Karnataka State Akkamahadevi Women's University

Vijayapura

Department of Physics

M.Sc. Physics

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Physics

Programmme Outcomes (POs) for M.Sc. Physics Programmme		
PO1	Knowledge	Capable of demonstrating comprehensive knowledge in Physics gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO4	Problem Solving	Inculcate the scientific temperament and capability of applying knowledge to solve scientific and solve real time problems
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary environment.
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO7	Modern tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO8	Science and Society	Professionally trained to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO9	Environment and Sustainibility	Possess adequate knowledge required for sustainable development keeping in view of environmental impacts and contemporary issues.
PO10	Life-Long Learning	Aptitude to apply both analytical and computational knowledge and skills, that are necessary for participating in learning activities throughout life
PO11	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
PO12	Research Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage research projects

Programmme Specific Outcomes (PSOs) for M.Sc. Physics Programmme	
PSO1	Acquire an in-depth understanding and knowledge of the core areas of Physics encompassing mathematical physics, classical mechanics, quantum mechanics, electrodynamics, and statistical mechanics for explicating physical phenomena covering wide length and time scales.
PSO2	Be capable of applying the core physical laws to unravel a multitude of physical properties, processes, and effects involving radiation, nuclei, atoms, molecules, and bulk forms of matter
PSO3	Develop hands-on skills for carrying out elementary as well as advanced experiments in different sub-fields of Physics viz. condensed matter physics, nuclear physics, particle physics, materials science, computational physics & electronics, along with enhancing their understanding of physical concepts and theories.
PSO4	Attain abilities of critical thinking, problem mapping & solving using fundamental principles of Physics, systematic analysis & interpretation of results, and unambiguous oral & writing/presentation skills.
PSO5	Have robust foundation in basic and practical aspects of Physics enabling them to venture into research in front-line areas of physical sciences, and career as Physics teachers and scientists.

Mapping of Courses with Programmme Outcomes(POs)												
Courses		**Programmme Outcomes**										
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
I Semester													
PHT-1.1		X			X				X		X		
PHT-1.2		X			X					X	X		
PHT-1.3		X			X				X	X	X		
PHT-1.4		X			X						X		
PST-1.5	**(a)**	X			X		X	X			X	X	
	(b)	X			X		X	X			X	X	
PHP-1.6		X	X		X	X	X	X			X	X	X
POE –1.7		X		X					X	X	X	X	
II Semester													
PHT-2.1		X			X					X	X		
PHT-2.2		X			X						X		
PHT-2.3		X			X				X	X	X		
PHT-2.4		X			X				X	X	X		
PST-2.5	**(a)**	X			X		X	X	X		X		
	(b)	X			X		X	X	X		X		
PHP-2.6		X	X		X	X	X	X			X	X	X
POE-2.7		X		X					X	X	X		
III Semester													
PHT-3.1		X			X				X		X		
PHT-3.2		X			X				X		X		
PHT-3.3		X			X				X		X		
PST-3.4	**(a)**	X			X		X	X	X	X	X		
	(b)	X			X		X	X	X	X	X		
PSP-3.5	**(a)**	X	X		X	X	X	X	X	X	X	X	X
	(b)	X	X		X	X	X	X	X	X	X	X	X
POE-3.6		X		X					X	X	X		
IV Semester													
PHT-4.1	**(a)**	X			X		X	X	X	X	X		
	(b)	X			X		X	X	X	X	X		
PHT-4.2	**(a)**	X			X		X	X	X	X	X		
	(b)	X			X		X	X	X	X	X		
PST-4.3	**(a)**	X		X			X	X	X	X	X		
	(b)	X			X	X	X	X	X		X	X	X
PHP-4.4		X	X	X	X	X	X	X	X	X	X	X	X
POE-4.5		X		X				X	X	X	X		

Course Outcomes: M. Sc Physics

COURSE		OUTCOMES After completion of these courses students should be able to :
	Semester I	
PHT-1.1	Classical Mechanics	CO1: Learn basic ideas of Newtonian Mechanics. CO2: Understand the Lagrangian approach in classical mechanics and solve problems using it. CO3: Gain the knowledge of motion in central force field CO4: Study Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion CO5: Understand the Hamiltonian approach in classical mechanics and solve problems using it CO6: Get knowledge of canonical transformation and Poisson's bracket
PHT-1.2	Mathematical Methods of Physics	CO1: Learn about special type of matrices that are relevant in Physics and then learn about tensors. CO2: Understand the methods to ordinary and partial differential equations and then learn different ways of solving them. CO3: Analyse the wide range of special functions and their use in solving complex Physics problems. CO4: Analyse the various integral transforms of different series and their applications in Physics.
PHT-1.3	Atomic, Molecular and Optical Physics (General)	CO1: The students will have an understanding of quantum behavior of atoms in external electric and magnetic fields; CO2: Describe the spectra of single and multiple electron atoms including fine- and hyperfine structure of hydrogen like atoms, different types of coupling such as L-S and J-J couplings. CO3: Explain the effect of electric and magnetic field on the atomic spectrum CO4: Analyse the spectra of diatomic molecules such as electronic, rotational, vibrational spectra and Raman spectroscopy
PHT-1.4	Basic Electronics	CO1: Understand the construction, operation and applications of diodes, BJT and FET. CO2: The students will have an understanding of the concepts of operational amplifier and its applications. CO3: The students will be able to use techniques for analyzing analog and digital electronic circuits
PST-1.5	a) Instrumentation	CO1: The students will have an understanding of different types of instruments and errors occurring during measurement. CO2: Understand production and measurement of vacuum. CO3:Understand production and measurement of low and high temperatures CO4:Understand the nuclear spectroscopy
	b) Astrophysics	CO1: Understand the basic concepts of astrophysics. CO2: Apply principles of physics to astronomical objects.
PHP- 1.6 Practical I	General Physics and Basic Electronics Lab	CO1: Educate the Basics of Instrumentation, Data Acquisition And Interpretation of Results CO2: Have a deep knowledge of fundamentals of optics. CO3:Apply the knowledge to understand the working of

		amplifiers, oscillators and multivibrators CO4:Understand analog and digital circuits
POE-1.7	Physics for All	CO1: Explain how Physics applies to phenomena in the world around them. CO2: Recognizing how and when Physical laws relevant to their field. CO3: Recognizing how and when Physics methods and principles can help in facing challenges to overcome weakness in their problems. CO4: Evaluating the limitations of their solutions CO5: Critically access their current state of knowledge and expertise to develop, implement and refine a plan in order to acquire new knowledge for specific goals and in pursuit of new intellectual interests. CO6: Participate effectively in multidisciplinary and /or interdisciplinary teams. CO7: Communicate effectively via oral, visual and written format to achieve diverse audiences. CO8: Articulate how one's own developing skills can be used in constructive community service or engagement that recognizes the potential impact on local and global issues including environmental impact and sustainability.
	Semester II	
PHT-2.1	Quantum Mechanics - I	CO1: To understand inadequacy of classical mechanics and origin of Quantum mechanics. CO2: To provide an understanding of the formalism and language of non-relativistic quantum mechanics. CO3: The students will be able to formulate and solve problems in quantum mechanics using Schrödinger and Dirac representation. CO4: And to understand the concepts of time-independent perturbation theory and their applications to physical situations. CO5: The students will be familiar with various approximation methods applied to atomic, nuclear and solid-state physics. CO6: To understand the basics of scattering theory
PHT-2.2	Mathematical and Computational Methods of Physics	CO1: Elaborate the understanding of group theory. CO2: Elaborate the understanding of complex variables. CO3: Identify a range of numerical methods that are essential for solving problems in Physics CO4: Learn Python-programming technique to solve problems in Physics.
PHT-2.3	Nuclear Physics (General)	CO1: Acquire basic knowledge about nuclear properties such as mass, spin, radius, binding energy etc. CO2: understand the features of nuclear forces, exchange force and Yukawa's meson theory. CO3: develop the understanding of various nuclear reactions and models CO4: learn the decay process and interaction of radiation with matter. CO5: learn about the concept nuclear energy, elementary particles and conservation laws.
PHT-2.4	Condensed Matter Physics	CO1: understand the concepts of the crystal classes and

	(General)	symmetries CO2: calculate the Braggs conditions for X-ray diffraction in crystals. CO3: create understanding crystal binding and lattice vibrational properties of solid state systems. CO4: learn the basics of the Band theory of solids, Magnetic behaviour materials and defects in solids CO5: gain basic knowledge of semiconductors.
PST-2.5	a)Physics of Nanomaterials	CO1:Understand the basics of nanotechnology CO2: Understand the Quantum confinement effects. CO3: To learn various approaches for the synthesis and fabrication of nanomaterials, nanostructures and nanoscale devices CO4: To learn various advanced methods of characterization techniques for the in depth characterization of materials at nanolevel.
	b) Physics of Laser and Laser Applications	CO1: Characteristics of the laser systems CO2: Know about the basic working principal of different kind of laser systems and use of it in practical applications. CO3:Understand the applications of LASER in various fields
PHP-2.6 Practical II	General Physics and Numerical Methods using Python Programming Lab	CO1: Have a deep knowledge of fundamentals of optics. CO2: Understand the fundamentals of Python programming CO3: Write Python program for simple applications in physics
POE-2.7	Elements of Modern Physics	CO1: Understand the meaning of relativity, frames of reference and postulates of theory of relativity and mass energy relation. CO2: Understand and explain the differences between classical and quantum mechanics. CO3:Explain different Laser used and make a comparison between them CO4: Know the Einstein's coefficients, types of pumping, some applications CO5: Condensed matter crystal Structure, Unit cell, Bonding in solids , Band theory of solids CO6: Learn the super conductivity phenomenon CO7: Identify properties of the nucleus and other sub-atomic particles. CO8: Describe theories explaining the structure of nucleus and models.
Semester III		
PHT-3.1	Quantum Mechanics -II	CO1: To understand the concepts of the time-dependent perturbation theory and their applications to physical situations. CO2: The students will be able to grasp the concepts of identical particles, spin and angular momentum, as well as their quantization and addition rules and symmetry principles. CO3: To apply the concepts of relativity to Quantum mechanics and obtain relativistic wave equations and to grasp the concepts of spin arising naturally from the Dirac equation.

		CO4: Understand quantization of wave fields.
PHT-3.2	Statistical Mechanics	CO1: Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics and Grasp the basis of ensemble approach in statistical mechanics to a range of situations CO2: work out equations of state and thermodynamic potentials CO3:describe the features and examples of Maxwell-Boltzmann, Bose-Einstein and Fermi Dirac statistics CO4:understand fluctuations in various ensembles CO5:to model Brownian motion and random walk problem
PHT-3.3	Electrodynamics	CO1: Understand the laws of electrostatics and magnetostatics CO2: Use Maxwell equations in analysing the electromagnetic field due to time varying charge and current distribution. CO3: Understand the covariant formulation of electrodynamics and the concept of retarded time for charges undergoing acceleration.
PST-3.4	a) Nuclear Physics – I (Special)	CO1: Understand the applications of Particle accelerators CO2: Learn Advanced concepts of Nuclear forces CO3: Nucleon- Nucleon interactions at low energy and high energy. CO4: Analyze the statistics of of nuclear particles With the help of Multi channel analyzer.
	b) Condensed Matter Physics – I (Special)	CO1: To describe the different crystal structures CO2: Shall be able to draw the energy bands, Brillouin zones and Fermi surface. CO3: To formulate basic models for quantization of lattice vibrations and elastic properties of solids CO4: Understand electrical transport in metals and semiconductors.
PSP-3.5 Practical III	**Specialization Lab**	
	a) Nuclear Physics Lab (Special)	CO1: Apply the theory to find the solutions of practical problems. CO2: various simulation techniques which can be used in future by students to analyze the data. CO3: how to handle nuclear materials and nuclear safely management
	b) Condensed Matter Physics Lab (Special)	CO1: Understand advanced concepts and mathematical methods of Condensed Matter physics. CO2: Practice problem solving by using selected problems in Condensed Matter physics. CO3: Explore important connections between theory, experiment, and current applications. CO4: Analyze the problem studied through analytical calculation
POE-3.6	Biophysics	CO1: Understand the interdisciplinary applications of Physics to life sciences.
Semester IV		
PHT-4.1	a) Nuclear Physics – II (Special)	CO1:Advanced topics of Nuclear fission, Gamma decay and elementary particle physics CO2:Understand the construction and working of Nuclear reactors

	b) Condensed Matter Physics – II (Special)	CO1: To know the magnetic properties of materials CO2: Study the ubiquity of dielectrics. CO3: Understand ferroelectrics.
PHT-4.2	a) Nuclear Physics – III (Special)	CO1: Understand partial wave and perturbation approach of nuclear reactions. CO2: Learn the various spectroscopic techniques in nuclear physics. CO3: Understand the various nuclear models like shell model, collective model, rotational model and Nilsson model.
	b) Condensed Matter Physics – III (Special)	CO1: To explain effect of doping in semiconductors. CO2: To explain the transport properties, Magnetic field effects and optical properties of semiconductors. CO3: Understand fabrication of semiconductor devices CO4: Study low dimensional semiconductor structures CO5: Understand thin film preparation methods and thickness measurements of thin films. CO6:Study the different soft materials
PST-4.3	a) Material Science	CO1: Study structure of solids CO2: Understand the various techniques involved in Crystal Growth. CO3: The basic concepts on Solid phases and phase diagrams. CO4: Understand the phase transformations and diffusion solids. CO5: Study different magnetic materials
	b) MATLAB and LabVIEW	CO1: Understand Basics of MATLAB coding. CO2: Write the program for a given problem in MATLAB coding. CO3: Simulate various electric circuits in MATLAB simulation tool CO4:Understand the data acquisition by interfacing with LabVIEW
PHP-4.4	Project Work	CO1: Understand the importance of experimental and theoretical analysis. CO2: Develop a Scientific approach in solving problems related to physics. CO3: Educate and train the students to write scientific papers.
POE-4.5	Atmospheric Science	CO1: Understand dynamics of meteorology CO2: Understand dynamics of monsoon CO3: Develop numerical methods for atmospheric models CO4: Understand working of atmospheric instrumentation systems.