

MASTER OF SCIENCE (M. Sc - Physics)

PROGRAMME CODE -04PGR001

PROGRAMME EDUCATIONAL OBJECTIVE (PEOS)

The structure of the M.Sc. (Physics) Programme is designed to produce graduates of physics and relative subjects with rigorous practical, analytical and research based skills, who are exceptionally well-equipped to go onto Masters in physics, or employment in industrial, academic and the public service. The M.Sc. (Physics) programme provides:

- **PEO 1:** To analyze the quantum mechanical problems.
- **PEO 2:** To impart knowledge about various mathematical tools employed to study physics problems.
- **PEO 3:** The objective of this course is to learn the properties of macroscopic system using the knowledge of the properties of individual particles.
- **PEO 4:** To Study some of the basic properties of the condensed phase of materials specially solids.
- **PEO 5:** Drawing attention toward the theory related to the Radiation Detection and practical use of Dosimetry in industrial and research institutions.
- **PEO 6:** To study basic properties of different types of lasers.
- **PEO 7:** To gain knowledge of modern techniques, theory and observational results in relative topics.
- **PEO 8:** To understand research and knowledge of different parts of research.
- **PEO 9:** To promote research culture and an environment that encourages the student's originality and creativity in their research.
- **PEO 10:** Skills to enable the student to critically examine the background literature relevant to their specific fields.

PROGRAMME OUTCOMES (POS)

- **PO 1:** Updation and confidence in subjects.
- **PO 2:** Development of orientation.
- **PO 3:** Participation in the field of scientific laboratory, research centre.
- **PO 4:** Value added achievements.
- **PO 5:** Promotion in higher education.
- **PO 6:** Useful in competing the national level examination as NET, SLET, CSIR, Gate, JEST, CAT, MAT, etc.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

- **PSO 1:** Understanding the scientific temperaments.
- **PSO 2:** Enhancing the advance concepts.
- **PSO 3:** Updation with relevant scenario in field of physics.

- **PSO 4:** Knowledge and application of modern equipments.
- **PSO 5:** Preliminary knowledge of research.
- **PSO 6:** Especially jobs in research centre.
- **PSO 7:** Critical thinking of a problem.
- **PSO 8:** Preparation of self employability.

Course Code: 6SMPH101

Course Name: MATHEMATICAL PHYSICS

Course Objective

- To impart knowledge about various mathematical tools employed to study physics problems.

Course Outcomes

Students will have understanding of:

- Various techniques to solve differential equations.
- How to use special functions in various physics problems.

Course Code: 6SMPH102

Course Name: CLASSICAL MECHANICS

Course Objective

- To apprise the students of Lagrangian and Hamiltonian formulation and their applications.

Course Outcomes:

Students will have understanding of:

- Necessity of Lagrangian and Hamiltonian formulation
- Essential features of a problem (Like motion under central force, rigid body dynamics, periodic motion) use them to set up and solve the appropriate mathematical equations and make quick and easy checks on the answer to catch simple mistakes.
- Theory of small oscillations which is important in several areas of physics i.e. molecular spectra, acoustics, variation of atoms in solids, coupled mechanical oscillators and electrical circuits.

Course Code: 6SMPH103

Course Name: QUANTUM MECHANICS-I

Course Objective

- To give exposure about various tools employed to analyze the quantum mechanical problems.

Course Outcomes

Students will have understanding of:

- Importance of quantum mechanics compared to classical mechanics at microscopic level.
- Various tools to calculate Eigen values and total angular momentum of particles.
- Application of approximation method and scattering theories.

Course Code: 6SMPH104

Course Name: ELECTRONIC DEVICES

Course Objective

- To introduce students to entire circuit design and to provide in depth theoretical base of electronics and digital electronics.

Course Outcomes

Students will have understanding of:

- Fundamental design concept of different types of logic gates, minimization techniques etc.
- Characteristics of device like PNP, NPN, Diodes and truth table of various logic gates.
- Basic elements and to measure their values with multimeter and their characteristics study.

Course Code: 6SMPH201

Course Name: QUANTUM MECHANICS-II

Course Objective

- To impart knowledge of advanced quantum mechanics for solving relevant physical problems.

Course Outcomes

Students will have understanding of:

- Importance of relativistic quantum mechanics compared to non – relativistic quantum mechanics.
- Various tools to understand filled quantization and related concept.
- Exposure to quantum field theory and universal interactions.

Course Code: 6SMPH202

Course Name: STATISTICAL MECHANICS

Course Objective

- The objective of this course is to learn the properties of macroscopic system using the knowledge of the properties of individual particles.

Course Outcomes

Students will have understanding of:

- Connection between statistics and thermodynamics.
- Difference ensembles and theories to explain the behaviour of the system.
- Difference between classical statistics and quantum statistics.
- Statistical behaviour of ideal Bose and Fermi systems.

Course Code: 6SMPH203

Course Name: SOLID STATE PHYSICS

Course Objective

- To Study some of the basic properties of the condensed phase of materials specially solids.

Course Outcomes

Students will have understanding of:

- Structure in solids and their determination using XRD.
- Behaviour of electrons in solids including the concept of energy bands and effect of the same on material properties.
- Electrical, thermal, magnetic and dielectric properties of solids and dielectric properties of solids.

Course Code: 6SMPH204

Course Name: ATOMIC & MOLECULAR PHYSICS

Course Objective

- Objective of this course is to learn atomic, molecular and spin resonance spectroscopy.

Course Outcomes

Students will have understanding of:

- Atomic spectroscopy of one and two valence electron atom.
- The change in behaviour of atoms in external applied electric and magnetic field.
- Rotation, vibrational, electronic and Raman spectra molecules.
- Electron spin and nuclear magnetic resonance spectroscopy.

Course Code: 6SMPH301

Course Name: CONDENSED MATTER PHYSICS

Course Objective

To study some of the basic properties of the condensed phase of materials specially solids.

Course Outcomes

Students will have understanding of:

- Structure in solids and their determination using XRD.
- Behaviour of electrons in solids including the concept of energy bands and effect of the same on material properties.
- Electrical, thermal, magnetic and dielectric properties of solids. properties of solids.

Course Code: 6SMPH302

Course Name: NUCLEAR PHYSICS

Course Objective

- To impart knowledge about basic nuclear physics provide the students with an understanding of basic radiation interaction and detection techniques for nuclear physics, radioactive decays, nuclear reactions and elementary particle physics.

Course Outcomes

Students will have understanding of:

- Basic properties of nucleus and nuclear models to study the nuclear structure properties.
- Various aspects of nuclear reactions will give idea how nuclear power can be generated.
- Need of standard model and its limitations.
- Weak interaction between quarks and how that this is responsible for beta decay.
- Leptons and how the electron neutrinos and antineutrinos are produced during beta plus and beta minus decays.

Course Code: 6SMPH303

Course Name: ELECTRODYNAMICS (Elective I)

Course Objective

Completion, the students will be able to:

- Demonstrate an understanding of the use of scalar and vector potentials of Gauss invariance, know and use methods of solution of Poisson and Laplace equations, and use principle of Lorentz covariant formalism and tensor analysis and basic understanding of plasma state essential for higher study.

Course Outcomes

Students will have understanding of:

- Time varying field and Maxwell Equations.
- Various concepts of electromagnetic waves.
- Radiation from ionised time varying sources and charged particle dynamics.

Course Code: 6SMPH304

Course Name: PLASMA PHYSICS (ELECTIVE I)

Course Objective

- To expose the students to theory related to motion charge particle in inhomogeneous field, production of plasma and uses of plasma.

Course Outcomes

Students will have understanding of:

- What are theoretical method to study the charged particle motion.
- How to generate plasma in the laboratory.
- How plasma production is helpful to make fusion reactors.

Course Code: 6SMPH305

Course Name: DIGITAL ELECTRONICS & MICROPROCESSOR (ELECTIVE II)

Course Objective

To provide theoretical knowledge and develop practical skill in digital systems, logic systems and microprocessor, Electronic systems and microprocessors.

Course Outcomes

Students will have understanding of

- Logic circuits, digital systems and microprocessor and their peripheral devices.
- Operating and designing digital systems.
- How to solve problems in design and /or implementation of digital electronics.

Course Code: 6SMPH306

Course Name: ENVIRONMENTAL PHYSICS (ELECTIVE II)

Course Objective

- The students shall acquire basic knowledge within selected environmental topics viz ionizing radiation, radioactivity, U-V & I-R radiation, ozone depletion problem, greenhouse effect and climate, whether and biological effects related to environments.

Course Outcomes

Students will have understanding of

- Students will describe and analyze the current national and global environmental problems.
- Students interpret biological and chemical data related to environments.
- Know how climate models can be used for weather forecasting, climate simulation, and

investigations of the causes of climate change.

Course Code: 6SMPH401

Course Name: MATERIAL SCIENCE (ELECTIVE III)

Course Objective

- To give comprehensive exposures to the students regarding various materials, crystalline, non- crystalline materials, crystal structure and their defects the concept of phase and different type of phase diagram.

Course Outcomes

Students will have understanding of:

- Different type of materials and their structure.
- Structure dependence of various thermal, optical and mechanical properties.

Course Code: 6SMPH402

Course Name: PHYSICS OF NANO MATERIALS (Elective III)

Course Objective

- To provide knowledge about physics based nano processes, to design and conduct experiments relevant to nano physics as well as to analyse the results, to improve usage of physics for modern technology, to provide an adequate knowledge on various nano physics aspects.

Course Outcomes

Students will have understanding of:

- Fundamental principles of nanotechnology and their application.
- Apply physical concepts to the nano scale and non – continuum domain.
- Evaluate processing conditions to engineer functional nano materials.

Course Code: 6SMPH403

Course Name: COMPUTATIONAL METHODS & PROGRAMMING (ELECTIVE IV)

Course Objective

- To provide various numerical methods for solving differential and integral equations to physical equations.

Course Outcomes

Students will have understanding of:

- Uses of computer in various fields.
- Various technique to solve differential and integral equations.

Course Code: 6SMPH404

Course Name: Communication Electronics (Elective IV)

Course Objective

- To built up the concept integrated circuits and its application in the electronics and communications.

Course Outcomes

Students will have understanding of:

- Operational amplifier and its applications.
- Knowledge of computer and wave from generator.
- Construction working and applications 555 timer, they will also acquire the knowledge of digital to analog and analog to digital techniques.

DOCTOR OF PHILOSOPHY (Ph. D - Physics)

PROGRAMME CODE -PH.D001

PROGRAMME EDUCATIONAL OBJECTIVE (PEOS)

The structure of the Ph.D. (Physics) programme is designed to produce post graduates as well as M.Phil. scholars with rigorous research and analytical skills, who are exceptionally well-equipped to go onto Ph. D. research, or employment in industrial, academic and the public service. The Ph.D. (Physics) programme provides:

- **PEO 1:** To prepare research oriented techniques.
- **PEO 2:** Society based research.
- **PEO 3:** Eco-friendly research.
- **PEO 4:** Review globally in research.
- **PEO 5:** To gain knowledge of modern techniques, theory and observational results in relative research area.
- **PEO 6:** To understand research and knowledge of different parts of research.
- **PEO 7:** To promote research culture and an environment that encourages the student's originality and creativity in their research.
- **PEO 8:** Skills to enable the student to critically examine the background literature relevant to their specific research area.
- **PEO 9:** Publishing the results of their research in high-profile scientific journals, through constructive feedback of written work and oral presentations.

PROGRAMME OUTCOMES (POS)

- **PO 1:** To look after nationwide as well as globally.
- **PO 2:** Knowledge of research in higher education.
- **PO 3:** Opportunity in national importance centre.
- **PO 4:** Build upon as a entrepreneurship.
- **PO 5:** Enhancement of thinking skill.
- **PO 6:** Research oriented.

PROGRAMME SPECIFIC OUTCOMES (PSOS):

- **PSO 1:** Upliftment of concepts, ideas and thoughts.
- **PSO 2:** Inculcation of research.
- **PSO 3:** Development of scientific temperament of research.
- **PSO 4:** Awareness about the first steps in research.
- **PSO 5:** Scope of employability in research centers.
- **PSO 6:** Promotion of research.

Course Code: 5010113001

Course Name: RESEARCH METHODOLOGY

Course Objective

- Objective of the course to enable Ph. D. scholar to understand the methods of research & different computer application in research and apply the knowledge and skills in conducting research work.

Course Outcome

- After learning this scholar will be able to understand the concept and process of research and will able to carry out their research work effectively considering the ethics of research for usefulness of society.

Course Code: 5010153001

Course Name: ADVANCED PHYSICS & TECHNOLOGIES (Elective)

Course Objective

- To inculcate the basis for doing research and to utilize the modern technologies for future applications.

Course Outcomes

Students will have understanding of:

- Fundamental knowledge of physical phenomena and scientific theories.
- Application in advanced research.
- Helpful in defining research objectives.
- Useful in laboratory.
- Helpful in analysis of several scientific results for environmental awareness.

Course Code: 5010153002

Course Name: SOIL SCIENCE & MICROWAVE REMOTE SENSING – GIS (Elective)

Course Objective

- To learn about the soil and its components and to test several properties of soil microwave sensing and GIS technology.

Course Outcomes

Students will have understanding of:

- Helpful in understanding the basics of soil properties.
- Helpful in enhancing the soil fertility using modern technologies.
- Understanding the application of GIS and Microwave remote sensing.

- Useful in understanding the basics of electromagnetic radiation.

Course Code: 5010153003

Course Name: ADVANCED MATERIALS & TECHNOLOGIES (Elective)

Course Objective

- To give comprehensive exposures to the students regarding various materials, crystalline, non – crystalline materials, crystal structure and the technologies to detects the properties of different types of materials.

Course Outcomes

Students will have understanding of:

- Knowledge of materials and their structure.
- Understanding the concepts of nanotechnology fabrications technology.
- Explanation of diffusion in materials.
- Useful in material science laboratory.
- Utilization in advance research.

Course Code:5010153004

Course Name: X-RAY CRYSTALLOGRAPHY (Elective)

Course Objective

- To drawn attention of the students toward the theory related to the Radiation Detection and practical use of Dosimetry in industrial and research institutions.

Course Outcomes

Students will have understanding of

- Useful in instrumentation.
- Especially in XRD.
- Useful in advanced laboratory i.e; radiography.
- Application in radiation safety.

Course Code: 5010153005

Course Name: ASTRONOMY & ASTROPHYSICS (Elective)

Course Objective

- To gain knowledge of modern techniques, theory and observational results in astrophysics and cosmology and to introduce the physics of planetary atmospheres.

Course Outcomes

Students will have understanding of:

- To understand binary stars as well as our solar system and the associated processes occurring in the galaxies.
- To describe the basic structure of an atmosphere and the climate system.
- The concept of potential temperature and how it relates to static stability.
- Know the components of the earth radiation balance and understand the radiative processes of different types.

Course Code: 5010113002

Course Name: RESEARCH AND PUBLICATION ETHICS

Course Objective

- The objective of the course is to enable M. Phil/Ph. D scholar to understand about the publication ethics and publication misconduct and to create the awareness.

Course Outcome

- After learning this subject scholar will be able to understand the concepts and process of research and aware about the publication ethics and publication misconduct.