
10		Microprocessor & Microcontroller	<ul style="list-style-type: none"> <li>The course will intend to impart knowledge of Microprocessors and microcontrollers to enable students gain the knowledge of basics of Modern computation. They will be able to design circuits for various applications using microprocessor.</li> </ul>
11		Nuclear and Particle Physics	<ul style="list-style-type: none"> <li>The students will have an understanding of the structure of the nucleus, radioactive decay and nuclear reactions with matter. They will be able to analyze the energy released by the nucleus during the fission and fusion process.</li> </ul>
12		Materials Synthesis and Characterization	<ul style="list-style-type: none"> <li>This course will develop an understanding of different materials systems and know the origins of physical, chemical and functional properties of different materials and they will study the basic principles of synthesis and characterization of materials.</li> </ul>
13		Molecular spectroscopy	<ul style="list-style-type: none"> <li>Students will gain knowledge about the rotational, vibrational and Raman spectroscopy of molecules. Able to comprehend the instrumentation techniques that are used in different regions of spectra. They will understand NMR spectra and visualize the physical phenomenon</li> </ul>
14	IV	Quantum Mechanics – II	<ul style="list-style-type: none"> <li>The students will be able to use the perturbation theory and variational approach to solve questions in atomic physics. Also they will learn the principles of adiabatic approximation and use these principles to explain time evolution in simple quantum systems.</li> </ul>

15		Communication Electronics	<ul style="list-style-type: none"> <li>Students will be able to analyze the antenna arrays, aperture antenna and special antennas such as frequency independent and broad band. They will get ability to discriminate between antennas on the basis of their electrical performance.</li> </ul>
16		Optoelectronics	<ul style="list-style-type: none"> <li>Use principles of physics, Students will be able to analyze and design the optoelectronic components like LEDs, lasers, photodiodes, and photovoltaics.</li> </ul>



### Programme Outcomes (PO)

1. Enable the students to analyze problems starting from first principles, evaluate and validate experimental results, and draw logical conclusions.
2. Prepare and motivate the students to advance their research careers to a doctoral degree, pursue careers in academics and industries.
3. As technology exploits the rules of physics, students properly trained in physics. Research can be good value addition in the field of technology too.
4. To equip students with essential knowledge and skills required for taking up multidimensional responsibilities in research.
5. To prepare students through systematic study and research towards contributing to the development of educational literature and leading to the growth of education as a discipline.
6. To develop a set of core skills in students to work with efficiency in the areas of teaching and learning.

### Programme Specific Outcomes (PSO)

1. Understand the mysteries of nature in terms of the fundamental principles, hypotheses and laws of physics.
2. Inculcate logical reasoning among the students and help them develop such skills as to quantitatively solve a problem.
3. Train the students over a wide range of analytical, experimental and computational techniques that can be applied in physics, in other scientific and technological domains.
4. Develop problem solving skills, ability of independent thinking and nurture creativity.
5. Mature as a researcher having reasonably good communication skills.
6. Transformation of Post Graduate students into research scholars. Understanding of research process, its design and ethical issues involved in research.
7. Sharpened abilities to analyse information.

8. Ability to critically examine research documentation and publication in SCI/SCI expanded journals. Submission of a thesis at the end of the programme.

### Course Outcomes (CO)

S.NO	SEMESTER	COURSE	OUTCOME
1	I	Scientific Research and Methodology	<ul style="list-style-type: none"> <li>Students will be able to understand some basic concepts of research and its methodologies. They will identify various sources of information for literature review and develop skills in qualitative and quantitative data analysis and presentation. They will get an idea how to write a research report and thesis.</li> </ul>
2		Advanced Physics	<ul style="list-style-type: none"> <li>This course will improve the basic concepts of core areas of Physics especially in mathematical Physics, X-ray Crystallography, Lasers and Non Linear Optics, Vibrational Spectroscopy and Crystal Growth and Thin Film Physics for unraveling the diverse phenomena observed in nature.</li> </ul>