



# M.SC PHYSICS

## PROGRAMME SPECIFIC OUTCOME

- PSO1:** Demonstrate substantial knowledge in various subfields of physics such as classical mechanics, mathematical physics, quantum mechanics, electrodynamics, solid state physics, statistical mechanics, lasers and optical fibers etc.
- PSO2:** Acquire considerable knowledge in mathematical methods, and practical knowledge in supported fields like computer science.
- PSO3:** Gain research experience within a specific field of physics through a supervised project and become familiar with contemporary research within various subfields of physics.
- PSO4:** Complete an original, creative project that demonstrably advances human knowledge within their subfield.
- PSO5:** Communicate effectively the results of the research project to professionals within their subfield and within the broader physics community, through both oral presentation and written work.
- PSO6:** Demonstrate fluency in comprehension of the research literature in subfields of their interest.
- PSO7:** Acquire scientific, technical and engineering skills to become employable in a variety of industries.

# COURSE OUTCOME

## SJPHY1C01 : CLASSICAL MECHANICS

SJPHY1C01.1	Understand Lagrangian formulations and its applications in various classical systems
SJPHY1C01.2	Understand Hamiltonian formulations and its applications in various classical systems.
SJPHY1C01.3	Understand Hamilton – Jacobi formulation and the classical background of quantum mechanics.
SJPHY1C01.4	Understand the Kinematics and Dynamics of rigid bodies.
SJPHY1C01.5	Understand the theory of small oscillations and its applications.
SJPHY1C01.6	Understand nonlinear equations and chaos.

## SJPHY1C02 : MATHEMATICAL PHYSICS I

SJPHY1C02.1	Understand orthogonal curvilinear coordinates and its application in different coordinate system
SJPHY1C02.2	Understand matrices and tensors in various field of physics
SJPHY1C02.3	Understand second order differential equation and its application in various field of physics
SJPHY1C02.4	Understand Special functions and its application in various field of physics
SJPHY1C02.5	Understand Fourier series and its application in various field of physics

## SJPHY1C03 : ELECTRODYNAMICS AND PLASMA PHYSICS

SJPHY1C03.1	Understanding the basics concepts of Maxwell's equation in time varying fields.
SJPHY1C03.2	Analyzing the behavior of plane waves in unbounded media.
SJPHY1C03.3	Understanding the behavior of plane waves in guided structure like transmission line, wave guides and cavity resonators
SJPHY1C03.4	Applying relativity in the field of electrodynamics and presenting it in tensor notations.
SJPHY1C03.5	Understanding the basic ideas of plasma and its applications

## SJPHY1C04 : ELECTRONICS

SJPHY1C04.1	Understand the concept of Field Effect Transistors.
SJPHY1C04.2	Understand the working principle of different type of microwave and photonic devices
SJPHY1C04.3	Understand the basic concept and characteristics of OP-AMP.
SJPHY1C04.4	Application of OP-AMP in Various electronic circuits
SJPHY1C04.5	Understand the concepts of flip flops, digital counters and architecture of Intel 8085 microprocessor.

## SJPHY2C05 : QUANTUM MECHANICS I

SJPHY2C05.1	Understand basic principles, mathematical methods for formulating Quantum mechanics.
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SJPHY2C05.2	Understand different methods used in Quantum dynamics and develop skill to solve problems.
SJPHY2C05.3	Understand the theory of angular momentum and its applications.
SJPHY2C05.4	Understand the theory of central potentials and its applications.
SJPHY2C05.5	Understand different invariance principles and the corresponding conservation laws.

## SJPHY2C06 : MATHEMATICAL PHYSICS - II

SJPHY2C06.1	Understand Complex variable theory and its applications in various fields of physics.
SJPHY2C06.2	Understand group theory and its applications in various fields of physics.
SJPHY2C06.3	Understand the method of calculus of variation and its application in physics.
SJPHY2C06.4	Understand the transformation of differential equation to integral form and different method to solve integral equations.
SJPHY2C06.5	Understand the basic concept of Green's function.

## SJPHY2C07 : STATISTICAL MECHANICS

SJPHY2C07.1	Understanding the basic ideas of statistical mechanics and its link with thermodynamics
SJPHY2C07.2	Understanding different ensembles and the formulation of various thermodynamic variables
SJPHY2C07.3	Understanding the formulation of quantum statistics
SJPHY2C07.4	Understanding the thermodynamic behavior of Boson gas and its application taking photons and phonons as examples
SJPHY2C07.5	Understanding the behavior of Fermi gas and its applications

## SJPHY2C08 : COMPUTATIONAL PHYSICS

SJPHY2C08.1	Understand basic and advanced concepts in python programming.
SJPHY2C08.2	Understand the different tools for maths and visualization in python using numpy and pylab modules.
SJPHY2C08.3	Develop skill to correlate python with various numerical techniques.
SJPHY2C08.4	Understand the concept of computer simulations used for problems in python.

## SJPHY2L03 : GENERAL PHYSICS PRACTICAL

SJPHY2L03.1	Apply and illustrate the concepts of properties of matter through experiments
SJPHY2L03.2	Illustrate elementary experiments using laser
SJPHY2L03.3	Apply and illustrate the experiments using spectrometer
SJPHY2L03.4	Apply and illustrate experiments to find various constants(Plank's constant, susceptibility)

## SJPHY2L04 : ELECTRONICS PRACTICAL

SJPHY2L04.1	Apply and illustrate the principles of transistor through experiments
SJPHY2L04.2	Apply and illustrate the principles of opamp IC 741 through experiments
SJPHY2L04.3	Apply and illustrate the principles of opamp IC 555 through experiments

SJPHY2L04.4 Apply and illustrate the principles of digital electronics through experiments

## SJPHY3C09 : QUANTUM MECHANICS II

SJPHY3C09.1 Understand and apply concepts of time independent perturbation theory.  
SJPHY3C09.2 Understand and apply variational and WKB methods.  
SJPHY3C09.3 Understand and apply concepts of time dependent perturbation theory.  
SJPHY3C09.4 Understand different concepts of scattering.  
SJPHY3C09.5 Understand and apply concepts of relativistic quantum mechanics.

## SJPHY3C10 : NUCLEAR AND PARTICLE PHYSICS

SJPHY3C10.1 Understand the properties of nucleus and the theory of nucleon-nucleon scattering.  
SJPHY3C10.2 Understand the concept and theory of alpha, beta and gamma decay.  
SJPHY3C10.3 Understand the theory of nuclear models and concept of nuclear fission and fusion  
SJPHY3C10.4 Understand the working principle of different types of nuclear detectors.  
SJPHY3C10.5 Understand different nuclear reactions and conservation laws in particle physics  
SJPHY3C10.6 Understand different models to classify of elementary particles

## SJPHY3C11 : SOLID STATE PHYSICS

SJPHY3C11.1 Understand various crystal structures, introduction to reciprocal lattice and crystal bondings.  
SJPHY3C11.2 Understand lattice vibration and Einstein and Debye model of specific heat capacities  
SJPHY3C11.3 understand Introduction to free electron theory and semiconductor theory.  
SJPHY3C11.4 Understanding dielectric electric and magnetic properties of crystals  
SJPHY3C11.5 Understanding basic principles of superconductivity

## SJPHY3E05 : EXPERIMENTAL TECHNIQUES

SJPHY3E05.1 Understand the concept of vacuum , different types of vacuum pumps, vacuum accessories and vacuum gauges  
SJPHY3E05.2 Understand the concept of thin film technology- thin film fabrication, thickness measurement and its application in physics and industry.  
SJPHY3E05.3 Understand different types of accelerators.  
SJPHY3E05.4 Understand the different ion sources, ion implantation technique and its application  
SJPHY3E05.5 Understand different nuclear technique for material analysis.  
SJPHY3E05.6 Understand the basic concept of XRD

## **SJPHY4E13 : LASER SYSTEM,OPTICAL FIBRES AND APPLICATIONS**

SJPHY4E13.1	Understand the basic theory of lasers.
SJPHY4E13.2	Understand the working principle and energy level diagrams of various laser systems.
SJPHY4E13.3	Understand the basic concepts of non linear optics.
SJPHY4E13.4	Understand the industrial and medical applications of lasers.
SJPHY4E13.5	Understand the basic structure ,theory and different types of optical fibres.

## **SJPHY4E20 : MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS**

SJPHY4E20.1	Understand Intel 8085 microprocessor and develop skill to write assembly language programme.
SJPHY4E20.2	Understand different methods for data transfer schemes and Intel 8085 timing.
SJPHY4E20.3	Understand different types of peripheral devices and how to interface with Intel 8085
SJPHY4E20.4	Understand the applications of microprocessors
SJPHY4E20.5	Understand the architecture of Intel 8051 microcontrollers and basics of AVR architecture.
SJPHY4E20.6	Understand concepts of AVR Programming language.

## **SJPHY4L06 : MODERN PHYSICS PRACTICAL**

SJPHY4L06.1	Apply and illustrate experiments using various experimental techniques.
SJPHY4L06.2	Apply and illustrate experiments using semiconductor devices,
SJPHY4L06.3	Apply and illustrate experiments using lasers and optical fibres.
SJPHY4L06.4	Develop and analyze programs using Intel 8085 microprocessor.
SJPHY4L06.5	Apply and illustrate experiments in optics

## **SJPHY4L07 : COMPUTATIONAL PHYSICS PRACTICAL**

SJPHY4L07.1	Develop python program for various numerical methods.
SJPHY4L07.2	Develop python program for Monte Carlo method
SJPHY4L07.3	Develop python program to simulate various physical systems.

## **SJPHY4P01 : PROJECT**

SJPHY4P01.1	Understand research methodology
SJPHY4P01.2	Undertake problem identification, formulation and solution.
SJPHY4P01.3	Demonstrate a sound technical knowledge of their selected project topic.
SJPHY4P01.4	Identify and enumerate the scope and limitations of the research work.

## **SJPHY4V01 : COMPREHENSIVE VIVA VOCE**

SJPHY4V01.1	Demonstrate knowledge in the program domain.
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SJPHY4V01.2  
SJPHY4V01.3

Present views cogently and precisely.  
Exhibit professional etiquette suitable for career progression.

## SJPHY4C12 : ATOMIC AND MOLECULAR SPECTROSCOPY

- SJPHY4C12.1 Understand the basic principle of vector atom model, Zeeman effect, Paschen Back effect and Stark effect 60.00
- SJPHY4C12.2 Understand the principle of microwave and infrared spectroscopy
- SJPHY4C12.3 Understand the principle of Raman spectroscopy
- SJPHY4C12.4 Understand the principle of vibrational analysis and rotational fine structure of electronic spectroscopy
- SJPHY4C12.5 Understand the principle of NMR, ESR and Mossbauer spectroscopy