

B.Sc PHYSICS

PROGRAMME OUTCOME

- PO1:** To enhance the student's academic abilities, personal qualities and transferable skills which will give them an opportunity to develop as responsible citizens.
- PO2:** To define the basic laws involved in Physics
- PO3:** To understand the concepts and significance of the various physical phenomena.
- PO4 :** To carry out experiments to understand the laws and concepts of Physics.
- PO5 :** To apply the theories learnt and the skills acquired to solve real time problems.
- PO6 :** To acquire a wide range of problem solving skills, both analytical and computational and to apply them.
- PO7 :** Apply the knowledge of mathematics, science, arts and management principles to the solution of complex problems.
- PO8 :** Devise solutions for intricate problems and plan system components or processes that meet the specified needs with appropriate consideration for the society, health , safety, cultural, societal, and environmental considerations.
- PO9 :** Use innovation-based knowledge and creative methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO10 :** Create, select, and apply appropriate techniques, resources, and modern IT tools Including prediction and modeling to complex activities with an understanding of the limitations.
- PO11 :** Comprehend the influence of the proficient clarifications in societal and environmental context for sustainable development.
- PO12 :** Pertain ethical principles and entrust to professional ethics and responsibilities.
- PO13 :** Function effectively as an individual, and in assorted teams.
- PO14 :** Communicate effectively on various activities and make effective presentations.
- PO15 :** Exhibit comprehension and understanding of the programmes and apply them in a multidisciplinary environment.
- PO16 :** Be familiar with the need for and have the training and skill to engage in self-regulating and life-long learning in the broadest perspective of hi-tech change

PROGRAMME EDUCATION OBJECTIVES

- To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community
- To motivate the students to pursue PG courses in reputed institutes
- To kindle the interest for research in students

- To acquire placement in educational institutions, engineering and industrial firms.
- To endow the students with creative and analytical skills; this will equip them to become entrepreneurs.

PROGRAM SPECIFIC OUTCOMES (PSO) PHYSICS

- PSO1** The modern world would be a very different place. The study of physics has brought underlies so many pivotal discoveries of the 20th century including the laser,
- PSO2** TV, radio, computer technology, DNA and nuclear weapons for instance and has played a vital role in the development of quantum theory.
- PSO3** Understand the theory of relativity, the big bang theory, and the splitting of the atom.
- PSO4** The main objective of the department is to discover the talented young people, introducing awareness in them, educating them in the most advanced manner through special programs and producing women physicist and educationalist.
- PSO5** To understand the practical and theoretical physics.

Paper I Mechanics and Properties of Matter

Objective

The objective of this course is to introduce the students to the world of mechanics and properties of the matter that exists in different phases i.e., solid, liquid and gas. Laws of motion and its applications to various systems studied in this paper is of fundamental nature and enable the students to handle different types of problems and is the pre-requisite for several other advanced courses in physics and chemistry. The pre-requisite for this course is knowledge of calculus, wave theory and modern physics. This course is the core course and every student pursuing B Sc with physics as one of the optional is required to study this course.

COS

1. Learning the basics concepts of elasticity, surface tension, gravitation, viscosity and sound
2. Understand the concepts of properties of matter and to recognise their applications in various real problems
3. Describe the key evidence for the breakdown of the classical description of the properties of matter
4. Recall the principles and basic equations and apply them to unseen problems
5. Formulate the equations for unique cases in the diverse categories of material systems
6. When presented with the variety of natural phenomena from everyday life, the student will be able to give qualitative explanation using basic physics principles (i.e. Newton's law).
7. This course is based on the study of the mechanics of rigid bodies and their states of matter, and Newton's laws and gravitation and their applications.
8. This course includes an introduction of fluids and their motions by developing knowledge of density, heat capacity, pressure & viscosity of liquids.
9. To understand the concepts of kinetic energy and potential energy of the system. It's measured by velocity changes of the resting & moving system.

10. To appreciate how energy can change from one form to another form. (I.e. electrical energy is converted to the heat energy. e.g. Iron Box).
11. To understand the momentum of the elastic and inelastic bodies (e.g. elastic: spring, balloon; inelastic: car crash).

Paper II Mathematical Methods in Physics

objectives:

This course is also aimed to develop knowledge in mathematical physics and its applications, to develop expertise in mathematical methods required in the study of Physics, to develop critical thinking and problem solving skill. After completion of this course students will be able to apply the concept of vectors and complex variables to various physical quantities. This course will also enable the students to solve the problems related to partial differentiation. Fourier Analysis unit will enable the students to analyze the periodic functions.

COS

1. Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical applications in physics.
2. Learn about special type of matrices that are relevant in physics and then learn about tensors.
3. CO3 Get introduced to Special functions like Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions and their recurrence relations
4. Learn different ways of solving second order differential equations and familiarized with singular points and Frobenius method.
5. Learn the fundamentals and applications of Fourier series, Fourier and Laplace transforms, their inverse transforms etc

Paper III Heat and Thermodynamics

objectives:

This course will introduce the students to the world of heat and thermodynamics and the behaviour of the physical systems at different thermodynamical conditions. After completing this course students will understand the difference in the behaviour of the ideal and real gases, transport phenomenon in gases. Students will also understand the working of various heat engines and the ways to increase their working efficiency.

COS

1. Listing the basic ideas on heat.
2. Understand the central concepts and basic formalisms of specific heat, entropy, quantum theory of radiation;
3. Use of tools needed to formulate problems in the thermodynamics of gases.
4. Solving problems based on heat transfer, entropy and thermal radiation

5. Finding applications of the physical quantities

Paper IV Electricity and Magnetism

objectives:

The objective of this course is to introduce the students to the concepts of static and dynamical electrical magnetic fields, the sources for generating such fields, polarization and induction effects, understand the basic difference between the DC and AC circuits and their functioning. This course is of most applied nature and will enable the students to understand the role of electricity in everyday life, relate electrical conduction, vlate using Ohm's law and will also enable the students to understand the working principles of various electrical components and gadgets.

COS

1. Gain knowledge in the scientific methods and learn the process of measuring different Physical variables
2. Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results
3. Have a deep knowledge of fundamentals of electric circuits, magnetism
4. Recognize basic terms in electricity and magnetism
5. Understand the laws of electrostatics and magnetostatics
6. Apply theorems to construct and solve electrical circuits.
7. Ability to design and conduct experiments as well as to analyze and interpret data
8. Build up strong problem solving skills by effectively formulate a circuit problem into a mathematical problem using circuit laws and theorems

Paper V Physics Practical Paper

Objectives:

Objective of this Laboratory course is to introduce the students to the practical applications of the four core courses in Physics that the students have studied in Semester I and II. The Laboratory course also includes experiments based on the computational methods applicable for solving problems in physical situations. The course will consist of lectures (both theory and practical) in the Computer Lab. Evaluation of the computational method does not include the programming skill of the students but will only analyze the basis of formulating the problem. Each student appearing for examination must produce a journal showing that he has completed not less than **12** experiments during the year; out of which at least two should be based on the computational methods.

COS

1. Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems.
2. Understand the usage of basic laws and theories to determine various properties of the materials given.
3. Understand the application side of the experiments
4. Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil and various physical quantities.
5. Use of basic laws to study the spectral properties and optical properties of the given prism.

Paper VI Waves and Oscillations

COS

1. To learn the vibration of wave mechanics produced in waves. Most will understand the all about different wave properties. (I.e. transverse waves & longitudinal waves).
2. To understand the production of sound and sound wave and speed of sound. Identifies the absolute and relative terms of sound wave.

Paper VIII Optics and Laser

COS

1. Optics is course provides students with working knowledge of optical physics and properties of light.
- 2 Optics is the heart of many of the powerful scientific instruments.
- 3 To understand the diffraction, refraction, spectroscopy, laser, etc., (To diffraction spectrometer uses the form of rainbow colors and illuminates by a wide spectrum)
- 4 To learn the principles of optical modulation and detection of light.
- 5 To learn the basic & working principles of laser lights. Laser is optical device that emits an extremely intense beam of energy in the form of light.
- 6 Spectroscopy, laser, and fiber optics also provides a basis study in optics. Fiber optics is the technology of sending information in the form of light through fine structure of transparent materials.
- 7 Spectroscopy is used to find the dispersion of light and how to form the different colors from monochromatic light.
- 8 To understand the light as energy and how to measure the speed of light, and wavelength of light.
- 9 To understand the lens of plane, concave and convex mirrors. And what will happen it combination of two lenses.
- 10 To analyze the intensity variations of light due to polarization. As light passes through the medium (glass), each colors of visible light is polarized with its own orientation.

Paper IX Electronics

COS

1. To learn the principle and working structure of the laser lights (e.g. Ruby laser, He-Ne laser).
- 2 The students should develop their knowledge of the semiconducting materials, diodes and their applications. To understand the principles of LED (Light Emitting Diode) & LCD (Liquid Crystal Diode).
- 3 To learn the basic principles and working structure of Television and Receivers. And to understand the principle and applications of RADAR Systems.
4. To understand the general applications of Integrated Circuits and Operational Amplifier.
5. To learn and develop the Digital Electronics circuit diagram and basic principles and working knowledge

Paper X & XI Practicals

Objectives:

- To make the students understand the importance of experimental and theoretical analysis.
- To make the students develop a Scientific approach in solving problems related to physics.
- To educate and train the students to write scientific papers.

COS

1. Understand the central concepts and basic formalisms of interference, diffraction, polarisation and basics of spectroscopy.
2. Use of tools needed to formulate problems in optics and Laser.
3. Gain Fundamental knowledge in lasers
4. To impart knowledge related to the concepts of He- Ne, Co₂, Hydrogen Laser
5. The course continues the development of your expertise in applying physical concepts to practical problems and in learning about experimental techniques and advanced equipment.
- 6 The students will be able to analyze the physical principles involved in the various instruments also relate the principle to new application.
- 7 The students will be able to think innovatively and also improve the creative skills that are essential for Physics.
8. To make the measurements using laboratory equipment and perform calculation that verifies the physical principles.
9. The student will be able to appreciate the relationship between experiment, theory and computation as scientific techniques.
10. The students should understand the elasticity of the solid material while doing the young's modulus experiment.
11. Zener diodes are widely used as voltage differences and as shunt regulators to regulate the voltage across small circuits.
12. To understand the properties of lens (concave and convex) by using Newton's ring method.
13. They get knowledge about dispersion of light (ex. Grating) and how to form the different

colors from monochromatic light.

14. Zener diodes are widely used as voltage differences and as shunt regulators to regulate the voltage across small circuits.

SKILL BASED SUBJECT:

Electrical Measurements I and Electronic devices and equipments-II

Skill Enhancement Course-II (Credit: 02) B. Sc. III and IV SEM

- CO1** To study the basic concept of measuring devices, it can be used to how to handle the instruments and calibrates the devices for transducers like capacitive, piezoelectric, photoelectric effect, photoconductive, ionization, Hall effect transducers and now a days etc.
- CO2** To study the performance characteristics of an Instrumentation system.
- CO3** Its used to Generalized measurement Zero order system first and second order system Dead time element Specification and testing of dynamic response.
- CO4** To study the Pressure Measurements. Its used to deduct Mechanical Pressure measurement devices Bourdon tube Pressure.
- CO5** The Bridgeman, Dead weight tester Low Pressure measurement & The Mc lead, Pirani thermal Conducting, & Knudsen gauge.
- CO6** To study the Flow Measurements and Measure Positive displacement & Flow Obstruction methods Flow measurement by drag effects. Hot wire and Hot film anemometers magnetic flow meters.
- CO7** To study the measurement of temperatures. It used to measure the temperature scales and calculate the temp & day today life also.
- CO8** The ideal gas thermometer temperature measurements by mechanical effects temperature measurements Thermistors Thermoelectric effects.

Papae XII Quntum Mechanics

COS

1. Recognize basic terms in Quantum Mechanics.
2. Understand the basic principles of quantum particles
3. Apply basics to construct and solve one particle equation
4. Ability to design and construct particle equation in the free and bound states as well as to analyze and interpret the results.
5. Approximation methods for time-independent problems like the WKB approximation
6. The variational equation and its application to ground state of the hydrogen and Helium atom
7. Perturbation theory and Interaction of an atom with the electromagnetic field
8. Second quantization of the Schrödinger wave field for bosons and fermions

Paper XIII SSP

COS

1. Outline the importance of solid state physics in the modern society
2. Explore the relationships between chemical bonding & crystal structure and their defects
3. Understand the basic properties of metals, insulators and semiconductors and their technological applications
4. Extend their knowledge in theoretical fundamentals of electron theory and super conductivity
5. Transfer their knowledge level from theoretical physical subjects towards the understanding of basic properties of solid state matter
6. have a basic knowledge of crystal systems and spatial symmetries , - be able to account for how crystalline materials are studied using diffraction, including concepts like reciprocal lattice and Brillouin zones
7. know what phonons are, and be able to perform estimates of their dispersive and thermal properties , be able to calculate thermal and electrical properties in the free-electron model
8. know Bloch's theorem and what energy bands are and know the fundamental principles of semiconductors
9. know the fundamentals of dielectric and ferroelectric properties of materials
10. know basic models of dia, para and ferro magnetism
11. be able to explain superconductivity using BCS theory

Paper XIV Atomic Molecular and Nuclear Physics

COS

- 1 Acquire knowledge of the fundamental physics underpinning atomic and nuclear physics
2. Understand the concepts and potential applications of atomic and nuclear physics
3. Apply general considerations of quantum physics to atomic and nuclear system
4. Analyse production and decay reactions for fundamental particles
5. Expand and evaluate the theoretical predictions for nuclear reactions.

Paper XV Digital Electronics

COS

- 1 To understand number systems in computer. How to store the numbers in computerized devices. And to learn their operations of Addition Subtraction Conversion (Analog to Digital & Digital to Analog) etc.
2. Convert different type of codes and number systems which are used in digital communication and computer systems.

3. Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.
4. Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
5. Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.
6. Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.
7. Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

Paper Practical XVI & XVII

COS

1. To describe the basic Analysis of positive rays.
2. To understand the structure of atoms.
3. To design and analyze the performance atoms.
4. To design and analyze Magneto optical properties of spectrum.
5. They get knowledge about Photo electric effect.
6. They understand the X-ray spectra.
7. To study about the Planck's law of radiation.
8. A sonometer is a device for demonstrating the relationship between the frequencies of the sound.
9. In electronics a logic gate is an idealized or physical device implementing a Boolean function, so that the students will perform the logic operation.
10. While doing solid prism experiment that can be given knowledge about the reflection of light or to split light into components with different polarization.

SKILL BASED SUBJECT:

**SEC III (B) Skill Enhancement Course: *B. Electrical Circuit Analysis Skill*
P-XV B - DSEP II (Section B) - Discipline Specific Elective Paper
*B. Linear and Digital Integrated Circuits***

B. Sc. TY V and VI SEM

COS

1. Analysis of Resistive Circuits and Solution of resistive circuits with independent sources

- 2.** Two Terminal Element Relationships for inductors and capacitors and analysis of magnetic circuits
- 3.** Analysis of Single Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits
- 4.** To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor
- 5.** To get an insight about the basic introduction of Digital electronics.
- 6.** To understand the basic concepts of operational amplifier and its various applications.
- 7.** To understand the basics of PLL and its practical applications.●
- 8.** To know about analog multipliers.●
- 9.** To know about various analog switches and different A/D and D/A convertors.●
- 10.** To understand the concepts of switched capacitor filters, Voltage regulator and various amplifiers