

## Department of Physics

### **Program outcome (PO):**

We provide FOUR YEARS U.G and THREE YEARS U.G PROGRAMME. This opens up the prospect for further study in science. Besides, with a science degree, students can access few opportunities in the field of

PO-1: research and development,  
PO-2: scientific analysis and investigation,  
PO-3: product and process development,  
PO-4: education and the media and  
PO-5: administration.

This program is most beneficial for students who have a strong interest in and background in Science and Mathematics. It is also beneficial for students who wish to pursue multi- and interdisciplinary science careers in the future.

### **Program specific outcome (PSO):**

We offer a FOUR YEARS U.G. and THREE YEARS U.G. PROGRAMME in PHYSICS. This degree opens a wide vista in the direction of science and technology.

In the four-year physics major structure, students can perform research in their final semesters.

With this degree,

PSO-1: A student can pursue a Masters degree in Physics, applied physics, biotechnology, etc.

PSO-2: if the student is interested in completing his/her M.Sc. Degree, he/she can get the access of the M.Phil or Ph.D. in some advanced topics.

PSO-3: During the course, students will get a glimpse of some advanced courses, which can guide them toward their interests

PSO-4: The opportunity in the field of teaching is one of the finest prospects in this field.

PSO-5: Students will learn the applications of the computer programming language PYTHON elaborately. This will enhance their technical skill and will allow them to pursue a career as a program developer.

PSO-6: With the experimental knowledge gained during the practical classes, the scope of industrial research/job will be enhanced.

PSO-7: students will learn electronic projects using the microcontroller kit ARDUINO UNO.

**Course Outcomes(CO):**

**SEMESTER- 1**

**PAPER: DSC-1 (FOUR YEARS U.G PHYSICS MAJOR),  
Minor-1 (FOUR YEARS U.G PHYSICS MINOR), and  
MDC-1 (THREE YEARS U.G PHYSICS)**

**SUBJECT: BASIC PHYSICS-I**

**THEORY [3 Credits]**

**(A) Mathematical Physics:**

Preliminaries are the basic building blocks of the subject, the Basic idea of calculus, ordinary differential equations, vector algebra, and the study of different coordinate systems.

**(B) Classical Mechanics:**

Idea of Newtonian mechanics, more precisely, basic mechanical properties of macroscopic (classical) bodies, that govern our everyday life.

**PRACTICAL [1 Credit]**

Handling the length measurement tools and studying their accuracy. Examine the general properties of matter like moment of inertia, rigidity modulus, etc.

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**PAPER: SEC-1 (FOUR YEARS U.G PHYSICS MAJOR), and  
(THREE YEARS U.G PHYSICS)**

**SUBJECT: INTRODUCTION TO COMPUTER PROGRAMMING AND GRAPH  
PLOTING**

**PRACTICAL [4 Credits]**

**1. Introduction to Graph Plotting (2D only, using GNUPLOT)**

Introduction to the graph plotting software GNUPLOT. The idea of 2D graph plotting and curve fitting are provided.

## **2. Introduction to programming in Python (Version 3):**

Students learn the applications of the computer programming language PYTHON elaborately. This will enhance their technical skill and will allow them to pursue a career as a program developer. In this course, PYTHON is introduced as a tool for numerical and logical analysis. Some elementary problems and basic operations like sorting, matrix operation, etc. are introduced.

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### **SEMESTER- 2**

**PAPER: DSC-2 (FOUR YEARS U.G PHYSICS MAJOR),  
Minor-2 (FOUR YEARS U.G PHYSICS MINOR), and  
MDC-2 (THREE YEARS U.G PHYSICS)**

**SUBJECT: BASIC PHYSICS-II**

#### **THEORY [3 Credits]**

##### **(A) Basic Electricity and Magnetism**

The classical idea of electric and magnetic fields. Electrical and magnetic properties are exhibited by matter and their nature. Relation between these two fields, and their application in electrical circuits.

##### **(B) Introduction to Thermodynamics**

Thermodynamics deals with the relations between heat and other forms of energy (such as mechanical, electrical, or chemical energy), and, by extension, the relationships between all forms of energy. The behavior and kinematics of gases are studied in this course.

#### **PRACTICAL [1 Credit]**

The idea of voltage, current, and resistance measuring tools. Different aspects of heat and temperature are examined; for example: the thermal effect on metallic rods.

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**PAPER: SEC-2 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: SCIENTIFIC WRITING SKILLS (LATEX)**

### **PRACTICAL [4 Credits]**

Introduction to scientific writing language LaTeX. This software is useful for writing books, journals, and other professional scientific articles.

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**PAPER: SEC-1 (THREE YEARS U.G PHYSICS)**

**SUBJECT: INTRODUCTION TO COMPUTER PROGRAMMING AND GRAPH PLOTTING**

### **PRACTICAL [4 Credits]**

#### **1. Introduction to Graph Plotting (2D only, using GNUPLOT)**

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### **SEMESTER-3**

**PAPER: DSC-3 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: WAVES OF OPTICS**

### **THEORY [3 Credits]**

Classical analysis of waves. Various properties of light like diffraction, interference, etc and the study of optical devices.

### **PRACTICAL [1 Credit]**

Various experiments with acoustic and optical devices like tuning fork, prism, spectrometers, etc, and study the properties of waves experimentally.

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**PAPER: DSC-4 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: MATHEMATICAL PHYSICS - I**

**THEORY [3 Credits]**

Solution methods for periodic functions, differential equations, some special integrals like beta and gamma functions, partial differential equations, initial concept of probability, numerical analysis, etc.

**PRACTICAL [1 Credit]**

Numerical analysis for scientific applications using the PYTHON code. Performing the integration, first order differential equations numerically. Learning to fit an experimental curve. Graph plotting using PYTHON.

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**PAPER: SEC-3 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: ARDUINO**

**THEORY [1 Credit]**

Familiarity with fundamental electronic components, basic Idea about microcontrollers; introduction to Arduino

**PRACTICAL [3 Credits]**

Setting the ARDUINO UNO kit and constructing sketches using various types of sensors.

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**PAPER: IDC (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: FRONTIERS OF PHYSICS (For Sem-I/II/III students)**

Understanding the nature of science, universe, matter, and forces for students of different disciplines.

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**PAPER: MINOR-1, (FOUR YEARS U.G PHYSICS MINOR):**

same content as DSC-1, for students of other departments of science discipline. This course will be offered to students who choose Physics as m2.

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## **SEMESTER-4**

**PAPER: DSC-5 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: MODERN PHYSICS**

**THEORY [3 Credits]**

The basic idea of radiation, understanding the wave and particle nature, the basic idea of quantum mechanics, and some applications like quantum harmonic oscillator.

**PRACTICAL [1 Credit]**

Getting the essence of the quantum world through the measurement of the Planck constant,  $e/m$ , quantum tunneling, etc.

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**PAPER: DSC-6 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: ELECTROMAGNETISM**

**THEORY [3 Credits]**

The idea of Alternating current, Electrostatics, and Magnetostatics are introduced for the first time. Some properties like di-electric property and imaging are described. Finally, the concept of electromagnetism and Maxwell's equation will be introduced.

**PRACTICAL [1 Credit]**

Realization of self and mutual induction. Measurement of Earth's magnetic field and some laws related to electromagnetism.

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**PAPER: DSC-7 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: MATHEMATICAL PHYSICS-II**

**THEORY [3 Credits]**

Second-order linear differential equation, Concept of Linear Vector Space, Introduction of tensors and matrices, partial differential equation will be performed.

**PRACTICAL [1 Credit]**

Computer programming language Python: Scientific python 'scipy' will be introduced. Using the module, integration, solution of ODE, PDE, etc will be demonstrated.

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**PAPER: DSC-8 (FOUR YEARS U.G PHYSICS MAJOR)**

**SUBJECT: CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY**

**THEORY [3 Credits]**

Concepts of non-inertial frame, rotational dynamics, variational calculus, and STR will be introduced.

**PRACTICAL [1 Credit]**

General properties like elasticity, the moment of inertia, etc will be demonstrated.

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**PAPER: MINOR-2, (FOUR YEARS U.G PHYSICS MINOR):**

same content as DSC-2, for students of other departments of science discipline. This course will be offered to students who choose Physics as m2.

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