Sree Narayana Mangalam College, Maliankara

(Affiliated to Mahatma Gandhi University, Kottayam)

PROGRAMME OUTCOME

PROGRAMME SPECIFIC OUTCOME, COURSE OUTCOME

M.Sc. PHYSICS

Sree Narayana Mangalam College
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At the end of the Post Graduate Program at S.N.M College, Maliankara, a student will have developed:

POST GRADUATE PROGRAMME OUTCOMES

PO1:	**Subject competence and Problem Solving:** Understanding the respectivesubject matter to become subject experts in the field and solve problems ofrelevance to society to meet the specified needs using the knowledge, skills andattitudes acquired from the program of study is the sole intention of this programoutcome. It enables the student at viewing multiple perspectives to analyse anysituation/task at hand and derive feasible solutions by optimistically approaching aproblem. This inculcates independent research aptitudes and strong decision
PO2:	**Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problem solving, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.
PO3:	**Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
PO4:	**Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO5:	**Scientific Reasoning:** Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO6:	**Self-directed Learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO7:	**Critical Thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PROGRAMME SPECIFIC OUTCOMES

At the end of M.Sc Physics at S.N.M College, Maliankara, a student will have developed:

PSO1	Ability to pursue research in theoretical/ experimental physics or related areas.
PSO2	Acquire a thorough understanding of the fundamentals of Physics so as to select an academic career in secondary or tertiary level.
PSO3:	Good knowledge in Physical Sciences and thereby trained to compete national level tests like UGC-CSIR NET, JEST, GATE, etc successfully.
PSO4:	To take up challenges as globally competitive physicists/researchers in diverse areas of theoretical and experimental physics.
PSO5:	Skill for employment and further studies in Physics

COURSE OUTCOMES: CORE COURSE (THEORY)

SEMESTER I

PH010101- Mathematical Methods in Physics I

At the end of this course, a student will have developed ability to:

CO1:	Understand basic and advanced mathematical tools required for physics problems.
CO2:	Understand the different techniques to solve differential and integral equations.
CO3:	Understand the various special functions and important transforms and their applications.
CO4:	Express integral theorems and their applications in physics.

PH010102 – Classical Mechanics

At the end of this course, a student will have developed ability to:

CO1:	Understand the fundamental concepts of the Lagrangian and the Hamiltonian methods and will be able to apply them to various problems.
CO2:	Understand the basic ideas of central forces, rigid body dynamics, Hamilton Jacobi method and the concept of action-angle variables.
CO3:	Give a brief introduction to the Lagrangian formulation of relativistic mechanics.
CO4:	Identify the motion of a mechanical system using Lagrange-Hamilton formalism.
CO5:	Apply the formalism of Lagrangian and Hamiltonian in generating equations of motion for complicated mechanical systems of classical mechanics.

PH010103 - Electrodynamics

At the end of this course, a student will have developed ability to:

CO1:	Impart proper understanding of electricity magnetism and electrodynamics.
CO2:	Explain the electromagnetic field radiating from accelerated charges and the impact of relativity in electromagnetism along with confined propagation of electromagnetic wave.
CO3:	Understand wave nature of electromagnetic field and its properties.
CO4:	Use Maxwell equations in analysing the electromagnetic field due to time varying charge and current distribution
CO5:	Describe the nature of electromagnetic wave and its propagation through different media and interfaces.

PH010104- Electronics

At the end of this course, a student will have developed ability to:

CO1:	Understand the characteristics of PN junction diodes, transistors, operational amplifiers, transducers and their applications.
CO2:	Analyse impedance matching, filtering and noise reduction techniques.
CO3:	Build mathematical and numerical background for design of electronics circuit & component value.
CO4:	Identify and model the problems of the field of electronics.

SEMESTER II

PH010201- Mathematical Methods in Physics II

At the end of this course, a student will have developed ability to:

CO1:	Understand the concepts of Laplace and Fourier transforms.
CO2:	Understand Fourier series and its application to solutions of partial differential equations.
CO3:	Perform calculations related with vectors.
CO4:	Analyse matrix and determinant operations

PH010202 – Quantum Mechanics I

At the end of this course, a student will have developed ability to:

CO1:	Understand the fundamental concepts of the Dirac formalism, quantum theory of angular momentum.
CO2:	Know on how quantum systems evolve in time.
CO3:	To solve the hydrogen atom problem which is a prelude to more complicated problems in quantum mechanics?
CO4:	Apply principles of Quantum mechanics to calculate observables for given wave functions.

PH010203 – Statistical Mechanics

At the end of this course, a student will have developed ability to:

CO1:	Find the connection between statistics and thermodynamics.
CO2:	Differentiate between different ensemble theories used to explain the behaviour of the systems.
CO3:	Differentiate between classical statistics and quantum statistics.
CO4:	Explain the statistical behaviour of ideal Bose and Fermi systems.

PH010204 – Condensed Matter Physics

At the end of this course, a student will have developed ability to:

CO1:	Explain the significance and value of condensed matter physics both scientifically and in the wider community.
CO2:	Treat functional materials from an experimental point of view, solid state theory and properties, understanding of on how microscopic/atomic processes acting between many atoms/molecules produces the typical properties of different solid state matter.
CO3:	Differentiate between different lattice types and explain the concepts of reciprocal lattice.
CO4:	Bridge the gap between basic solid state physics and quantum theory of solids.

SEMESTER III

PH010301 – Quantum Mechanics II

At the end of this course, a student will have developed ability to:

CO1:	Understand the different stationary state approximation methods and its application to various quantum systems.
CO2:	Explain time dependent perturbation theory and application to semi classical theory of atom radiation interaction.
CO3:	Understand Born approximation and the method of partial waves.
CO4:	Formulate basic concepts on relativistic quantum mechanics.

PH010302 – Computational Physics

At the end of this course, a student will have developed ability to:

CO1:	Understand the basic idea about the techniques used in physics to solve problems with the help of computers when they cannot be solved analytically.
CO2:	Formulate algorithms on their own.
CO3:	Identify modern programming methods and describe the extent and limitations of computational methods in physics.
CO4:	Identify and describe the characteristics of various numerical methods.

PH010303 –Atomic and Molecular Physics

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge about atomic structure and spectra of typical one electron and two electron systems.
CO2:	Explain the theory of microwave and infrared spectroscopy as well as the electronic spectroscopy of molecules.
CO3:	Understand the basics of Raman spectroscopy, nonlinear Raman effects, NMR, ESR and Mossbauer spectroscopy.
CO4:	Developing analytical, laboratory and computing skills through problem solving, laboratory & computer based exercises which involve the applications of atomic and molecular physics.

PH800301 – Digital Signal Processing (Elective Paper)

At the end of this course, a student will have developed ability to:

CO1:	Illustrate digital signals, systems and their significance.
CO2:	Analyse digital signals using various digital transforms such as DFT, FFT etc.
CO3:	Design and develop the basic digital system.
CO4:	To study the design techniques for FIR and IIR digital filters.

SEMESTER IV

PH010401 – Nuclear and Particle Physics

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge about the basic properties of the nucleus and the nuclear forces.
CO2:	Describe the major models of the nucleus and the theory behind the nuclear decay process, nuclear reactions.
CO3:	Explain the interaction between elementary particles and the conservation laws in particle physics.
CO4:	To impart some idea about nuclear astrophysics and the practical applications of nuclear physics.

PH800402 – Microelectronics and Semiconductor Devices (Elective Paper)

At the end of this course, a student will have developed ability to:

CO1:	Understand the architecture and instruction set of basic microprocessors, fundamentals of semiconductor devices and their processing steps in detail.
CO2:	Use the knowledge of semiconductor fabrication processes to work in industry in the area of semiconductor devices.
CO3:	Understand semiconductor device operation as well as the fabrication techniques used in their manufacture.
CO4:	Understand the fundamental scientific principles governing semiconductor electronic devices, modelling of such devices and their incorporation into modern integrated circuits.

PH800403 – Communication Systems (Elective Paper)

At the end of this course, a student will have developed ability to:

CO1:	Understand the basic concepts of different communication systems such as optical fiber, radars and antennas.
CO2:	To analyse analog communications in time doain and frequency domain.
CO3:	To study the fundamental concept of the analog communication systems.

CO4:	Understand types, characterisation and performance parameters of transmission channels.

COURSE OUTCOMES: CORE COURSE (PRACTICAL)

SEMESTER I & II

PH010105- General Physics Practical

At the end of this course, a student will have developed ability to:

CO1:	Gain practical knowledge in utilizing different types of instruments in optics, practical handling of lasers and their applications.
CO2:	Describe the methodology of science and the relationship between observation and theory.
CO3:	Determine Fraunhoffer diffraction pattern of a single slit, double slit and wire mesh
CO4:	Determine Hall coefficient, carrier concentration and carrier mobility of magnetic materials, magnetic susceptibility of a paramagnetic solution using Quinck's tube method, hysteresis curve of a ferromagnetic material and determination of retentivity and coercivity.

PH010205– Electronics Practical

At the end of this course, a student will have developed ability to:

CO1:	Understand the characteristics of various diodes, transistors, Op-Amp, designing concepts of logic gates and digital circuits.
CO2:	Acquire knowledge about the basic elements and measurement using multimeters and utilization of CRO.
CO3:	Design and construct integrator, differentiator, logarithmic amplifier, square wave generator, triangular wave generator using Op-Amp.
CO4:	Design and construct a first and second order low pass Butterworth filter, first and second order high pass Butterworth filter, first order narrow band pass Butterworth filter using Op-Amp and to draw frequency response curve.

SEMESTER III & IV

PH010402– Computational Physics Practical

At the end of this course, a student will have developed ability to:

CO1:	Write C++ program, compile and execute.
CO2:	Practical implement numerical methods in programming.
CO3:	Sove ordinary first-order differential equations using the Euler methods or the fourth order Runge-Kutta method.
CO4:	Study the path of a projectile in motion with and without air drag and compare the values

PH800302– Advanced Practicals in Electronics (Elective Paper)

At the end of this course, a student will have developed ability to:

CO1:	Perform experiments on microprocessors and micro Controllers like sorting of numbers in ascending/descending order, finding the largest and smallest of numbers in array of memory, measurement of frequency, current and voltage using microprocessors.
CO2:	Perform experiments on communication electronics like generation PAM and PWM, multiplexer and demultiplexer using digital IC 7432, measurement of characteristic impedance and transmission line parameters of a coaxial cable.
CO3:	Perform experiments on electronic instrumentation like DC and AC milli voltmeter construction and calibration, instrumentation amplifier using a transducer, generation of BH curve and diode characteristics on CRO.
CO4:	Perform experiments on Optoelectronics like characteristic of a photo diode - Determination of the relevant parameters, beam Profile of laser, spot size and divergence, temperature co-efficient of resistance of copper.

PH010403– Project

At the end of this course, a student will have developed ability to:

CO1:	Bring out their talents in experimental, theoretical or computational research.
CO2:	Oral and verbal presentation skills.
CO3:	Analyse collected data and reach at a conclusion.
CO4:	Expand and develop their future research field.

PH010404– Comprehensive viva voce

At the end of this course, a student will have developed ability to:

CO1:	Demonstrate knowledge in the programme domain.
CO2:	Present his/her views cogently and precisely.
CO3:	Exhibit professional etiquette suitable for career progression.
CO4:	Oral and verbal presentation skills