DEPARTMENT OF PHYSICS (UG & PG)

CRITERIA 2.6.1 PROGRAM OUTCOMES, PROGRAM SPECIFIC OUTCOMES, COURSE OUTCOMES

DEPARTMENT OF PHYSICS (UG & PG)	
B. Sc. PHYSICS PROGRAMME	
PROGRAMME OUTCOME (PO)	In BSc Physics program the students are able to learn the cause of different natural phenomena through understanding the core of physics, including substantial experimental physics, enabling them to train in both the theoretical and practical aspects. They are provided with a high quality education in physics within an environment committed to excellence in both teaching and research. The programme is oriented in such a way that it helps students to prepare themselves tackling problems of day to day life by correlating them with appropriate physical principles. The students will also be able to demonstrate their skills in scientific enquiry, problem solving and techniques adopted in the laboratory using experimental, computational, and/or theoretical method based on basic laws of physics.
PROGRAMME SPECIFIC OUTCOME (PSO)	PSO1: To make students familiar with the understandings of the basic laws of nature.
	PSO2: To develop the ability among students to solve complex problems by critical understanding, analysis and synthesis.
	PSO3: To help students to understand and grasp things quickly.
	PSO4: To help students to assimilate the knowledge of physics that is used to produce technologies in everyday use.
	PSO5: To provide a systemic understanding of core physical concepts, principles and theories along with their applications.
	PSO6: To develop proficiency in the analysis of complex physical problems and the use of mathematical or other appropriate techniques to solve them.
	PSO7: To grow the ability to use a variety of software packages and techniques to solve analytic and numerical problems and present data in a wide variety of formats.
	PSO8: To provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
COURSE OUTCOMES	
COURSE	Outcome
MATHEMATICAL METHODS OF PHYSICS-I	Mathematical Methods of Physics-I: It forms an intial mathematical foundation based on which further studies can be made.
MECHANICS	Exposes students to become familiar with the Newtonian Mechanics and general properties of matter. Students will have a basic understanding of the concepts and underlying principles of classical physics.
MATHEMATICAL METHODS OF PHYSICS-II	It enhances the concept of some special functions and complex mathematical integrals. Advanced mathematical physics helps students
ELECTRICITY AND MAGNETISM	Students understand electric and magnetic fields in matter. They apply Maxwell's equations and EM wave propagation to various physical
CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY	Students introduce themselves to a new horizon of thinking and have a working knowledge of special relativity in a hypothetical four dimensional spacetime continuum.

THERMAL PHYSICS-I	Students will demonstrate knowledge-based competencies in the fields of Thermodynamcis.
ANALOG SYSTEMS AND APPLICATIONS	Students will understand the electronic systems with a continuously variable signal and learn the function of basic component's use in linear circuits.
ELECTRICAL CIRCUIT NETWORK SKILLS	It develops problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems.
ELECTROMAGNETIC THEORY	Students will have an ability to determine and describe static and dynamic electric and magnetic fields for technologically important structure. they understand how electric field and magnetic fields are produced and their behavior also. They also learn what is an electromagnetic wave and how it propagates and their application in modern day communication systtem.
WAVES AND OPTICS	Students will apply knowledge of sound waves, and light waves to explain natural physical processes and related technological advances.
DIGITAL SYSTEMS AND APPLICATIONS	After completing the course students develop knowkedge of working of binary logic, and how different kinds of logic gates work. Students develop a digital logic and apply it to solve real life problems. They understand the difference between combinational and sequential logic circuits. They can analyze, design and implement combinational and sequential logic circuits. By this way they can get an opportunity to gain knowledge how modern day computer works.
COMPUTATIONAL PHYSICS	Computational Physics helps to developing computer programming and other numerical computations.
QUANTUM MECHANICS	Quantum Mechanics helps the students to have a deeper understanding of the mathematical foundations of quantum mechanics.
THERMAL PHYSICS-II	Students will demonstrate a mastery of the core knowledge in the areas of Thermal Physics and Statistical Mechanics.
NUCLEAR AND PARICLE PHYSICS	After completing of this course, the students gain knowledge of structure and properties of nuclie, the mechanism of different radioactive decays and their applications in peaceful use of nuclear energy. In particle physics they learn what are the elementary particles constitute this known universe. Stuents will gather capability of elementary problem solving in nuclear and particle physics.
ATOMIC PHYSICS AND SPECTROSCOPY	The concepts of Quantum Mechanics will enable the students to explain and describe the fundamental mathematical and scientific framework that underpins Quantum Mechanics.
STATISTICAL MECHANICS	The course gives an introduction to statistical mechanics which discusses how probability theory can be used to derive relations between the microscopic and macroscopic properties of matter. Both classical and quantum statistics and their application in different systems enable students to develop knowledge about how Bosonic and Fermionic systems behave. How electrons behave in metals and semiconductors and photons in blackbody radiations or phonons in solids.
CONDENSED MATTER PHYSICS	Students learn about fundamental topics in solid-state physics, and learn to work with quantum mechanics, statistical physics and electromagnetism.
APPLIED OOTICS	Students know about basic optical phenomena and understand the fundamentals and the basic tools which explain these phenomena.
NANO-MATERIALS AND APPLICATIONS	Students will gain experience in applying unique properties of nanomaterials to solve problems and challenges in our life. They will demonstrate the ability to develop case studies of nanomaterials with a focus on fundamentals, fabrication, characterization, and applications. The course also ensures knowledge about synthesys, characterizattion and applications of nanomatterials. Knowlege about optical, electtrical and mechanical properties of the nanomaterials are also outcome of this particular cours.

M. Sc. PHYSICS PROGRAMME

PROGRAM OUTCOMES	Bring up students as educated individuals imbued with Indian values and to prepare them to serve as good educators or scientists. Exposure to proper laboratory infrastructures will create opportunity to enhance their technological skill. Exposure to sophisticated instruments will also widen their knowledge. Seminars will give an opportunity to the students to develop their scientific temper, to improve their communication skills. Computational skills acquired would be of immense use in future while working with theoretical and as well as experimental physics. Will motivate students to pursue research careers especially in the field of Applied Optics, Photonics, Spintronics, Quantum computing and information processing. Will equip students to appear different competitive examinations like NET/GATE/SET/JEST/WBCS/UPSC etc for future research or professional career.
PROGRAM SPECIFIC OUTCOMES	The laws of physics in the Macroscopic and Microscopic world are significantly different. It is extremely important and absolute necessary to have a clear concept of classical mechanics before or simultaneous introduction of quantum mechanics. Alternate and generalized formulation of classical mechanics will help in to create a bridge with quantum mechanics. Non linear aspects of classical motions will help in understanding complex dynamical systems.
COURSE OUTCOMES	
COURSE	OUTCOMES
CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY	The Lagrangian and Hamiltonian approach will be useful in microscopic systems and field theoretic description of continuous systems. The concept of Hamilton-Jacobi theory will raise the idea of transition of a system from classical to quantum mechanics. The description of rigid body dynamics in terms of Euler angles will have direct implication in rotation in quantum mechanics. Relativistic formulation will be useful in understanding relativistic electrodynamics and relativistic quantum mechanics. Non linear aspects will be helpful in understanding chaotic behaviour of dynamical systems e.g. turbulence in fluid mechanics, weather systems etc.
QUANTUM MECHANICS-I	Students will learn to solve Schrodinger's equation for different potentials. Familarisation with mathematical tool of quantum mechanics such as linear spaces, operator algebra, matrix mechanics and eigen value problems. A good understanding of the mathematical tools used in the subject will help the students in solving problems in nuclear physics, electrodynamics, high energy physics etc. The advanced topics will help the students in understanding several atomic and nuclear phenomena.
MATHEMATICAL METHODS OF PHYSICS	Students are expected to be well acquainted with technique to solve different problems related to complex analysis, differential equations, integral transform, linear algebra. Students would be capable to apply their knowledge to read/understand other branches of physics, especially in Quantum Mechanics, Electrodynamics, Solid State Physics, Quantum Optics.

	The understanding of Group Theory will be useful in studying various symmetry properties in high energy physics, quantum mechanics as well as condensed matter physics.
COMPUTER PROGRAMMING AND COMPUTATIONAL PHYSICS	Experiments will enhance knowledge, and assist in learning and clarification and consolidation of theory. Students will learn to operate and handle various instruments. Seminars will give an opportunity to the students to develop their scientific temper, to improve their communication skills and scientific documentation skills.
THERMAL AND STATISTICAL PHYSICS	This course can help to understand properties of different systems in condensed matter physics, atomic physics, Astrophysics and many more. It helps reader to realize distinguishable features of quantum and classical systems of particles Cluster expansion technique can be useful to initiate research work on the theoretical advancement in the field of quantum Monte Carlo simulations.
ELECTRODYNAMICS AND PLASMA PHYSICS	The students will understand origin of electric and magnetic field and their unification. Students will gain solid knowledge on generation and propagation of electromagnetic radiation. The mathematical formulation in multipole expansion will be helpful in understanding nuclear models. Understanding of scattering of electromagnetic waves will be helpful in understanding scattering in quantum mechanics. Basic concepts in plasma physics will be stepping stone to research in the new and active area of research. Introduction to antenna will be helpful in Communication Electronics.
CONDENSED MATTER PHYSICS	A thorough knowledge of basic condensed matter physics will be helpful in understanding magnetic, electronic and transport properties of materials and their response to externally applied fields. This will be stepping stone in developing concepts of new technology and materials. This vibrant branch of physics will open up new arenas of professional and academic career of the students.
NUCLEAR AND INTRODUCTION TO PARTICLE PHYSICS	This course helps develop a physical feeling on the complexity of nuclear potential and spectrum. It extends the idea about nuclear reactions, reactors and radioactive properties of material and grows interest in the studies of Radio Therapy. It may motivate to learn about the mystery of mass generation and to study astro-particle physics.
PHYSICS LAB - II & SEMINAR	Experiments will enhance knowledge, and assist in learning and clarification and consolidation of theory. Students will learn to operate and handle various instruments in electronics and photonics laboratory. Seminars will give an opportunity to the students to develop their scientific temper, to improve their communication skills and scientific documentation skills.
QUANTUM MECHANICS II	Students will learn about discrete symmetries, scattering theory, quantum Hall effect and their applications. Relativistic cases, Dirac equation, concept of particles and anti-particles etc. would motivate post graduate students to further study in field theory and particle physics. Students will get introduction to active research topics like topological superconductor, Weyl semi-metals etc. and this can lead to further career in academics and research.
ATOMIC AND MOLECULAR SPECTROSCOPY	Basic concept of atomic and molecular spectrum is indispensible for advance studies in pure and applied physical science. This course can motivate students to pursue research careers especially

	in material sciences and associated fields.
ADVANCED OPTICS	Students will be familiar with different types of light source and detector needed in present day optical communication. Students will gather knowledge about propagation of light through optical fiber. Different types of losses incurred during propagation. This course can motivate students to pursue research careers especially in the field of applied optics and photonics
PHYSICS LAB - III & SEMINAR	Experiments will enhance knowledge, and assist in learning and clarification and consolidation of theory. Students will learn to operate and handle various instruments in electronics and photonics laboratory. Seminars will give an opportunity to the students to develop their scientific temper, to improve their communication skills and scientific documentation skills.
ELECTRONICS (ANALOG AND DIGITAL)	Students will develop in-depth knowledge both in analog and digital electronics. Course will give a thorough knowledge about semiconductor and its properties and will help the students to design several electronic devices Will help the students to get knowledge in Electronics circuits that are widely being used in industrial applications.
OPTOELECTRONICS AND LASER PHYSICS	Students will be familiar with different types of advanced light sources and their modulating mechanism widely used in present day information processing. Students will also learn about Nonlinear optics (NLO), which is the branch of optics that describes the behaviour of light in nonlinear media,. This course can motivate students to pursue research careers especially in the field of applied optics and photonics
COMMUNICATION ELECTRONICS	After taking the course the students will be familiar with different types of communication systems used in electronics. They will also be familiar with information theory and coding techniques. They will get knowledge about principle of Radar, satellite and mobile communication system. The students will also acquire knowledge about Television
NON-LINEAR OPTICS & OPTICAL SWITCHING	Students will also learn about Nonlinear Optics (NLO) which is the branch of optics that describes the behaviour of light in nonlinear media. Students will be familiar with different types nonlinear phenomena, different frequency mixing, parametric oscillation, self focusing etc. and their applications in present day industry. Students will be acquainted with working and application of optical switch which is a device for opening or closing an optical circuit in a communication application that selectively switches the signal in an optical fiber or integrated optical circuit (IOC) from one circuit to another. This course can motivate students to pursue research careers especially in the field of Optical computing and information processing.
MICROWAVE AND QUANTUM DEVICES	After taking this course, students will be familiar with different techniques of microwave sources and waveguides. They also get knowledge about measuring power, frequency, and impedance in microwave region. They will learn about the working of quantum devices also.