M. Sc. (Physics)

Sem I

Course:	**PH-411: Mathematical Methods of Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** use different mathematical methods to study problems in non-linear sciences. **CO2:** understand the methods to ordinary differential equations, understand the methods to solve Nonlinear Schrodinger type equations; **CO3:** understand the concepts and application of solutions.

Course:	**PH-412: Classical Mechanics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the basic concepts on Classical Mechanics; **CO2:** understand the theorems relating to the nonlinear bodies; **CO3:** understand the various aspects of dynamics and oscillations of bodies.

Course:	**PH-413: Measurement, Instrumentation and Experimental Planning**
Course Outcomes	At the end of the course, the students will be able to **CO1:** acquire the knowledge about the different errors occurring during measurement; **CO2:** understand the principle behind the instrumentation for measurement; **CO3:** identify the various transducers involved in measurements.

Course:	**PH-414: General Electronics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the fundamentals of working of semiconductor and special devices; **CO2:** learn applications of electronic devices.

Course:	**PH-415: PRACTICALS**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the fundamentals of working of semiconductor and special devices; **CO2:** learn applications of electronic devices.

Sem II

Course:	**PH-421: Quantum Mechanics - I**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the basics of quantum mechanics; **CO2:** learn various physics concepts in the light of quantum mechanics.

Course:	**PH-422: Solid State Physics**

Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the basic concepts on properties of materials in solid state physics; **CO2:** learn phenomenon of superconductivity and its properties; **CO3:** study different techniques used for synthesis and fabrication of nano-materials.

Course:	**PH-423: Classical Electrodynamics and Plasma Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the basic concepts nucleus and its properties; **CO2:** gain the knowledge on elementary particles.

Course:	**PH-424: Numerical Analysis, Computer Programming**
Course Outcomes	At the end of the course, the students will be able to **CO1:** Numerical methods & programming At the end of course, students will be able to understand some numerical methods to solve physical problems and simulate that problems by knowing some compiler languages; **CO2:** understand the basic concepts of numerical methods and programming.

Course:	**PH-425: Practicals**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the fundamentals of working of semiconductor and special devices; **CO2:** Applications of electronic devices.

Sem III

Course:	**PH-531: Quantum Mechanics - II**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand the scattering and perturbation theory; **CO2:** understand the relativistic wave equations.

Course:	**PH-532: Nuclear and Particle Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand theoretical aspects of nuclear structure models, nuclear interaction, nuclear decay and nuclear reactions; **CO2:** They also learn about the structure and interaction of the sub-nuclear particles in quark models and the underlying fundamental symmetry properties.

Course:	**PH-533: Basic Nuclear Structure**
Course Outcomes	After successfully completing this course, the student will be able to: **CO1:** revise the basic properties of the nucleus; **CO2:** review semi-empirical mass formula; **CO3:** establish Q-value equation; **CO4:** learn techniques of measuring nuclear magnetic moments; **CO5:** understand the theory of the emission of the alpha particles;

	CO6: understand the Fermi's theory of the emission of the beta particles; **CO7:** understand the emission of gamma radiations and associated parameters; **CO8:** learn the process of internal conversion; **CO9:** understand the experimental data of the deuteron nucleus; **CO10:** give explanation to the properties of deuteron nucleus; **CO11:** review strong and weak nuclear forces and their properties; **CO12:** understand the theory of nucleon-nucleon scattering; **CO13:** understand various nuclear models and explain nuclear properties based on them.

Course:	**PH-534: Nuclear Detectors and Detection**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand in detail interaction of particles with matter; **CO2:** learn principles of different detectors; **CO3:** study construction and working of some detectors; **CO4:** study construction and working of gamma ray spectrometer and analyze gamma ray spectra; **CO5:** understand the working of alpha and beta spectrometers; learn general characteristics of detectors such as sensitivity, energy resolution, time characteristics, efficiency etc.; **CO6:** understand the errors that arise during detection of the particles; **CO7:** analyze data as probability distribution, binomial distribution, The Poisson distribution, The Gaussian distribution etc.; **CO8:** learn methods for the measurements of errors and their calculations; **CO9:** understand the basic idea of pulse signal processing technique; **CO10:** learn electronics of pre-amplifiers, amplifiers, pulse shaping, discriminators etc; **CO11:** study single channel analyzer, multi-channel analyzer, ADC etc.; **CO12:** understand the experimental techniques for nuclear detection; **CO13:** learn basic coincidence technique and associated parameters for nuclear detection

Course:	**PH-425: Practicals**
Course Outcomes	At the end of the course, the students will be able to **CO1:** familiarize with the Nuclear Radiation and Radioactive Sources; **CO2:** learn about various nuclear radiation detectors; **CO3:** come to know about how to handle the Beta and Gamma radioactive sources; **CO4:** learn C programming language and learn various syntax used in C language. **CO5:** interpret relationships in graphed data and also using least square fit analysis and communicate results from laboratory experiments in a written laboratory report; **CO6:** perform a quantitative analysis of experimental data including the use of computational and statistical methods where relevant;

	CO7: calculate permissible standard error in any physics experiment; **CO8:** derive conclusions from the analysis of own data; **CO9:** understand the fundamentals of working of semiconductor and special devices; **CO10:** Applications of electronic devices.

Sem IV

Course:	**PH- 541: Physics of Lasers and Lasers Applications**
Course Outcomes	At the end of the course, the students will be able to **CO1:** gain knowledge of the basic theory behind Laser Operation and Its properties throughout; **CO2:** get familiarity with electromagnetic theory and non-linear optics.

Course:	**PH-542 : Atomic and Molecular Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** get a unified account of physics of atoms and molecules from a modern viewpoint; **CO2:** learn how deal with of material on basic atomic physics, including atomic structure, the optical and X-ray spectra of atoms and the interaction of atom with electric and magnetic fields.

Course:	**PH-543: Nuclear Reactions and Reactor Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** understand different types of nuclear reactions; **CO2:** study reaction cross-sections; **CO3:** learn Coulomb scattering and nuclear scattering **CO4:** understand Ghoshal experiment and compound nuclear formation; **CO5:** study resonance reactions, direct reaction, heavy-ion reaction and reaction mechanism; **CO6:** learn complete and incomplete fusion reactions; **CO7:** revise the discovery of process of nuclear fission and its characteristics; **CO8:** learn the processes of nuclear fusion and thermos-nuclear reaction; **CO9:** study techniques of nucleo-synthesis; **CO10:** classify neutrons based on their energy and learn about neutron sources; **CO11:** understand neutron reactions and reaction cross-section; **CO12:** learn detection and interference of neutrons; **CO13:** learn need of particles accelerators, their classifications and types; **CO14:** understand the construction and working of various particle accelerators; **CO15:** learn basics of thermal neutrons, their diffusion and diffusion techniques; **CO16:** establish Fermi age equation; **CO17:** have in-depth study of nuclear chain reaction.

Course:	**PH-544: High Energy Physics**
Course Outcomes	At the end of the course, the students will be able to **CO1:** classify the elementary particles based on their various properties; **CO2:** learn properties of the particles **CO3:** understand parity, its conservation in strong and electromagnetic interactions; **CO4:** understand parity violation in weak interaction; **CO5:** learn conservation of charge conjugation, parity and time reversal; **CO6:** obtain equations of relativistic kinematics; **CO7:** get introduced to the concept of eightfold way; **CO8:** learn about the unitary groups; **CO9:** draw root and weight diagram; **CO10:** learn Gell-Mann Nishijima scheme; **CO11:** study group theory; **CO12:** understand the Young tableaux **CO13:** establish meson and baryon wave functions; **CO14:** learn elastic and inelastic scattering of a point particle; **CO15:** study Resenbluth formula **CO16:** understand structure functions; **CO17:** learn Bjorken scaling; **CO18:** understand parton model; **CO19:** study structure functions in terms of PDFs.

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