

Kalinga University

Science

Master Of Science (Physics)

PO

S. No.	Program Outcome (PO) Description
1	Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
2	Effective Communication: Speak, read, write and listen clearly in person and through electronic media and make meaning of the world by connecting people, ideas, books, media and technology.
3	Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.
4	Effective Citizenship: Demonstrate empathetic social concern and equity-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
5	Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
6	Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PSO

S. No.	Program Specific Outcome (PSO) Description
1	Postgraduates will develop the critical analysis and problem-solving skills required in the application of principles of Physics.
2	Escalating sufficient academic and realistic background/understanding of physics as per UGC framework.
3	Understanding fundamental concepts of classical and statistical mechanics to put in plain words the explanation of physical events with appreciable limitations.
4	Refreshing the concepts of electrodynamics, condensed matter physics, Nuclear & particle physics, atomic & molecular physics for better understanding of advanced physical concepts.
5	Understanding in detail the basic and advanced concepts of quantum mechanics because the nature is governed by regulations of quantum mechanics.
6	The essential features of electronic devices and related techniques to have a perceptive of many household electronic devices and Performing handful of experiments/projects as per program framework.
7	Understanding advanced and special/elective subjects like plasma physics, lasers, advanced electronics and their applications for welfare of mankind.
8	Postgraduates will be prepared with a working knowledge of experimental/computational techniques and instrumentation required to work independently in research or industrial environments.
9	Postgraduates will have strong capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
10	Postgraduates will successfully compete for current employment opportunities.

CO

S.No.	Course Code	Course Name	Course Outcome (CO's) - Description
1	MPHY101	Mathematical Physics	CO1: To develop knowledge in mathematical physics and its applications.
			CO2: To develop expertise in mathematical techniques those are required in physics.
			CO3: To enhance problem solving skills.
			CO4: To give the ability to formulate, interpret and draw inferences from mathematical solutions
2	MPHY102	Classical Mechanics	CO1: To give students a solid foundation in classical mechanics.
			CO2: To introduce general methods of studying the dynamics of particle systems.
			CO3: To give experience in using mathematical techniques for solving practical problems.
			CO4: To lay the foundations for further studies in physics and engineering.
3	MPHY103	Electrodynamics	CO1: Reviewing basics of electrostatics and magnetostatics to comprehend Maxwell's equations and their solution in various media.
			CO2: Understanding radiations and related physics by moving charges, the concepts of retarded potentials and Abrahm-Lorentz method of self-force.
			CO3: Describing 4-vectors and Lorentz transformation in 4-dimensional space to revise invariance of charge & potential under Lorentz transformation and furthermore the motion of charged particles in electromagnetic fields.
			CO4: Solving questions based on tutorial problems casing above topics/concepts.
4	MPHY104	Electronics – I	CO1: To become skilled at the basic concepts of JFET, BJT, MOSFET, MESFET and microwave devices.
			CO2: To study and understand the various photonic devices including diode lasers and their applications.
			CO3: To be acquainted with the concepts and applications of digital integrated circuits and operational amplifiers.
			CO4: Describing memory devices and the devices based on electro/magneto/acousto-optic, piezoelectric, and surface acoustic effects.
5	MPHY105A	Research Methodology	CO1: Students will understand a general definition of research design.
			CO2: Students will know why educational research is undertaken, and the audiences that profit from research studies.
			CO3: Students will be able to identify the overall process of designing a research study from its inception to its report.

			CO4: Students will be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research
6	PHY105B	Science Journalism	CO1: They will appreciate the digital landscape within which science journalism exists today by learning: blogging in science journalism (honing your craft, developing a voice); how to get work (pitching and staying relevant); the value of social networks for science journalism (sharing stories, finding stories, joining discussions and finding sources); digital strategies employed by major news organizations (data visualization, multimedia, community building). CO2: Students will analyze and learn about the structure of several types of data including numbers, texts and documents. Students will learn the skills to examine, evaluate, and critique those data, extract patterns, summarize features, create visualizations, and provide insights, while learning to be sensitive to ethical concerns associated
	MPHY201	Quantum Mechanics – I	CO1: Answering why and how quantum mechanics with understanding of basic postulates and solution of Schrodinger equation for one dimensional problem. CO2: Having basic knowledge of linear vector space, Bra and Ket algebra, matrix theory and uncertainty relations. CO3: Solving Schrodinger wave equation for three dimensional problems like H-atom, harmonic oscillator, square well potential and their application to atomic spectra, molecular spectra and deuteron. CO4: Understanding angular momentum in quantum mechanics, its matrix representation and coupling, Pauli spin matrices and the concept of Clebsch-Gorden coefficients.
8	MPHY202	Statistical Mechanics	CO1: Understanding foundations of statistical mechanics and its association with thermodynamics to solve countless physical problems. CO2: Describing Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. CO3: Explaining cluster expansion of a classical gas, dynamical model of phase transition and Landau theory of phase transition. CO4: Elucidating thermodynamical fluctuations and Brownian motion on the basis of Langerin's theory and Fokker-Planck equation.
	MPHY203	Computational Methods & Programming	CO1: Learning the essential components of programming in BASIC. CO2: Understanding the computational skills of solving linear and non-linear algebraic/transcendental equations including simultaneous linear equations. CO3: Being comfortable with the techniques of obtaining Eigen values & Eigen vectors of matrices, curve-fitting and numerical differentiation & integration.

9	MPHY204	Electronics – II	CO4: Realizing the basic concepts of random variables, numerical solution of ordinary and partial differential equations
			CO1: To understand the basic elements of communication electronics, microwave transmission and satellite communication.
CO2: To appreciate the construction, operation and application of microwave devices and radar.			
CO3: Learning the operation of Intel 8085 microprocessor its interrupts.			
10	PHY205A	Entrepreneurship	CO4: Analyzing potential aspects of programmable interface devices and interfacing with D/A & A/D converters
			CO1: Develop awareness about entrepreneurship and successful entrepreneurs.
CO2: Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication			
11	PHY205B	Intellectual Property Right	CO3: Understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective.
			CO1: The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works during their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search.
			CO2: This course provides further way for developing their idea or innovations.
			CO3: To Pave the way for the students to catch up Intellectual Property (IP) as a career option a. R&D IP Counsel b. Government Jobs – Patent Examiner c. Private Jobs d. Patent agent and Trademark agent e. Entrepreneur
12	MPHY301	Quantum Mechanics – II	CO1: Learning approximation methods for bound states, i.e., perturbation theory, variation method and WKB approximation method with their application to physical problems.
			CO2: Understanding the concepts of time dependent perturbation theory, adiabatic and sudden approximation, absorption and induced emission, transition probability and Einstein's A and B coefficients.
			CO3: Studying physical concepts of the theory of scattering and its applications.
			CO4: Exploring the application of Schrodinger's and Dirac's relativistic equations in understanding negative energy states and hyperfine splitting of energy states.
			CO1: Define, using fundamental plasma parameters, under what conditions an ionized gas consisting of charged particles (electrons and ions) can be treated as plasma.

13	MPHY302	Plasma Physics	CO2: Distinguish the single particle approach, fluid approach and kinetic statistical approach to describe different plasma phenomena. CO3: Determine the velocities, both fast and slow (drift velocities), of charged particles moving in electric and magnetic fields that are either uniform or vary slowly in space and time. CO4: Explain the physical mechanism behind Landau damping and make calculations in this area using kinetic theory
14	MPHY303	Atomic & Molecular Physics	CO1: To explain the quantum states of one electron and two electron systems, interaction energy in LS & JJ couplings, hyperfine structure and broadening mechanisms. CO2: Understanding the types of molecules, energy levels and intensity of their rotational spectra. CO3: Understanding vibrational spectra of diatomic molecules with inputs of energy levels and operation of IR spectrometer. CO4: Learning the concepts, techniques and instrumentation of ultraviolet, visible and infrared spectroscopy such as Raman, Photoelectron, Photo acoustic, Mossbauer and NMR spectroscopy.
15	MPHY304A	Solid State Physics	CO1: To understand interaction of x-rays with matter, x-ray diffraction for structure determination, defects in solids and the electron microscopic techniques CO2: Learning band theory of solids, classification of solids, concept of effective mass, Fermi surface and de Hass von Alfvén effect. CO3: Understanding atomic and molecular polarizability, quantum Hall effect, magneto resistance, superconductivity and the general idea of high T_c superconductivity CO4: Explaining magnetic properties of solids, Optical reflectance, Photo electromagnetic effect, Faraday effect and the elements of Raman effect in solids.
16	MPHY304B	Experimental Physics	CO1: Assemble and document a relevant bibliography for a physics experiment. CO2: Prepare a journal-style manuscript using scientific typesetting software. CO3: Plan and conduct experimental measurements in physics while employing proper note-taking methods. CO4: Calculate uncertainties for physical quantities derived from experimental measurements.
			CO1: Apply conservation laws to predict astrophysical phenomena.

17	MPHY305A	Astronomy & Astrophysics	CO2: Recognize the impact of high-energy phenomena upon the evolution of the Universe.
			CO3: Assess astrophysical threats to the Earth and potential mitigation.
			CO4: Present current astronomical research in written, visual, and verbal format to an audience of your peers.
18	MPHY305B	Nanotechnology: Principles & Practices	CO1: Explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials at nanoscale.
			CO2: Choose appropriate synthesis technique to synthesize quantum nanostructures of desired size, shape and surface properties.
			CO3: Correlate properties of nanostructures with their size, shape and surface characteristics.
			CO4: Appreciate enhanced sensitivity of nanomaterial-based sensors and their novel applications in industry



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