

B. Sc. (Hons.) Physics

Program Outcomes

Graduate Attributes in B. Sc. (Hons.) Physics

After completing this program (under CBCS), the students will be able to prepare a progressive mindset by developing following attributes, qualities and skills:

•Disciplinary knowledge:

- (i) Comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in core areas of Physics -like Classical and Quantum mechanics, Thermodynamics and Statistical mechanics, Electricity, Magnetism and Electromagnetic theory, Wave Theory, Optics, Solid State Physics, and Analogue and Digital electronics; and in the chosen disciplinary elective sub-fields of the subject like Nuclear and Particle Physics, Analytical dynamics, Astronomy and Astrophysics, Advanced Mathematical Physics, Nanophysics and interdisciplinary subfields like Biophysics, Geophysics, Atmospheric Physics, Medical Physics, Embedded Systems, etc.
- (ii) Ability to use physics laboratory methods and modern instrumentation for designing and implementing new experiments in physics, interdisciplinary/multidisciplinary research areas and industrial research.

• Skilled communicator:

Ability to transmit abstract concepts and complex information relating to all areas in Physics in a clear and concise manner through scientific report writing. Ability to express complex relationships and information through graphical methods and proper tabulation. Ability to explain complex processes through simulation and modelling. Ability to express complex and technical concepts orally in a simple, precise and straightforward language for better understanding.

• Critical thinking:

Ability to distinguish between relevant and irrelevant facts and information, discriminate between objective and biased information, apply logic to arrive at definitive conclusions, find out if conclusions are based upon sufficient evidence, derive correct quantitative results, make rational evaluations, and arrive at qualitative judgments according to established rules.

- **Sense of inquiry:**

Capability for asking relevant/appropriate questions relating to the issues and problems in the field of Physics and beyond. Planning, executing and reporting the results of theoretical or experimental investigation.

- **Team player/worker:**

Capable of working effectively in diverse teams in both classroom, laboratory, Physics workshop and in field-based situation.

- **Skilled project manager:**

Capable of identifying/mobilizing appropriate resources required for a project, and managing a project through to completion, while observing responsible and ethical scientific conduct, safety and laboratory hygiene regulations and practices.

- **Digitally Efficient:**

Capable of using computers for computational and simulation studies in Physics. Proficiency in appropriate software for numerical and statistical analysis of data, accessing and using modern e-library search tools, ability to locate, retrieve, and evaluate Physics information from renowned physics archives, proficiency in accessing observational and experimental data made available by renowned research labs for further analysis.

- **Ethical awareness/analytical reasoning:**

The graduates should be capable of demonstrating the ability to think and analyze rationally with modern and scientific outlook and adopt unbiased objectives and truthful actions in all aspects of work. They should be capable of identifying ethical issues related to their work. They should be ready to appropriately acknowledge direct and indirect contributions received from all sources, including from other personnel in the field of their work. They should be willing to contribute to the free development of knowledge in all forms. Further, unethical behavior such as fabrication, falsification or misrepresentation of data, or committing plagiarism, or not adhering to intellectual property rights should be avoided.

- **Social, National and International perspective:**

The graduates should be able to develop a perspective about the significance of their knowledge and skills for social well-being and a sense of responsibility towards human society and the planet. They should have a national as well as an international perspective about their work and career in the chosen field of academic and research activities.

- **Lifelong learners:**

Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of Physics.

Program Specific Outcomes

Aims of Bachelor Degree Programme in B. Sc. (Hons.) Physics

This program aims to:

- Create the facilities and learning environment in educational institutions to consolidate the knowledge acquired at +2 level, motivate students to develop a deep interest in Physics, and to gain a broad and balanced knowledge and understanding of physical concepts, principles and theories of Physics.
- Provide opportunities to students to learn, design and perform experiments in lab, gain an understanding of laboratory methods, analysis of observational data and report writing, and acquire a deeper understanding of concepts, principles and theories learned in the classroom through laboratory demonstration, and computational problems and modelling.
- Develop the ability in students to apply the knowledge and skills they have acquired to get to the solutions of specific theoretical and applied problems in Physics.
- To prepare students for pursuing the interdisciplinary and multidisciplinary higher education and/or research in interdisciplinary and multidisciplinary areas, as Physics is among the most important branches of science necessary for interdisciplinary and multidisciplinary research.
- To prepare students for developing new industrial technologies and theoretical tools for applications in diverse branches of the economic life of the country, as Physics is one of the branches of science which contribute directly to technological development; and it has the most advanced theoretical structure to make quantitative assessments and predictions.
- And in light of all of the above to provide students with the knowledge and skill base that would enable them to undertake further studies in Physics and related areas, or in interdisciplinary/multidisciplinary areas, or join and be successful in diverse professional streams including entrepreneurship.

Programme Learning outcomes for B. Sc. (Hons.) Physics

Students graduating with the B.Sc. (Hons.) Physics degree should be able to

- **Acquire**

- (i) Fundamental/systematic and coherent understanding of the academic field of basic Physics in areas like Mechanics, Electricity and Magnetism, Waves and Optics, Thermal and Statistical Physics, Quantum Mechanics, Mathematical Physics and their applications to other core subjects in Physics.
 - (ii) Wide ranging and comprehensive experience in physics laboratory methods in experiments related to mechanics, optics, thermal physics, electricity, magnetism, digital electronics, solid state physics and modern physics. Students should acquire the ability for systematic observations, use of scientific research instruments, analysis of observational data, making suitable error estimates and scientific report writing.
 - (iii) Procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Physics, including professionals engaged in research and development, teaching and government/public service.
 - (iv) Knowledge and skills in areas related to their specialization area corresponding to elective subjects within the disciplinary/subject area of Physics and current and emerging developments in the field of Physics.
- Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
 - Recognize the importance of mathematical modelling, simulation and computational methods, and the role of approximation and mathematical approaches to describing the physical world and beyond.
 - Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose-written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics.
 - Demonstrate relevant generic skills and global competencies such as:
 - (i) Problem-solving skills that are required to solve different types of Physics-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary area boundaries.
 - (ii) Investigative skills, including skills of independent investigation of Physics-related issues and problems.

- (iii) Communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature.
 - (iv) Analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Physics and ability to translate them with popular language when needed.
 - (v) ICT skills
 - (vi) Personal skills such as the ability to work both independently and in a group.
- Demonstrate professional behavior such as:
 - (i) Being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism.
 - (ii) The ability to identify the potential ethical issues in work-related situations.
 - (iii) Be committed to the free development of scientific knowledge and appreciate its universal appeal for the entire humanity.
 - (iv) Appreciation of intellectual property, environmental and sustainability issues.
 - (v) Promoting safe learning and working environment.