Teerthanker Mahaveer University
Faculty of Engineering
M.Sc. (Physics)

Programme Specific Outcome

PSO – 1	**:**	Understanding and learning the concepts in basic as well as certain advanced areas of Physics.
PSO – 2	**:**	Learning designing and performing experiments in the labs to demonstrate the concepts of principles learned in classrooms.
PSO – 3	**:**	Applying the knowledge acquired in the classrooms and laboratories to solve a wide range of problems in theoretical and experimental Physics.
PSO – 4	**:**	Analyzing the real-life problems and to seek their solutions using one's own knowledge & understanding related to Physics.
PSO – 5	**:**	Creating a critical attitude and logical reasoning among students to make them able for applying knowledge of physics in diverse fields

Course Outcomes

MPH111	**CO1.**	Understanding the structure of vector space.
	CO2.	Applying the methodologies & techniques of training to develop a training plan.
	CO3.	Applying the concepts of Calculus of variation like Euler Equation, Lagrange's Equation, and Hamilton's Principle.
	CO4.	Applying the special function, recurrence relations in solving integration problems.
	CO5.	Analyzing the dependency of vectors in linear equations.
MPH112	**CO1.**	Understanding the concept of generalized coordinates, Lagrangian, and Hamiltonian formalism.
	CO2.	Understanding the concepts of central force, scattering under central force field & Euler angles.
	CO3.	Understanding concepts of frames of references and special theory of relativity
	CO4.	Applying the Lagrange-Hamilton formalism to study the motion of various mechanical systems.
	CO5.	Applying the Euler angle concept for solving the problems of symmetric top & vibrating string motions.
MPH113	**CO1.**	Understanding basic concepts of wave function, operator algebra and Schrodinger equation in quantum physics.
	CO2.	Understanding the concepts of matrix formulation and

		generalized uncertainty principle in quantum mechanics.
	CO3.	Applying Schrodinger equation for solving harmonic oscillator, particle in a hard potential box and tunneling problems.
	CO4.	Applying Schrodinger equation for mechanism hydrogen atom and calculating the dependence of energy on quantum numbers and shape of orbitals.
	CO5.	Applying operator algebra for understanding the coupling of angular momentum and calculating Clebsch-Gordan coefficients.
MAT115	**CO1.**	Understanding basic concepts of research and its methodologies, sampling techniques, meaning of scaling, its classification, important scaling techniques, basic principles of graphical representation
	CO2.	Identifying appropriate research topics using better central tendency and dispersion procedures
	CO3.	Analyzing different research problem and their associated parameters, hypothesis with significance levels and different degree of freedoms, correlation and regression
	CO4.	Evaluating appropriate project proposal (to undertake a project), significance of report writing, layout and precautions for writing research report.
	CO5.	Creating, organizing and conducting research (advanced project) in a more appropriate manner with the help of SPSS for data analysis
MPH161	**CO1.**	Understanding the concepts of Elliptical and Hyperbolic Fringes
	CO2.	Applying the Quinck's & Guoy's methods to observe the magnetic susceptibility of liquid & solid materials.
	CO3.	Analysing fibre attenuation & Stefan's constant.
	CO4.	Analysing the resistivity properties of semiconductor material.
	CO5.	Analysing the characteristic curve, band gap energy of a thermistor, elastic constants & Curie temperature using CRO
MPH162	**CO1.**	Understanding the concepts of Electromagnetism & optics laws to find dielectric constant & Cauchy constant.
	CO2.	Applying the concepts of frequency variation in various oscillators.
	CO3.	Applying ESR method to find the spin of electron.
	CO4.	Analysing the BH curve on CRO & I-V characteristic of solar cell.
	CO5.	Analysing the parameters of semiconductors using Hall effect.
TMUPA-101	**CO1.**	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount.
	CO2.	Applying the arithmetical concepts in Ratio and Proportion, Mixture and Allegation.

	CO3.	Employing the techniques of Percentage, Ratios and Average in inter related concepts of Time and Work, Time speed and Distance.
	CO4.	Evaluating the different possibilities of various reasoning based problems in series, Direction and Coding-Decoding.
TMUPS-101	**CO1.**	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings
	CO2.	Understanding and analyzing self and devising a strategy for self growth and development.
	CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.
	CO4.	Utilizing time in the most effective manner and avoiding procrastination.
	CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.
	CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.
MPH211	**CO1.**	Understanding concepts of the Fourier series, Fourier transform and Laplace transform.
	CO2.	Understanding about Analytic functions, Cauchy-Riemann relations and their physical significance.
	CO3.	Understanding about Taylor and Laurent expansions and singularities
	CO4.	Understanding Group, Field and Rings and their properties.
	CO5.	Applying Fourier transform and Laplace transform in the various fields of Physics.
	CO6.	Analyzing complex integrals in solving real problems of Physics.
MPH212	**CO1.**	Understanding the physics of crystal structure, defects and various type of atomic bonding in crystal.
	CO2.	Understanding the x ray diffraction and the theory of specific heat of solids.
	CO3.	Understanding the electrical and thermal properties of metals and semiconductor.
	CO4.	Understanding the magnetic and superconducting properties of solids.
	CO5.	Applying the Bragg's law to deduce the crystal structure of materials.
	CO6.	Applying the concept of Josephson junction to understand the working and principle of SQUIDs
MPH213	**CO1.**	Understanding the spectrum of atoms and their origin such as

		spin orbit interaction LS and JJ couplings.
	CO2.	Understanding the effects on the atoms when placed in an external field like electric and magnetic.
	CO3.	Understanding the concepts of motion of atoms & molecules in an environment.
	CO4.	Applying the principals of electronic vibrations to study of UV & Vis spectrum.
	CO5.	Applying the rigid/non-rigid rotator concepts to explain microwave and IR spectroscopy
	CO6.	Applying the Frank-Condon principle to measure dissociation energy in electronic spectrum.
MPH214	**CO1.**	Understanding of approach of perturbation theory, WKB approximation, scattering theory.
	CO2.	Understanding the Variation& WKB methods to explain the ground state of Helium.
	CO3.	Understanding the concepts of Spinor.
	CO4.	Applying the perturbation methods to explain the fine structure in H-atom & Zeeman effect.
	CO5.	Applying Dirac theory to explain existence of positron.
	CO6.	Analyzing of electron systems which cannot solved by the Schrödinger equations.
MPH261	**CO1.**	Understanding the concepts of Michelson interferometer used in research and industry.
	CO2.	Analyzing the data and plot of GM Counter to understand the concept of radioactive decays.
	CO3.	Analyzing of Susceptibility using Quinck's & Guoy's apparatus.
	CO4.	Analyzing the quantization of electronic charge using Millikan's oil drop method.
	CO5.	Analyzing the existence of atomic energy levels using Franck – Hertz Experiment.
	CO6.	Analyzing the perturbation of energy levels applying weak magnetic field (Zeeman effect)
MPH262	**CO1.**	Understanding the concepts of Malus law & Beer–Lamber law.
	CO2.	Understanding the function of Linear and Preamplifier circuits.
	CO3.	Applying the concepts of thermal field to determine the conductivity and luminescence properties of materials.
	CO4.	Applying Beer-Lamberts law to measure the extinction coefficients of materials.
	CO5.	Analyzing psychometric chart to find relative humidity
TMUPA-201	**CO1.**	Applying the concepts of modern mathematics Divisibility rule,

		Remainder Theorem, HCF /LCM in Number System.
	CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.
	CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data
	CO4.	Employing the concept of higher level reasoning in Clocks and Calendars, Set theory and Puzzle Problems.
TMUPS-201	**CO1.**	Communicating effectively in a variety of public and interpersonal settings.
	CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.
	CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.
	CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.
	CO5.	Handling difficult situations with grace, style, and professionalism
MPH311	**CO1.**	Understanding the electrostatics, magnetostatics& EM concepts of fields.
	CO2.	Understanding the boundary conditions at interface of two media.
	CO3.	Understanding concept of propagation of EM wave through bounded and unbounded media
	CO5.	Applying Gauss's law, Poisson and Laplace equations method of image to find the electric fields and potentials.
	CO6.	Applying Ampere's law to find the magnetic field solenoid etc.
	CO7.	Applying radiation theory to understand the concept of antenna
MPH312	**CO1.**	Remembering and understanding importance and applications of thermodynamic laws.
	CO2.	Understanding the concepts of probability and their relations with Statistical Mechanics.
	CO3.	Understanding the concepts of macroscopic and microscopic phenomenon.
	CO4.	Applying the Maxwell distribution to explain equation of state for a non-ideal gas; Vander Waals' equation of state; Meyer cluster expansion.
	CO5.	Applying the Fermi-Dirac distribution to explain the paulipara-magnetism and White dwarf.
	CO6.	Applying the B-E Statistics to explain black body radiation.

MPH317	**CO1.**	Understanding the concepts of semiconductor materials and its properties.
	CO2.	Understanding the carrier transport mechanism in semiconductors.
	CO3.	Understanding functioning of junction devices such as p-n diodes, MOSFET, BJT.
	CO4.	Applying IC fabrication process.
	CO5.	Applying the concepts of deposition methods for preparation of Crystals.
MHM320	**CO1.**	Understanding the importance of value education in life and method of self-exploration.
	CO2.	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
	CO3.	Applying right understanding about relationship and physical facilities.
	CO4.	Analysing harmony in myself, harmony in the family and society, harmony in the nature and existence.
	CO5.	Evaluating human conduct on ethical basis.
MPH361	**CO1.**	Understanding the working of various electronic circuits like differentiator, integrator, logic gates etc.
	CO2.	Understanding the OP-AMP, Adder, Substractor and various IC's to understand their working.
	CO3.	Applying logics gates to verify the Boolean algebra.
	CO4.	Applying the IC's as a stable multivitorator and voltage controlled oscillator, multiplication and division etc.
	CO5.	Analyzing the I-V characteristic of FET and MOSFET.
MPH313	**CO1.**	Understanding the basics concepts of dielectric and ferroelectric properties of materials.
	CO2.	Understanding the concepts of corrosion in superconductors.
	CO3.	Understanding the concepts of Phase diagram growth of transformations in alloy.
	CO4.	Applying the key concepts of elastic behaviour to understand the mechanical properties of materials.
	CO5.	Analyzing the phase diagrams to understand the Austenite, Pearlite, Bainite and Martensite phases of Iron-Carbon alloys
MPH315	**CO1.**	Understanding the basics of nano-particle, its classification and synthesis.
	CO2.	Understanding the concept of nano-magnetism, nano-electronics and integrated system
	CO3.	Applying the various microscopy techniques to characterize nano-

		materials.
	CO4.	Applying the concepts of nano-materials in developing, LEDs, SET and DNA Chips.
	CO5.	Applying the concepts of Hall effect in working of Hall effect sensors.
MSC012	**CO1.**	Understanding basics of biology in Physics.
	CO2.	Understanding the physical methods of investigation of macromolecules for the analysis of biological systems.
	CO3.	Understanding the concepts of isotopes for labelling and detection of biomolecules in non-curable diseases.
	CO4.	Applying the instrumental methods to characterize the macromolecules.
	CO5.	Applying the radiation sources to explain the effect of radiation on living systems
MPH319	**CO1.**	Understanding observation and estimation of errors in experimental data.
	CO2.	Understanding production and measurement various vacuum systems.
	CO3.	Understanding the techniques of production and measurement of low and high temperature.
	CO4.	Understanding the concept of monochromatrors, photomultipier, used in various radiation detectors.
	CO5.	Applying the concept of error measurement to best fit the experimental data using least square method.
	CO6.	Applying the concept of Magnetic resonance to understand the principle and working of NMR, ESR, NQR and ENDOR.
MPH321	**CO1.**	Understanding and Applying the concept of OPAMP
	CO2.	Understanding the concept of Number system
	CO3.	Applying the truth table of logic gates in different logic system.
	CO4.	Understanding the clock timer and flip-flop
	CO5.	Understand
MPH412	**CO1.**	Understanding various analog modulation techniques like AM, FM, PM.
	CO2.	Understanding the fundamental concepts of Digital communication.
	CO3.	Understanding the classification of the elementary particles and their interactions.
	CO4.	Applying the Fourier series and transform for signal transmission.
	CO5.	Applying the basics of Optical communication
MPH414	**CO1.**	Understanding the basic nuclear properties, force and nuclear

		models.
	CO2.	Understanding the concepts and properties of nuclear decays processes.
	CO3.	Understanding the basic concept of nuclear reactions.
	CO4.	Understanding the symmetry and conservations laws elementary particles.
	CO5.	Applying the selection rule to explain the decay process.
	CO6	Analyzing binding energy curves to explain the stability of nuclei.
MAT461	**CO1.**	Understanding simple program modules to implement single numerical methods and algorithms.
	CO2.	Applying to use basic flow controls (if-else, for, while).
	CO3.	Applying Test program output for accuracy using hand calculations and debugging techniques
	CO4.	Applying multiple program modules into larger program packages
	CO5.	Analyzing the generate plots and export this for use in reports and presentations
MPH411	**CO1.**	Understanding basic concept of Plasma state and various gas discharge principle and method.
	CO2.	Understanding the concept of fluid and kinetic description of plasma.
	CO3.	Understanding the concept of thermonuclear fusion.
	CO4.	Applying single particle dynamics to understand the particle confinement.
	CO5.	Applying the fluid description of plasma explaining the generation of ion acoustic, Alfven and magnetosonic wave.
	CO6.	Applying the kinetic description of plasma to explain the phenomena of Landau damping.
MPH413	**CO1.**	Understanding the basic concepts of Astronomy, various co-ordinates and time systems and various astronomical instruments.
	CO2.	Understanding the properties and classification of stars.
	CO3.	Understanding the physics of the sun and its interior structure, properties of planets and satellites and theory of formation of the solar system.
	CO4.	Applying Chandrasekhar's Limit for the formation of White Dwarfs, Neutron Stars, and Black Holes.
	CO5.	Applying the concepts of hydrostatic equilibrium, mass conservation, luminosity and temperature gradient equations for the formation of stellar structure.
	CO6.	Applying the Schwarzschild criterion for the stability of the stellar

		medium
MPH 431	**CO1.**	Understanding the world we inhabit
	CO2.	Understanding the hierarchical structuring of the universe in categories of space, time, matter and energy, from the very small to the gigantic.
	CO3.	Understanding the bonding from chemical compound to large molecule and living matter.
	CO4.	Applying the physical concept in weather forecast.
	CO5.	Analyzing physical realities of quantum world