Programme: ***MSc Physics***

Course Outcome

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PH010101: MATHEMATICAL METHODS IN PHYSICS – I	The objective of this course is to make students have an idea of vector, matrices and tensors, it's physical interpretation and applications.
PH010102: CLASSICAL MECHANICS	After completing the course, the students will (i) understand the fundamental concepts of the Lagrangian and the Hamiltonian methods and will be able to apply them to various problems; (ii) understand the physics of small oscillations and the concepts of canonical transformations and Poisson brackets ; (iii) understand the basic ideas of central forces and rigid body dynamics; (iv) understand the Hamilton-Jacobi method and the concept of action-angle variables. This course aims to give a brief introduction to the Lagrangian formulation of relativistic mechanics.
PH010103: ELECTRODYNAMICS	This course is intended to develop the basic philosophy of spectroscopy. Its aims to equip the student with the understanding of (1) atomic structure and spectra of typical one- electron and two-electron systems. (2) the theory of microwave and infra-red spectroscopies as well as the electronic spectroscopy of molecules; (3) the basics of Raman spectroscopy and the nonlinear Raman effects; (4) the spin resonance spectroscopies such as NMR and ESR. This course also introduces the student to the ideas of Mossbauer spectroscopy.
PH010104: ELECTRONICS	Electronics is the study of the flow of charge (electron) through various materials and devices such as semiconductors, resistors, inductors, capacitors, nanostructures etc. All applications of electronics involve the transmission of power and possibly information.
PH010201: MATHEMATICAL METHODS IN PHYSICS – II	Introduce the concepts of Laplace and Fourier transforms. Introduce the Fourier series and it's application to solutions of partial differential equations.
PH010202 QUANTUM MECHANICS-I	This course aims to develop the basic structure of quantum Mechanics. After completing the course, the student will (i) understand the fundamental concepts of the Dirac formalism (ii) understand how quantum systems evolve in time; (iii) understand the basics of the quantum theory of angular momentum. Also, this course enable the student to solve the hydrogen atom problem which is a prelude to more complicated problems in quantum mechanics.
PH010203 STATISTICAL MECHANICS	This paper is structured in such a way that the student gets an idea on how the behaviour of a material can be understood taking into account a statistical analysis of the properties of its molecules. The student will also learn how quantum theory is applied to have an understanding of material behaviour, based on the restrictions applied to the molecules in micro regimes.
PH010204: CONDENSED MATTER PHYSICS	This course envisages that the student will understand the properties of a solid, how to characterize the symmetry and its various aspects. The course also illustrates the major role of electrons in determining the properties of solids. The student will be familiarized with the fundamental theories evolved through decades to understand the properties of electrons and its influence on solid behaviour. The student is expected to understand how quantum theory can be applied for an effective explanation of crystal behaviour.

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PH010301: QUANTUM MECHANICS-II	This course aims to extend the concepts developed in the course ' Quantum Mechanics-I . After completing this course, the student will (i) understand the different stationary state approximation methods and be able to apply them to various quantum systems; (ii) understand the basics of time-dependent perturbation theory and its application to semi-classical theory of atom-radiation interaction; (iii) understand the theory of identical particles and its application to helium; (iv) understand the idea of Born approximation and the method of partial waves. Also, this course will introduce the student to the basic concepts of relativistic quantum mechanics.
PH010302: COMPUTATIONAL PHYSICS	To help the students to have the basic idea about the techniques used in physics to solve problems with the help of computers when they cannot be solved analytically with pencil and paper since the underlying physical system is very complex. After the completion of this course students might be able to develop their own Algorithms of every method described in the syllabus.
PH010303: ATOMIC AND MOLECULAR PHYSICS	This course is intended to develop the basic philosophy of spectroscopy. Its aims to equip the student with the understanding of (1) atomic structure and spectra of typical one- electron and two-electron systems. (2) the theory of microwave and infra-red spectroscopies as well as the electronic spectroscopy of molecules; (3) the basics of Raman spectroscopy and the nonlinear Raman effects; (4) the spin resonance spectroscopies such as NMR and ESR. This course also introduces the student to the ideas of Mossbauer spectroscopy.
Elective Paper – I PH810301: SOLID STATE PHYSICS FOR MATERIALS	The first chapter of this course intends to disseminate to the students the deviations of crystal symmetry dealt with in ideal situations from perfection to imperfections, in the form of defects and dislocations and how they can affect the fundamental identities of solids such as mechanical, electrical, and magnetic properties. The second chapter deals with atomic diffusion and crystal binding whereas in the third chapter the student is expected to understand the application of quantum theory to understand the crystal properties.
PH010401: NUCLEAR AND PARTICLE PHYSICS	This course aims to provide the student to build up the fundamentals of nuclear and particle physics. After undergoing this course, the student will have a knowledge about (1) the basic properties of the nucleus and the nuclear forces. (2) Major models of the nucleus and the theory behind the nuclear decay process;(3) the physics of nuclear reactions (4) the interaction between elementary particles and the conservation laws in particle physics. This course intends to impart some idea about nuclear astrophysics and the practical applications of nuclear physics.
Elective Paper – II PH810402: SCIENCE OF ADVANCED MATERIALS	This course is structured with an objective to impart onto the students the properties of a few important materials and their applications, and methods to modify the properties in order to suit them for various technologies and applications.
Elective Paper – III PH810402 NANOSTRUCTURES AND MATERIALS CHARACTERISATION	This course envisages to make the student familiarize with the tremendous change in the properties of materials when they come to the nanoscale. The student will be familiarized with a few nanomaterials, their properties and applications, methods to synthesize nanomaterials, etc. Apart from synthesis, the student will understand how to characterize the synthesized material in order to understand their properties, using sophisticated tools and instrumentation.