M P M M S N TRUSTS COLLEGE, SHORANUR

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOME AND COURSE OUTCOME OF DEPARTMENTS

DEPARTMENT OF PHYSICS

NAME OF PROGRAMME	B.Sc. PHYSICS
PROGRAMME OUTCOME	The aim of B.Sc Physics programme is to • provide an insight into the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life. • Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments. • Analyze the given scientific data critically and systematically and the ability to draw the objective conclusions. • think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems. • Realize how developments in any science subject helps in the development of other science subjects and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.
PROGRAMME SPECIFIC OUTCOME	• Demonstrate a rigorous understanding of the core theories & principles of physics, which includes mechanics, electromagnetism, thermodynamics, & quantum mechanics. • Learn the Concepts as Quantum Mechanics, Relativity, introduced at

	degree level in order to understand nature at atomic levels. • Provide knowledge about material properties and its application for developing technology to ease the problems related to the society. • Understand the set of physical laws, describing the motion of bodies, under the influence of system of forces. • Understand the relationship between particles & atom, as well as their creation & decay. • Relate the structure of atoms & subatomic particles • Analyze the applications of mathematics to the problems in physics & develop suitable mathematical method for such application & for formulation of physical theories. • Learn the structure of solid materials & their different physical properties along with metallurgy, cryogenics, electronics, & material science. • Understand the fundamental theory of nature at small scale & levels of atom & sub-atomic particles.

COURSE OUTCOMES

SEMESTER	COURSE CODE	COURSE NAME	CREDIT	COURSE OUTCOME
I	**PH1B01**	**METHODOLOGY OF SCIENCE AND PHYSICS (CORE COURSE I)**	2	• A general idea about what is science, what is scientific temper, history of science and scientific revolutions. • Familiarity with the different steps involved in the scientific method with the help of a flow chart,explaining what is hypothesis and how they become scientific laws.
	PH1C01	**PROPERTIES OF MATTER AND THERMODYNAMICS (COMPLEMENTARY COURSE I)**	2	• After completing the course, the student will be able to identify and describe the basic concepts related to modulus of elasticity, the molecular theory of surface tension and the theories of thermodynamics.
II	**PH2B02**	**PROPERTIES OF MATTER, WAVES AND ACOUSTICS (CORE COURSE II)**	2	• Learn the basics of properties of matter, • Familiarise with general terms in acoustics like intensity, loudness, reverberation etc, and study in detail about production, detection, properties and uses of ultrasonic waves. • Learn the fundamentals of waves and Oscillations.
	PH2C02	**Mechanics, Relativity, Waves and Oscillations (COMPLEMENTARY COURSE II)**	2	Students who have completed this course should • Have a deep understanding of Newton's laws, • Be able to solve the Newton equations for simple configurations using various methods. • Solve for the solutions and describe the behavior of a damped and driven harmonic oscillator in both time and frequency domains. • Understand and implement Fourier series

				• Construct travelling and standing solutions to the wave equation.
III	**PH3B03**	**MECHANICS (CORE COURSE III)**	4	This course will enable students to develop • the fundamentals of different types of frames of references and transformation lawsBoth Galilean and Lorentz. • conservation laws of energy and linear and angular momentum and apply them to solveproblems. • basics of potentials and fields, central forces and Kepler's laws. • Lagrangian and Hamiltonian formulations of classical mechanics. • Fundamental ideas of special theory of relativity .
	PH3C03	**OPTICS, LASERS, ELECTRONICS AND COMMUNICATION (COMPLEMENTARY COURSE III)**	2	After successful completion of the course, the student is expected to : • To have developed the idea of interference, diffraction and polarization and to solve problems related to the phenomena. • understand about different laser systems and its applications. • study about Basics electronics Technology. • Realize the importance of different electronic communication systems.
IV	**PH4B04**	**ELECTRODYNAMICS I (CORE COURSE IV)**	4	After successful completion of the course, the student is expected to : • Have gained elaborated knowledge about electrostatics and laws governing the charge distribution • Have gained ability to apply Laplace equation for calculating potentials. • Study in depth about Polarization, bound charges and boundary condition. • realize the importance of application of Biot Savarts Law and Amperes law. • understand the relevance of different magnetization and the boundary condition of magnetic field.

	PH4C04	**Electricity ,Magnetism and Nuclear Physics (COMPLEMENTARY COURSE IV)**	2	After taking this course, the student will be able to: • Demonstrate Coulomb's law for the electric field, and apply it tosystems of point charges as well as line, surface, and volume distributions ofcharges. • Explain relation between electric field and potential, solve a variety of problems, and relate it to thepotential energy of a charge distribution. • Apply the tools of vector calculus to solve problems. • Demonstrate an understanding of the behaviour of electric conductors. • Express the basic concepts of nuclear physics.
	PH4B04	**CORE COURSE V PRACTICAL - I**	5	After completion of this course, students will • Apply knowledge of linear motion, forces, energy, and circular motion to explain natural physical processes and related technological advances. • Use an understanding of algebraic mathematics along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world. • Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. • Follow instructions to perform laboratory experiments in optics and document their results, using correct procedures and protocols. • Analyse, interpret and communicate results from laboratory experiments, orally or in a written laboratory report.
	PH4B05	**COMPLEMENTARY COURSE PRACTICAL**	4	
	PH5B06:	**ELECTRODYNAMICS II (CORE COURSE VI)**	3	This course provides the undergraduate student with advanced knowledge in understanding the principles and dynamic phenomena of electromagnetism that occur in the case of time-varying sources (local charges and currents). In addition, this course equips

v				the students with the necessary mathematical knowledge for a detailed and accurate description of these phenomena and for solving related problems. After a successful completion of the course, the student must be in a position to • have a unified surveillance of electromagnetic phenomena and be engaged to draw qualitative conclusions about them by managing a small number of physical concepts and laws • be able to make a mathematical description of electromagnetic phenomena based on basic physical quantities through the fundamental equations of electromagnetism (Maxwell equations) • attack problems in electrodynamics through, somewhat advanced level mathematics, and resolving them through the fundamental equations • acquire a sense of unity in physics at a fundamental level by embracing the concepts of special relativity as emerged through the laws of electrodynamics and equipped with the necessary mathematical concepts to be able to solve relative problems.
	PH5B07	**QUANTUM MECHANICS (CORE COURSE VII)**	3	This course develops concepts in quantum mechanics such that the behaviour of the physical universe can be understood from a fundamental point of view. It helps to • describe the structure of the hydrogen atom and show an understanding of quantisation of angular momentum; • apply techniques such as Fourier methods and ladder operators for selected problems in quantum mechanics; • use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanation.

	PH5B08	**PHYSICAL OPTICS AND MODERN OPTICS (CORE COURSE VIII)**	3	• Describe and discuss waves, colour, frequency, photon energy, phase difference, optical coherence and coherent sources using monochromatic light sources of light. • Describe and discuss optical interference observed using wavefront splitting and amplitude splitting interferometers optical antireflection coatings. • Describe and discuss linear, circular and elliptical polarisation and methodsused to generate and analysis polarised light using wave plates. Outline stress Birefriengence and use of polarised light. • Describe and discuss diffraction effects observed in a single slit and circular aperture and relate to Rayleigh criterion and optical resolution. • Derive and manipulate formula and perform fundamental numerical calculations to solve physical optics problems related to waves, polarization, interference and diffraction phenomena.
	PH5B09	**ELECTRONICS (CORE COURSE IX)**	3	• Understand electronic systems with a continuously variable signal • Understand proportional relationship between a signal and a voltage or current that represents the signal. • To learn function of basic component's use in linear circuits. • Understand component symbol, working principle, classification and specification. • To learn different theorems for simplification of basic linear electronics circuits • Understand basic digital electronic systems • To learn function of basic digital circuits and use of transistors to create logic gates in order to perform Boolean logic. • To learn different theorems for simplification of basic Digital electronics circuits.

				• Student understands symbols, Truth tables, Boolean equations, & working principle.
	PH5 D01(1)	**NON CONVENTIONAL ENERGY SOURCES (OPEN COURSE)**	2	• The students of other disciplines acquire knowledge about the depletion of conventional energy sources and the relevance of non conventional energy sources like solar energy,geothermal energy, tidal energy, wind energy etc.
VI	**PH6B10**	**THERMAL AND STATISTICAL PHYSICS (CORE COURSE X)**	4	• Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, and partition functions. • Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose- Einstein distributions to solve problems in some physical systems. • Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems. • Apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc. • Analyze phase equilibrium condition and identify types of phase transitions of physical systems. • Make connections between applications of general statistical theory in various branches of physics. • Design, set up, and carry out experiments; analyze data recognizing and accounting for errors; and compare with theoretical predictions.
	. PH6B1 1	**SOLID STATE PHYSICS, SPECTROSCOPY AND LASER PHYSICS (CORE COURSE XI)**	4	Students will • be able to account for interatomic forces and bonds • have a basic knowledge of crystal systems and spatial symmetries • be able to account for how crystalline materials are studied using diffraction, includingconcepts like form factor,

				structure factor, and scattering amplitude. • know the principles of structure determination by diffraction. • know what phonons are, and be able to perform estimates of their dispersive and thermal properties • be able to calculate thermal and electrical properties in the free- electron model • know the fundamental principles of semiconductors, including pn-junctions, and be able to estimate the charge carrier mobility and density. • know basic models of magnetism • be able to outline the importance of solid state Physics in the modern society.
	PH6B12	**NUCLEAR PHYSICS, PARTICLE PHYSICS AND ASTROPHYSICS (CORE COURSE XII)**	4	On satisfying the requirements of this course, students will have the knowledge and skills to: • analyse production and decay reactions for fundamental particles, applying conservation principles to determine the type of reaction taking place and the possible outcomes • describe the role of colour in the strong force, and appreciate why going from strong interactions between quarks to nuclear structure is a currently unsolved problem • describe the role of spin-orbit coupling in the shell structure of atomic nuclei, and predict the properties of nuclear ground and excited states based on the shell model • apply quark mixing models to analyse weak interaction physics such as beta and kaon decay • read, understand and explain scholarly journal articles in nuclear and particle physics • make relevant measurements of energy and decay spectra using basic experimental facilities and apply Poisson statistics to evaluate the uncertainties in the data.

	PH6B13	**COMPUTATIONAL PHYSICS (CORE COURSE XII)- ELECTIVE**	3	• Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems • Design, correctly implement and document solutions to significant computational problems • Analyze and compare alternative solutions to computing problems • Implement software systems that meet specified design and performance requirements • Work effectively in teams to design and implement solutions to computational problems • Communicate effectively, both orally and in writing
	PH6B13	**PRACTICAL II** **(CORE COURSE PRACTICAL XIV)**	5	After completion of this course, students will • Apply knowledge of linear motion, forces, energy, and circular motion to explain natural physical processes and related technological advances. • Use an understanding of algebraic mathematics along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world. • Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. • Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.
	PH6B14	**PRACTICAL III** **(CORE COURSE PRACTICAL XV)**	5	On successful completion of the course, the student will be able to – • Distinguish between analog and digital systems. • Identify the various digital ICs and understand their operation. • Apply Boolean laws to simplify the digital circuits. • Design simple logic circuits.

NAME OF PROGRAMME	**M.Sc. PHYSICS**
PROGRAMME OUTCOME	• To develop strong student competencies in Physics and its applications in a technology-rich, interactive environment. • To develop strong student skills in research, analysis and interpretation ofcomplex information. • To prepare the students to successfully compete for employment inElectronics, Manufacturing and Teaching and to offer a wide range of experience in research methods, data analysis to meet the industrial needs.
PROGRAMME SPECIFIC OUTCOME	On completion of programme, the graduates will • Analyze the applications of mathematics to the problems in physics & develop suitable mathematical method for such application & for formulation of physical theories. • Apply knowledge and skill in the design and development of Electronics circuits to cater to the needs of Electronic Industry. • Become professionally trained in the area of electronics, optical communication, nonlinear circuits, materials characterization and lasers. • Develop good problem solving skills.

SEMESTER	COURSE CODE	COURSE NAME	CREDIT	COURSE OUTCOME
I	**PHY1C01**	**CLASSICAL MECHANICS**	4	After completing this course the student will be able to • identify and describe classical systems using Lagrangian and Hamiltonian formulation . • the transformation from classical to quantum mechanics. • formulate the dynamics of rigid body and oscillations of small amplitude.
	PHY1C02	**MATHEMATICAL PHYSICS**	4	• This course develop the mathematical methods and techniques widely used to describe various physical phenomena. • The students expertise in various mathematical formulations using matrices, special functions , differential equations etc.
	PHY1C03	**ELECTRODYNAMICS AND PLASMA PHYSICS**	4	The student can will be familiar with • the foundations of electrodynamics, the multipoleexpansion of the electromagnetic field. • Maxwell's equations in vacuum and inside matter after this advanced course. • The concepts and properties of electromagnetic wave propagation and introduce the concept of relativistic electrodynamics and plasmaphysics.
	PHY1C04	**ELECTRONICS**	4	• After this course will be able to use analytical techniques in resistive circuits energized by direct voltage and current sources • Digital electronics enable to explain concepts of the basic memory elements using flip flops and various applications in registers,counters. • Students will also be able to explain the basic logic operations to interpret logic functions, circuits, truth tables, and Boolean algebra expressions and apply the laws of Boolean algebra to simplify circuits. These digital concepts will lead them to explain the architecture of 8085 microprocessor

	PHY1P01	**GENERAL PHYSICS PRACTICAL-I**	**3**	• Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Interference • Surfac etension • Magnetism and electricity • Diffraction • Elasticity • filters
	PHY1P02	**ELECTRONICS PRACTICAL - I**	**3**	The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Transistor • Amplifier • FET • Oscillator • Filters • OPAMP • Modulation • Differential amplifier
II	**PHY2C05**	**QUANTUM MECHANICS-I**	4	• This course develops concepts in quantum mechanics such that the behavior of the physical universe , postulates of quantum mechanics. • It provides a basis idea about operators, eigen functions, compatible observables, • It provides methods to solve infinite well and harmonic oscillator problems in one and three dimensions • It helps to develop angular momentum algebra and theory of scattering.
	PHY2C06	**MATHEMATICAL PHYSICS-II**	4	This paper lays the foundation on special mathematical techniques like- • group theory, • calculus of variations, • Greens functions • integral equations etc.
	PHY2C07	**STATISTICAL MECHANICS**		The students could gain idea about

			4	• Basics of thermodynamics • the various natural phenomena like Bose- einstein condensates, fermionic systems etc. • Ensembles
	PHY2C08	**COMPUTATIONAL PHYSICS**	4	The student develop skill to solve mathematical problem using numerical techniques and develop programming skill in python language.
	PHY2P03	**GENERAL PHYSICS PRACTICAL-II**	3	• Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Interference • Surfac etension • Magnetism and electricity • Diffraction • Elasticity • filters
	PHY2P04	**ELECTRONICS PRACTICAL - II**	3	The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Transistor • Amplifier • FET • Oscillator • Filters • OPAMP • Modulation • Differential amplifier
III	**PHY3C09**	**QUANTUM MECHANICS – II**	4	The students are expertise to solve • quantum mechanical systems using time dependent and independent perturbation methods • Relativistic quantum mechanical problems
	PHY3C10	**NUCLEAR AND PARTICLE PHYSICS**	4	• The course will build on the fundamentals of nuclear reactions and decays as some of the most important phenomena of nuclear physics. • Topics to be studied will include decay modes.

				• The course deals with the ideas of particle physics and fundamental interactions. • It also includes a detailed description of various nuclear models.
	PHY3C11	**SOLID STATE PHYSICS**	4	• Students should gain knowledge of solid state systems including reciprocal lattices, band structure, magnetic and electric behaviour of solids. • This will generate interest in students for further research in solid material research.
	PHY3E05	**EXPERIMENTAL TECHNIQUES (ELECTIVE–I)**	**4**	This course will give a strong idea about • vacuum techniques • Thin film techniques • Accelerator techniques • Material analysis by Nuclear techniques • X- Ray Diffraction techniques
	PHY3PO5	**MODERN PHYSICS PRACTICAL -I**	**3**	• Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Studies of radiation using GM counter • Absorption spectrum of KMNO4 • Polarization • Band Gap energy of Ge, Si • LED characteristics • ESR Spectrometer
IV	**PHY4C12**	**ATOMIC AND MOLECULAR SPECTROSCOPY**	4	This blows light to the atomic and molecular structure of various micro systems using the interaction of light with atoms and molecules.
	PHY4E14	**MATERIAL SCIENCE(ELECTIVE–II)**	**4**	The students could gain idea about • Growth and Characteristics of various crystalline structure. • Advanced materials like Nano structure and also its applications. • Communication systems • Radiation and antennas
	PHY4E20	**MICROPROCESSORS AND APPLICATIONS (ELECTIVE–III)**	4	Students are equipped with the microprocessor programming in 8085 microprocessor for further research in machine language programming

	PHY4PO 6	**MODERN PHYSICS PRACTICAL -II**	**3**	• Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies. The aim is to deliver practical knowledge ad the implementation of the concepts studied like- • Studies of radiation using GM counter • Absorption spectrum of KMNO4 • Polarization • Band Gap energy of Ge, Si • LED characteristics • ESR Spectrometer
	PHY4PO 7	**COMPUTATIONAL PHYSICS PRACTICAL**	**3**	• To study the poweful programming language –Python • To use Python for numerical computation. • Plotting of Graphs involved in Physical processes using Python programs.
	PHY4Pr 1	**PROJECT**	**4**	• To survey literature for the topic of the project. • To undestand and analyse the research problem. • To handle instruments for analysis and discuss their experiment al results. • To used ICT tools to prepare project reports and present it using Power point.
		COMPREHENSIVE VIVA VOCE	**4**	To analyse how well a student has understood the stuff studied in the programme.