

B.Sc. Physics Programme Outcomes

At the completion of under graduate programme, the student will be able to imbibe the following programme outcomes.

- Create logical reasoning and critical thinking through the knowledge that they acquired in classrooms, laboratory etc. and apply them in real-life situations.
- Internalize the significance of various academic as well as extracurricular activities that will enable them to become skilled professionals.
- Grow into accountable and empowered individuals who will emerge as scientists, entrepreneurs etc., and be employed in various governmental and non-governmental sectors.
- Attain expertise in communication skills, acquire moral and social values that keep one creative and compassionate human in all walks of life and turn out to be responsible citizens
- Build up self-esteem and ability to engage in independent and life-long learning in the context of an ever-changing world and competence to face challenges.
- Recognize the current local and global issues of environmental contexts and involves in activities that promote sustainable and green living.

B.Sc. Physics Model I Programme Specific Outcomes

- Develop deep understanding of the various subjects of physics.
- Enhance practical and mathematical skills and competencies to conduct scientific experiments.
- Create analytical thinking and interpret the inferences from verbal, mathematical and graphical data.
- Develop problem solving skills and formulate questions from theoretical understanding of the subject.
- Ability to perform various task using their creativity, intellectual capacity, innovative thoughts and enthusiasm with precision and responsibility.
- Skill to organize events and transfer knowledge through fruitful communications and interact effectively with people from sundry backgrounds.
- Ascertain their area of interest in academic and R&D and get prepared for competitive exams.

COURSE OUTCOMES (CO)

Course Code	Title of the Course
PH5CRT01	METHODOLOGY AND PERSPECTIVES OF PHYSICS
PH5CRT02	Mechanics and properties of Matter
PH5CRT03	optics and photonics
PH5CRT04	Semiconductor physics
PH5CRT05	Electricity and Electrodynamics
PH5CRT06	Classical and Quantum Mechanics
PH5CRT07	Digital Electronics and Programming
PH5CRT08	Environmental Physics and Human Rights
PH5OPT0X	Open Course PH5OPT01: Our Universe PH5OPT02: Physics in Daily Life
PH6CRT09	Thermal and Statistical Physics
PH6CRT10	Relativity and Spectroscopy
PH6CRT11	Nuclear, Particle and Astrophysics
PH6CRT12	Solid State Physics
PH6CBT0X	Choice Based Course PH6CBT03 Computational Physics

SEMESTER I

PH1CRT01: METHODOLOGY AND PERSPECTIVES OF PHYSICS

This paper helps in the following ways

1. Acquire an overview on the inspiring history in the development of physics.
2. Develop a knowledge on different number systems and their conversion process and to identify the application of binary numbers in computers.
3. Learn the relevance of vectors in physics.

4. Get acquainted with different coordinate systems and their applications in various kinds of problems in physics.
5. Attain knowledge on the importance of care to be taken while doing experiment and distinguish different types of errors that can involve in the experiment.

SEMESTER II

PH2CRT02: MECHANICS AND PROPERTIES OF MATTER

1. Understand superposition of waves.
2. Define simple harmonic motion and deduce total energy of SHM.
3. Analyze the theory of various oscillations and resonance.
4. State and prove parallel and perpendicular axes theorems.
5. Derive expressions for moment of inertia of regular bodies using parallel/perpendicular axes theorem.

SEMESTER III

PH5CRT03 OPTICS, LASER AND FIBER OPTICS

1. Distinguish the basic phenomena like interference, diffraction and polarization that occur in nature.
2. Understand the basic theories and applications of these phenomena.
3. Understand the basic working principle of Laser and different types of lasers.
4. Familiarize applications of lasers in different fields.
5. Study the light propagation in optical fibres and acquaint with different kinds of optical fibres and its applications.

SEMESTER IV

PH5CRT04 SEMICONDUCTOR PHYSICS

1. Gain knowledge about the basic of semiconductor components like diode, transistor, FET, MOSFET and operational amplifier.
2. Build foundation in the theoretical understanding to handle the electronic components such as resistors, capacitors, inductors, ordinary diode, zener diode etc. in a circuit when connected individually or in combination.

3. Grasp the knowledge to participate in the design and development of electronic systems.

SEMESTER V

PH5CRT05 ELECTRICITY AND ELECTRODYNAMICS

1. Lay a sound theoretical foundation in electricity and electrodynamics.
2. Realize how the development of modern technological world rely on the field-electricity and electrodynamics.
3. Comprehend various phenomena and applications around them related to electric and magnetic field.
4. Understand the power of Maxwell's Equations and their various solutions to ponder into various topics that include Energy and Momentum of Electromagnetic Fields, Radiation Sources and Antennas, Electrodynamics in Macroscopic Media, Wave Guides and Cavities.
- 5 Acquire practical knowledge to handle electronic gadgets and explain its working principle.

PH5CRT06 CLASSICAL AND QUANTUM MECHANICS

1. Understand the basic concepts of constraints and the formulation of Lagrangian and Hamiltonian.
2. Appreciate the historical development and origin of quantum mechanics.
3. Understand the basic mathematical formulation of quantum mechanics.
4. Apply the Schrodinger equation for solving the problem of a particle in a box.
5. Distinguish between classical mechanics and quantum mechanics.

PH5CRT07 DIGITAL ELECTRONICS AND PROGRAMMING

1. Explain the basic logic operations of NOT, AND, OR, NAND, NOR, and XOR gates.
2. Simplify circuits and Boolean expressions using the Boolean laws.
3. Design different registers and counters.
4. Design basic combinational and sequential logic circuits.

5. Simplify Boolean algebra expressions using Karnaugh maps.
6. Understand the basics of object oriented C++ programming.
7. Acquire the skills to write the programs using the basic concepts of C++.

PH5CRT08 ENVIRONMENTAL PHYSICS AND HUMAN RIGHTS

1. Gain basic knowledge about water resources and proper water management.
2. Realize different aspects of pollution, its dangers and means to prevent it.
3. Recognize the need to protect various energy sources and understand advantages of renewable energy sources and steps to harness them.
4. Identify different means of harnessing solar energy and its advantages.
5. Understand their basic rights as well as ways and means to prevent the violation of rights.

SEMESTER VI

PH6CRT09 THERMAL AND STATISTICAL PHYSICS

1. Define the concept of entropy and explain its physical significance.
2. Explain fundamental concepts of statistical mechanics.
3. Explain Lees Disc experiment and can calculate the thermal conductivity by experimentally.
4. Derive Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distribution laws and compare the laws.

PH6CRT10 RELATIVITY AND SPECTROSCOPY

1. Explain special theory of relativity.
2. Derive Lorentz transformation equations.
3. Illustrate twin paradox.
4. Explain relativistic time dilation and length contraction.
5. Derive Einstein's mass energy relation $E=mc^2$.

PH6CRT11 NUCLEAR, PARTICLE AND ASTROPHYSICS

1. Understand the basic tenants of nuclear physics and particle physics.
2. Differentiate the different types of nuclear reactions.
3. Explain the origin and effects of cosmic rays.

4. Develops a research interest in nuclear & Astrophysics.

PH6CRT12 SOLID STATE PHYSICS

1. Realize the importance of crystallography in solid state physics.
2. Classify materials as metals, semiconductors and insulators based on band theory.
3. Distinguish various chemical bonding in common crystal structures.
4. Describe material properties such as magnetism, dielectric properties, superconductivity and understand the theoretical framework of the same.
5. Solve problems and analyze experimental results.

PH6CBT03 COMPUTATIONAL PHYSICS (CHOICE BASED COURSE)

1. Understand the methods to solve linear algebraic and nonlinear equations.
2. Explain the methods of curve fitting.
3. Discuss numerical differentiation and integration methods.
4. Understand numerical differentiation and integration methods.
5. Use numerical methods to solve ordinary differential equations.

OPEN COURSE

PH5OPT01: OUR UNIVERSE

1. Explain various models of universe and fundamental concepts of observational astronomy.
2. Understand the origin and evolution of the universe.
3. Understand fundamentals of telescopes and its classifications.
4. Describe the solar system.
5. Realize the impact of Earth's orbital motion on seasonal changes.
6. Illustrate the different phenomenon occurring in the universe.

PH5OPT02: PHYSICS IN DAILY LIFE

1. List the units and dimensions of fundamental and derived quantities.
2. Explain the concepts of reflection, refraction, diffraction, interference, scattering and total internal reflection.
3. Understand the different methods of power generation and evaluate the merits and demerits of the same.
4. Realize the importance of satellites.
5. Understand the different phenomena that occur in the universe.

COMPLEMENTARY PHYSICS FOR MATHEMATICS

PH1CMT01: PROPERTIES OF MATTER & ERROR ANALYSIS

1. Understand the theory behind the modulus of elasticity.
2. Analyze the bending moments/torsion while applying force on different objects.
3. Understand and evaluate the practical significance of the fluid dynamics.
4. Explain different types of errors in measurements.
5. Estimate and report errors in physical measurements.
6. Apply mathematics to explain different physical phenomena.

PH2CMT01: MECHANICS AND ASTROPHYSICS

1. Recall the laws of gravitation.
2. Apply parallel and perpendicular axes theorem.
3. Formulate and numerically solve problems.
4. Describe the characteristics of waves.
5. Acquire numerical problem solving skills.

PH3CMT01: MODERN PHYSICS AND ELECTRONICS

1. Describe different atom models.
2. Calculate various factors related to radioactivity.
3. Comprehend the theory behind diodes and transistors.
4. Use basic number system.
5. Explain the inadequacies of classical physics and experimental evidences for quantum theory.
6. Obtain the Schrodinger equation and use it for solving the problem of a particle in a box.

PH4CMT01: OPTICS & ELECTRICITY

1. Distinguish the basic phenomena like interference, diffraction and polarization that occur in nature.
2. Understand the basic working principle of Laser and its applications.
3. Develop a knowledge on the theory of light propagation through fibres.
4. Develop practical skills based on optical and electrical experiments.

5. Identify the optical technology used in day to day gadgets.

COMPLEMENTARY PHYSICS FOR CHEMISTRY

PH1CMT01: PROPERTIES OF MATTER & THERMODYNAMICS

1. Understand the theory behind the modulus of elasticity.
2. Analyze the bending moments/torsion while applying force on different objects.
3. Understand and evaluate the practical significance of the fluid dynamics.
4. Explain thermodynamic systems and processes.
5. Understand the theory and practical aspects of heat engines.

PH2CMT01: MECHANICS AND SUPERCONDUCTIVITY

1. Recall the laws of gravitation.
2. Apply parallel and perpendicular axes theorem.
3. Describe the characteristics of waves.
4. Understand the origin of superconductivity.
5. Classify materials like insulators, semiconductors and superconductors.

PH3CMT01: MODERN PHYSICS AND MAGNETISM

1. Describe different atom models.
2. Calculate various factors related to radioactivity.
3. Explain the inadequacies of classical physics and experimental evidences for quantum theory.
4. Obtain the Schrodinger equation and use it for solving the problem of a particle in a box.
5. Understand the principles of various spectroscopic methods.
6. Comprehend the theory behind diodes and transistors.
7. Discuss about magnetism, different magnetic materials, its properties and reason for Earth's magnetism.

PH4CMT01: OPTICS & SOLID STATE PHYSICS

1. Distinguish the basic phenomena like interference, diffraction and polarization that occur in nature.
2. Understand the basic working principle of Laser and its applications.

3. Develop a knowledge on the theory of light propagation through fibres and various kinds of fibres.
4. Define different types of polarization leading to dielectric property.
5. Model different crystal structures.
6. Enhance problem solving skills and correlate between numerical problems and real life situations.

Importance of Practical's

Laboratory provides a wide space for students to nurture their hidden scientific potential, creative thinking and systematic analyzing skills. Through B. Sc. Physics programme, students will realize how theory, experiment and observation mutually correlated and help each other to expand the frontiers of knowledge of the physical universe. By conducting various experiments, students will be able to internalize a number of skills and they will be benefitted in life many ways as follows:

- Understand the basic concepts of physics thoroughly.
- Provide platform to test out the theoretical knowledge gained in class rooms.
- Learn to formulate physical phenomenon mathematically.
- Make inferences from observations.
- Earn competency to use mathematical methods to solve physics problems.
- Enhance the observational and technical skills.
- Ability to handle various instruments in the laboratory.
- Learn to tabulate the data systematically.
- Development of personal learning and thinking capacity.
- Develop observational, analytical and evaluating skills.
- Grow the aptitude towards research.

CONSOLIDATED SCHEME FOR I TO VI SEMESTERS- PRACTICALS

MODEL I

Course Code	Title of the Practical
PH2CRP01	Mechanics and properties of Matter
PH4CRP02	Optics and Semiconductor Physics
PH6CRP03	Electricity, Magnetism and Laser

PH6CRP04	Digital Electronics
PH6CRP05	Thermal Physics, Spectroscopy and C++ programming
PH6CRP06	Acoustics, Photonics and Advanced Semiconductor Physics

CONSOLIDATED SCHEME FOR I TO VI SEMESTERS- PRACTICALS

MODEL II

Course Code	Title of the Practical
PH2CRP01	Mechanics and properties of Matter
AE2VOP01	Basic and Power Electronics
PH4CRP02	Optics and Semiconductor Physics
AE4VOP02	Microprocessor and Linear Integrated Circuits
AE4VOP03	Microprocessor and Communication Electronics
PH6CRP03	Electricity, Magnetism and Laser
PH6CRP04	Digital Electronics
PH6CRP05	Thermal Physics, Spectroscopy and C++ programming
PH6CRP06	Acoustics, Photonics and Advanced Semiconductor Physics

Language and subsidiary courses

For a perfect curriculum language learning is necessary. It helps students to think creatively and nurture their imaginative and artistic talents. It fosters the knowledge about various cultures and respect the diversity. Expertise in language strengthen students to think, speak, read or write creatively and make communications more effective.

Along with core courses, subsidiary courses too have an unavoidable role in a programme. Subsidiary subjects not only broaden student's knowledge, but it also supports to learn the main stream courses in a better way. To learn and understand physics in a better way, mathematics is an essential tool. Basic mathematical tools such as differential and integral calculus, vector calculus, linear algebra, Fourier series and transforms and functions of a complex variable used in physics to explain phenomena's accurately and prove theoretical concepts. Likewise chemistry also complement BSc physics programme.

