St. Albert's College (Autonomous)

An initiative of Archdiocese of Verapoly

Affiliated to Mahatma Gandhi University, Kottayam

(Accredited with "A" Grade by NAAC)

Programme Outcomes

Programme Specific Outcomes

Course Outcomes

Department of Physics

Dept. of Physics, St. Albert's College (Autonomous)

M.Sc. Physics (2016 Admission onwards)

Programme code: **PHY02**

Programme Objectives (POs)

The objectives of the M.Sc. Physics programme are to train the students with in-depth knowledge and understanding of physics with higher order critical, analytical, mathematical and research skills; ability to think rigorously and independently to meet higher level expectations of academia and research with sufficient transferrable skills.

Programme Specific Objectives (PSOs)

- Understanding the basic concepts of physics particularly concepts in classical mechanics, quantum mechanics, Mathematical Physics, statistical mechanics and electrodynamics.
- To appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws through logical and mathematical reasoning.
- Learn to carry out experiments in basic as well as certain advanced areas of physics such as condensed matter physics, nanoscience, lasers and electronics.
- Gain hands on experience to work in applied fields.
- Gain a through grounding in the subject to be able to teach it at college as well as school level.
- Viewing physics as a training ground for the mind developing a critical attitude and the faculty of logical reasoning that can be applied to diverse fields.
- Understand and apply principles of physics for understanding the scientific phenomenon in classical domain.
- Understand and apply mathematical techniques for describing and deeper understanding of physical systems.
- Understand and apply statistical methods for describing the classical and quantum particles in various physical systems and processes.

- Understand and apply inter-disciplinary concepts and computational skills for understanding and describing the natural phenomenon.
- Understand and apply principles of Quantum mechanics for understanding the physical systems in quantum realm
- Provide exposure in various specialization of Physics (Solid State Physics/Nuclear Physics/Particle Physics/Material Science).
- Provide exposure to advanced experimental/theoretical methods for measurement, observation, and fundamental understanding of physical phenomenon/systems.
- Engage in research and life-long learning to adapt to changing environment.

Course Objectives (COs)

Name of the course with course code	Course Objectives
PPH1CRT01: Mathematical Methods in Physics- I	➢ To expose the student to the indispensable role that mathematics plays in modern physics. ➢ Intended to provide students with a firm grounding in mathematical concepts, tools and techniques that are essential to the solution of problems they encounter in advanced courses of Physics. ➢ Enable the students to understand and apply the mathematical skills to solve quantitative problems in the study of physics. ➢ To enable students to apply integral transform to solve mathematical problems of interest in physics. ➢ Enable the students to use Fourier transforms as an aid for analysing experimental data. ➢ Enable the students to formulate and express a physical law in terms of tensors, and simplify it by use of coordinate transforms.

PPH1CRT02: Classical Mechanics	➢ To introduce the techniques of classical mechanics to students so that they are familiarized with Lagrangian and Hamiltonian formulation, Rigid body dynamics ➢ Introduce to nonlinear dynamics and general theory of relativity. ➢ The students will be able to apply the Vibrational principles to real physical problems. The students will be able to model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations.
PPH1CRT03: Electrodynamics	➢ This course aims to provide a comprehensive introduction to the subject of Electrodynamics and to cater the needs of students who intend to go for further studies and research. ➢ To explain and solve advanced problems based on classical electrodynamics using Maxwell's equation. ➢ Enable the students to analyse radiation systems in which the electric dipole, magnetic dipole or electric quadruple dominate. ➢ To make the students understand the covariant formulation of electrodynamics and the concept of retarded time for charges undergoing acceleration. ➢ To make the students understand relativistic electrodynamics.
PPH1CRT04: Electronics	➢ After completing this course, the student will be able to comprehend the working and applications of an OPAMP as an amplifier, wave shaper, voltmeter, ammeter etc. ➢ To develop practical understanding of various electronic components and enable students to adapt

	to the changing technology.
PPH1CRP01: General Physics Practical	➢ Learn to carry out experiments in basic as well as certain advanced areas of physics. ➢ Gain hands on experience to work in applied fields.
PPH2CRT01: Mathematical Methods in Physics-II	➢ The aim of this course is to acclimatize the methods of mathematics to study physical problems. ➢ The course enables students to learn Mathematical Physics in the advanced level. ➢ To know the method of contour integration to evaluate definite integrals of varying complexity. ➢ To gain ability to apply group theory to physics problems, which is a pre-requisite for deeper understanding of crystallography, particle physics, quantum mechanics and energy bands in solids. ➢ To apply calculus of variations to diverse problems in physics including isoperimetric problems. Another interesting aspect is the use of Lagrange multipliers in solving physics problems. ➢ To become familiar with the method of Green's function to solve linear differential equations with inhomogeneous term ➢ To find solutions to integral equations using different methods.
PPH2CRT02: Thermodynamics and Statistical Mechanics	➢ To give a strong foundation in Thermodynamics and Statistical Mechanics to understand the real world systems ➢ To Know the basics of thermodynamics up to Carnot's engine, its working and comparison with

	practical engines. ➢ To know about Gaussian distributions, axioms of probability theory and real physical meaning of second law of thermodynamics.
PPH2CRT03: Condensed Matter Physics	➢ Enable the students to formulate basic models for electrons and lattice vibrations for describing the physics of crystalline materials. ➢ To develop an understanding of relation between band structure and the electrical/optical properties of a material.
PPH2CRT04: Quantum Mechanics - I	➢ This course aims to provide a comprehensive introduction to the subject of quantum mechanics. It ➢ To familiarize the student with the physical concepts and the mathematical basis of quantum mechanics. ➢ To cultivate learner's skill at formulating and solving Physics problems. ➢ To formulate and solve problems in quantum mechanics. ➢ To enable the students to grasp the concepts of spin and angular momentum, as well as their quantization and addition rules.
PPH2CRP01: Electronics Practical	➢ Learn to carry out experiments in condensed matter physics, nanoscience, lasers and electronics. ➢ Gain hands on experience to work in applied fields.

PPH3CRT01: Quantum Mechanics - II	➢ This course aims to provide the learner the knowledge of how to deal with time dependent problems in quantum mechanics. ➢ Introduces the students to quantum field theory and to the techniques of quantum mechanics underlining the scattering problem. ➢ Familiarizes the students with the concepts of relativistic quantum mechanics.
PPH3CRT02: Computational Physics	➢ This course is intended to introduce the concept of numerical computing to students since mathematical computations are essential in every field of Physics. ➢ To help the student in choosing the correct method for solving a numerical problem and in understanding its limitations. ➢ Enable the student to get wide knowledge of numerical methods in computational Physics that can be used to solve many problems which does not have an analytic solution
PPH3CRT03 : Integrated Electronics and Digital Signal Processing	➢ Enable the student to know basics and fabrication techniques of ICs ➢ To learn about signal processing steps and Fourier transform of signals.
PPH3CRT04: Micro electronics and semiconductor devices	➢ Enable the student to know about microprocessors and microcontrollers ➢ Enable to do experiments using microprocessors and microcontrollers.
PPH3CRP01: Computational Physics Practical	➢ Use computer programing/simulations to understand and apply inter-disciplinary concepts and computational techniques for

	describing the natural phenomenon.
PPH4CRT01: Atomic and Molecular Physics	➢ This course is designed to provide a strong foundation in Spectroscopy. ➢ The students will have an understanding of quantum behaviour of atoms in external electric and magnetic fields. ➢ Student become familiar with NMR, ESR and Mössbauer spectroscopy.
PPH4CRT02: Nuclear and Particle Physics	➢ The course is aimed to provide an introductory account of nuclear physics and elementary particle physics. ➢ The Nuclear physics course will give the student an in-depth knowledge about the structure and properties of nuclei and about the various models that describe the properties; ➢ The Particle physics course aims to give a coherent description of the basic building blocks of matter such as quarks and lepton ➢ Introduces about grand unification theory.
PPH4CRT03 Instrumentation and communication electronics	➢ Enable to apply basic knowledge in the field of electronics and mobile communication. ➢ Enable to design and study mini systems to meet the requirement of public need and offers solutions to societal and environmental concerns. ➢ Enable to develop consciousness of professional, ethical, and social responsibilities as experts in the field of communication electronics.
PPH4CRT04: Thin Film and Nano Science	➢ Introduce vacuum technology, and its applications

	in material science and technology ➢ Enable the students to understand the thermodynamics behind thin film growth and properties of thin films. ➢ Introduce various thin film deposition and characterization techniques ➢ Introduce the properties and applications of nanomaterials in detail. ➢ Introduce various Nano synthesis and pattern replication methods
PPH4CRP01: Advanced electronics practicals	➢ Learn to carry out experiments in certain advanced areas of physics such as condensed matter physics, Digital electronics, microprocessors, lasers and electronics. ➢ Gain hands on experience to work in applied fields.
PPH4CPR01: Project/Dissertation	➢ To have research experience within a specific field of physics ➢ To combine and use knowledge from several disciplines. ➢ To critically and independently assess and evaluate research methods and results. ➢ Impart ability to develop and renew scientific competence -- independently, ➢ Enable to enter new problem areas that require an analytic and innovative approach.
PPH4CRV01: Viva Voce	➢ Communicate and present ideas clearly and concisely.