**Department of Physics**

**Mahatma Gandhi College**

**Thiruvananthapuram**

**M.Sc. Degree Programme in Physics**

(2020 admission onwards)

**PROGRAM OUTCOME**

1. Define and explain fundamental ideas and mathematical formalism of theoretical and applied physics.
2. Identify, classify and extrapolate the physical concepts and related mathematical methods to formulate and solve real physical problems.
3. Identify and solve interdisciplinary problems that require simultaneous implementation of concepts from different branches of physics and other related areas.
4. To define a research problem, translate ideas into working models, interpret the data collected draw the conclusions and report scientific data in the form of dissertation.
5. To disseminate scientific knowledge and scientific temper in the society to contribute towards greater human cause.

**COURSE OUTCOMES**

**PH 211: CLASSICAL MECHANICS**

1. Students are able to learn the concepts of Lagrangian and Hamiltonian mechanics and use them to solve problems in mechanics. Able to learn concepts of generating functions, Poisson brackets Hamilton Jacobi equations and action angle variables.
2. To equip the students to deal with central force problem and analyzing Kepler’s laws.
3. To inculcate the students the concepts of special and general theory of relativity and related problems.
4. To acquaint the students about the theory of small oscillations and Euler’s equations of motions of rigid bodies.
5. To analyze nonlinear dynamical systems and to explain the concepts of classical chaos.

**PH 212: MATHEMATICAL PHYSICS**

1. To apply and analyze the various vector and matrix operations and to perform complex analysis for solving physical problems.
2. To demonstrate and utilize the concepts of Fourier series and its transforms.
3. To explain and differentiate different probabilistic distributions.
4. To apply partial differential equations and special functions for solving mathematical problems.
5. To illustrate and apply concepts of group theoretical operations and tensors.

**PH 213: BASIC ELECTRONICS**

1. To equip the students design and analyze different analogue and digital circuits.
2. To summarize the knowledge of basic arithmetic and data processing circuits and memory devices.
3. To equip the students to explain various components in optical communications systems and microwave devices.
4. To measure and analyze the different electronic signals.

**PH 221: MODERN OPTICS AND ELECTROMAGNETIC THEORY**

1. To demonstrate the linear and nonlinear optical phenomena.
2. To explain and discuss propagation of electromagnetic waves through different media. (iii)
3. To restate formulations and relativistic effects in electrodynamics.
4. To analyse the propagation of electromagnetic waves through waveguides.
5. To use radiation theory in developing different antennas.

**PH 222: THERMODYNAMICS, STATISTICAL PHYSICS AND BASIC QUANTUM MECHANICS**

1. To explain the basic thermodynamic relations, Maxwell’s equations and its consequences.
2. To equip the students to demonstrate and apply classical and quantum statistics in different physical phenomena.
3. To distinguish the different phase transitions using Ising model.
4. Outline and apply foundations of quantum mechanics.

**PH 223: COMPUTER SCIENCE AND NUMERICAL TECHNIQUES**

1. To summarize computer hardware and its operating systems
2. Explain internal architecture of microprocessors 8085 and create assembly language programming.
3. To develop and compile programs in python and C++.
4. Apply numerical methods to solve physical problems.

**PH231: ADVANCED QUANTUM MECHANICS**

1. To extend the use of approximation methods viz variation, WKB, time dependent and time independent perturbations.
2. To summarize different types of symmetry, conservation laws and quantum theory of scattering.
3. (iii) To distinguish different approximation methods, to study the structure and properties of many electron systems.
4. To compute eigen values of angular momentum and evaluation of CG coefficients.
5. Infer the requirements of relativistic quantum mechanics.

**PH 232: ATOMIC AND MOLECULAR SPECTROSCOPY**

1. Explain different symmetry operations and deduction of molecular structure.
2. Distinguish and classify the different spectra shown by atoms and molecules
3. Illustrate the various spectroscopic experimental techniques.

**PH 233 E: ADVANCED ELECTRONICS -I**

1. To summarize various techniques of digital and analog communication systems.
2. Generalize the idea of information theory
3. Illustrate various techniques for digital signal processing based Fourier and Z transform

**PH 241: CONDENSED MATTER PHYSICS**

1. Discuss crystal physics, lattice vibrations, models of thermal properties and band theory of solids.
2. Explain the theoretical concepts of semiconductors, dielectric, magnetic and superconducting materials.
3. To describe the synthesis and characterization techniques of nanomaterials.
4. To apply the concepts in condensed matter physics to meet the challenges.

**PH 242: NUCLEAR AND PARTICLE PHYSICS**

1. To describe and analyze nuclear structure, models and reactions.
2. To illustrate the mechanisms of nuclear fission and fusion reactions.
3. Discuss various nuclear detectors and particle accelerators.
4. To classify elementary particles and discuss their interactions.

**PH 243 E: ADVANCED ELECTRONICS-II**

1. Demonstrate microprocessor architecture, programming and interfacing devices.
2. Outline the basic concepts of embedded systems, artificial intelligence and neural networks.
3. Illustrate fundamental data communications codes, radar and satellite communication systems.

**PH 251: GENERAL PHYSICS PRACTICALS**

1. To measure and analyze various physical quantities.
2. To calculate error in various general physics experiments.
3. To develop experimental skills

**PH 252: ELECTRONICS AND COMPUTER SCIENCE PRACTICALS**

1. To design and construct various electronic circuits and its validation.
2. To calculate error in various electronics experiments.
3. To develop experimental and programming skills

**PH 261 ADVANCED PHYSICS PRACTICALS**

1. To measure and analyze various physical quantities.
2. To calculate error in various advanced physics experiments.
3. To develop experimental skills
4. To analyze and point out results of experimental data.

**PH 262 E ADVANCED ELECTRONICS PRACTICALS**

1. To design and construct various electronic circuits and its validation.
2. To calculate error in various electronics experiments.
3. To develop and test assembly language programs using microprocessors.