



THE MADURA COLLEGE

An Autonomous Institution affiliated to Madurai Kamaraj University
 Re-accredited (3rd cycle) with 'A' grade by NAAC
 Vidya Nagar, T.P.K. Road, Madurai – 625 011

DEPARTMENT OF PHYSICS

Course Outcomes mapped with POs

PROGRAMME : M.Sc. (Physics)

Course Code	Course Title	CLO	Mapping of CO with PO				
			PO1	PO2	PO3	PO4	PO5
21P1PMC1	Mathematical Physics – I	Apply the concept of vector calculus to solve the real world problem in Physics.	3	3	-	2	1
		Solve Eigen value problems and appreciate its application to the field of Quantum Mechanics.	3	3	-	2	1
		Analyze diffraction data and power spectrum of electronics circuits using Fourier transforms.	3	3	-	2	1
		Analyze physical problems like electric monopoles, dipoles and analyzing the gravitational potential of the earth due to its spheroidicity by modeling the systems using Legendre Polynomials. Also solve Eulerian integrals as beta and gamma functions.	3	3	-	2	1
		Apply Bessel's functions to Fraunhofer diffraction through a circular aperture. Also study the properties of Hermite polynomials.	3	3	-	2	1
21P1PMC2	Classical Mechanics	Infer basic concepts of mechanics to describe the Lagrangian equations of motion to simple systems.	3	2	1	2	2
		Develop Hamilton's equation of motion to real life applications.	3	2	1	2	2
		Apply generating functions and Poisson brackets to solve problems in Canonical transformations	3	2	1	2	2
		Analyze and evaluate equations of motion for coupled systems having small oscillations.	3	2	1	2	2

		Formulate equations of motion for rigid bodies using Euler's equations.	3	2	1	2	2
21P1PMC3	Advanced Electronics	Differentiate various semiconducting diodes by comparing their principles and working and its applications.	3	1	2	1	1
		Apply and analyze various operating modes of Op-amp, its linear/non-linear applications.	3	1	2	1	1
		Realize the combinational and sequential logic circuits by using various logical blocks.	3	1	-	1	1
		Compare and contrasts the concept ADC, DAC blocks required for data conversion.	3	1	2	1	1
		Classify various types of memories and shift registers	3	1	2	1	-
21P1PME1(A)	Physics of non-conventional energy resources	Discuss about the energy system an resources available in the world	3	2	2	2	2
		Categorize the thermal storage collection and its application	3	-	2	3	2
		Apply the real life application and study its uniqueness of wind energy	3	2	2	3	-
		classify sustainable geothermal application	3	-	2	2	2
		Compare the design and working principle of the wind ,wave and ocean energies	3	2	2	3	2
21P1PME1 (B)	Medical Physics	Physics aspects of Interaction of Radiation Quantities and Units	3	-	2	1	3
		Acquire knowledge on x –ray interaction and production.	3	-	-	1	2
		Apply the real life application and study its radiation therapy	3	-	2	1	2
		Discuss about the different types of particle accelerators and their medical application	3	2	-	1	2
		Explain the different types Electromagnetic Radiation and their sources/properties	3	1	2	1	3
21P1PMP1	Practical I	Understand the given problem in terms of domain knowledge in the field of physics.	3	1	3	-	1
		Design appropriate Experiment /Test for the given problem.	3	1	3	-	-
		Demonstrate skill in doing the experiment by choosing	3	1	3	1	-

		the appropriate technique and instruments and record data.					
		Analyze the data collected and infer the outcome and represent the analysis in meaningful form.	3	1	3	-	-
		Communicate the findings in appropriate scientific terminology.	3	1	3	-	1
21P1PMP2	Practical II	Understand the given problem in terms of domain knowledge in the field of physics.	3	1	3	-	1
		Design appropriate Experiment /Test for the given problem.	3	1	3	-	-
		Demonstrate skill in doing the experiment by choosing the appropriate technique and instruments and record data.	3	1	3	1	-
		Analyze the data collected and infer the outcome and represent the analysis in meaningful form.	3	1	3	-	-
		Communicate the findings in appropriate scientific terminology.	3	1	3	-	1
21P2PMC4	Mathematical Physics - II	Apply Cauchy-Riemann equation and Cauchy's integral theorem to analytic function.	3	3	-	2	1
		Analyze poles and residues using concepts of contour integration.	3	3	-	2	1
		Understanding the application of tensors in Physics.	3	3	-	2	1
		Classify molecules among various crystallographic point groups by applying principles of group theory.	3	3	-	2	1
		Apply the Great Orthogonality theorem to crystallographic point groups and construct character tables.	3	3	-	2	1
21P2PMC5	Quantum Mechanics- I	Recognize the basic terms in Quantum mechanics and apply the Schroedinger wave equation to simple quantum mechanical problems.	3	1	1	1	-
		Outline postulates of quantum mechanics and use them to a discussion of the total energy and momentum of a particle and to an illustrative problem.	3	-	1	1	-
		Set up Schroedinger wave equation to one dimensional and three dimensional problems and solve as well as	3	2	2	1	1

		analyze the results					
		Comprehend the important properties of matrices and then the matrix formulation in quantum mechanics and also apply it to examine the equation of motion.	3	2	1	2	-
		Construct angular momentum matrices and evaluate CG coefficients for system with two or more angular momentum parts	3	1	1	-	-
21P2PMC6	Electromagnetic Theory	Apply mathematical operations and develop knowledge of vector fields and scalar fields	3	-	2	2	2
		Explain boundary value problem in electrostatics and magneto statics	3	2	3	3	-
		Acquire knowledge on the information of the various mode of propagation in Maxwell equations	3	2	3	2	2
		Analyses the behavior of EM wave in conducting media	3	2	2	2	-
		categorize with the basis of radiation and radiation reaction	3	-	2	2	2
21P2PME2 (A)	Instrumentation And Methods	Illustrate the static characteristics of instruments as well as integrate the statistical error analysis of output results.	3	3	3	2	1
		Analyze the dynamic performance characteristics and formulate the governing equations of various instruments for improving dynamic response of systems.	3	3	2	2	1
		Focus the complete knowledge of various transducers operation and correlate the applications of modern industrial transducers	3	1	3	2	1
		Inspect different measuring techniques in transducers to measure physical quantities in the field of science and technology	3	1	3	2	2
		Apply the principles of thermal analysis method and examine the thermal characterization of materials	3	1	2	1	1
21P2PME2 (B)	Computational Physics	Understand the concepts of object-oriented programming	3	3	2	-	1
		Contrasts the difference between the various types of functions	3	3	2	-	1
		Make use of Structures and function programming techniques to solve problems in the C++ programming language	3	3	2	-	1

		Implement programming techniques to solve problems in the C++ programming language.	3	3	2	-	1
		Apply the concepts and principles of the programming language to the real-world problems and solve the problems through project-based learning	3	3	2	-	1
21P2PMP3	Practical III	Understand the given problem in terms of domain knowledge in the field of physics.	3	1	3	-	1
		Design appropriate Experiment /Test for the given problem.	3	1	3	-	-
		Demonstrate skill in doing the experiment by choosing the appropriate technique and instruments and record data.	3	1	3	1	-
		Analyze the data collected and infer the outcome and represent the analysis in meaningful form.	3	1	3	-	-
		Communicate the findings in appropriate scientific terminology.	3	1	3	-	1
21P2PMP4	Practical IV	Understand the given problem in terms of domain knowledge in the field of physics.	3	1	3	-	1
		Design appropriate Experiment /Test for the given problem.	3	1	3	-	-
		Demonstrate skill in doing the experiment by choosing the appropriate technique and instruments and record data.	3	1	3	1	-
		Analyze the data collected and infer the outcome and represent the analysis in meaningful form.	3	1	3	-	-
		Communicate the findings in appropriate scientific terminology.	3	1	3	-	1
21P3PMC7	Condensed Matter Physics-I	Students will understand what is a crystalline matter, powder, and amorphous matter. They will know crystal structures, what are atomic coordinates, what are lattice defects, crystallographic directions, planes.	3	1	1	1	1
		They will study and understand Bragg law and photographic techniques of identifying and understanding	3	1	-	-	1

		crystalline matter, different bonding types in crystals, atomic scattering factor, structure factor.					
		They will understand different Brillouin zones, diffraction by crystals.	3	-	-	-	1
		Students will learn lattice vibration in monatomic and diatomic lattice.	3	-	-	-	-
		They will understand superconductivity and excitons.	3	1	1	-	-
21P3PMC8	Quantum Mechanics –II	Use time independent perturbation theory to evaluate approximate energy values and wave functions for quantum mechanical problems.	3	2	1	1	1
		Outline the kinematics of scattering theory and apply them to describe problems related to quantum scattering.	3	2	1	1	1
		Develop approximation methods like the variation method and the WKB approximation method and apply them to time independent problems.	3	2	1	1	1
		Understand the concepts of approximation methods applicable to time dependent physical problems and use them to obtain approximate solution and analyze the results.	3	2	1	1	1
		Setup and solve relativistic wave equation for quantum mechanical systems and analyze the results.	3	2	1	1	1
21P3PMC9	Thermodynamics & Statistical Mechanics	Apply basics of concepts and formalisms entropy and theory of micro and macro states.	2	2	2	3	3
		Finding applications of the thermo dynamical potential.	3	1	1	2	3
		Examine to design and construct particle equations in the basic knowledge of classical statistics and quantum statistics.	2	3	2	2	2
		Apply classical and quantum distributions in circumstances varying from standard examples to real statistical problems	1	2	1	2	2
		Understanding the sequence of the various modes of quantum statistics.	2	2	2	2	3
21P3PMDC		Understand the fundamentals of crystal growth and nucleation	3	1	2	-	-

	Materials Science	Appreciate and understand the various methods of thin film preparation and the advantages of low dimensional materials over traditional bulk materials.	3	1	2	1	-
		Comprehend the fundamental concepts in various characterization techniques for analyzing materials properties.	3	2	2	1	-
		Comprehends the synthesis, properties and applications of nanostructure in various fields.	3	1	1	-	2
		Explain about Polya's urn model and classification of states and chain in solving stability of Markov chain problems.	3	3	2	1	-
21P3PMP5	Practical-V	Understand the usage of basic laws and theories to determine various properties of the materials given	3	1	3	-	1
		Use standard methods to measure the low pass, high pass and band pass filter of the given material.	3	1	3	-	-
		Apply knowledge of physics fundamentals and an instrumentation to arrive solution for various problems	3	1	3	1	-
		Understand the problem and the ability to identify the necessity of equipment to a specific problem.	3	1	3	-	-
		Understand the application side of the experiments	3	1	3	-	1
21P3PMP6	Practical-VI	Understand the usage of basic laws and theories to determine various properties of the materials given	3	1	3	-	1
		Use standard numerical methods to find the solution of the given problem.	3	1	3	-	-
		Apply knowledge of fundamentals programming and an instrumentation to arrive solution for various problems	3	1	3	1	-
		Understand the problem and the ability to identify the necessity of equipment to a specific problem.	3	1	3	-	-
		Understand the application side of the experiments	3	1	3	-	1
21P4PMC10	Condensed Matter Physics-II	Understand what is density of orbital's in 1d and 3d.They will understand electronic conductivity and resistivity and thermal conductivity.	3	1	1	-	-
		They will study and understand nearly free electron theory, wave equation in periodic potential.	3	-	-	-	-

		They will understand direct and indirect band gaps, effective mass of semiconductor, polarization, macroscopic and local electric field.	3	-	1	1	-
		They will understand pseudo potential, Fermi surface, quantization of orbits in magnetic fields.	3	-	-	-	-
		Students will understand dia, para and ferromagnetism.	3	1	1	1	1
21P4PMC11	Molecular Spectroscopy	Differentiate rigid rotator from non- rigid rotator	3	-	2	2	1
		Distinguish between harmonic oscillator and an harmonic oscillator	3	-	2	2	1
		Apply the knowledge of Raman spectroscopy in the determination of structure of simple molecules	3	-	2	2	1
		Explain the variation of intensities of vibrational – electronic spectra based on Franck –Condon principle	3	-	2	2	1
		Estimate the atomic / molecular mass of the given sample with high accuracy	3	-	2	2	1
21P4PMC12	Nuclear and Elementary Particle Physics	Infer the energy released in nuclear reactions and nuclear interactions to derive nuclear properties.	3	-	-	1	2
		Apply the concepts of radioactivity to comprehend its applications.	3	-	-	1	2
		Distinguish and compare the different nuclear models and apply it to determine the nuclear properties.	3	-	-	1	2
		Analyze the fission reactions and its application in nuclear reactors.	3	-	-	1	2
		Identify the properties of elementary particles and infer their interactions.	3	-	-	1	2
21P4PME3(A)	Modern Optics	Focus the complete knowledge of the matrix method to solve problems of geometrical optics.	3	1	1	1	2
		Apply the complete idea about the propagation of coherence function through free space and simple optical elements.	3	1	1	1	2
		Use the basics of diffraction theory and identify the solution of diffraction problems.	3	2	1	1	1
		Categorize the various diffraction approximation and to calculate the patterns of standard optical components.	3	2	3	2	1

		Illustrate the harmonic generations of light and predict the frequency generated by a non-linear optical process.	3	1	1	1	2
21P4PME3(B)	Nano Physics	Infers the basic concepts of solid state physics.	3	-	-	-	1
		Apply the concepts of characterization techniques to comprehend the properties of nanostructures.	1		2	2	1
		Identifies the different methods of synthesis of nanostructures.	2	-	2	-	1
		Analyze the properties of nanostructures due to dimensionality and density of states.	2	-	-	2	1
		Comprehends the applications of nanostructure in various fields.	2	-	-	2	1
21P4PME3(C)	Microprocessors	Develop assembly language programs in 8086 microprocessor for executing tasks like adding 64 – bit numbers, 16-bit numbers, to compare string information, series summation etc.	3	-	-	-	2
		Explain the functions of pins and signals available in 8086 microprocessor	3	-	-	-	2
		Make use of the concept of segment descriptors in determining the segment base address and segment limit	3	-	-	-	2
		Distinguish between i486 and i386 microprocessor architectures	3	-	-	-	2
		Differentiate complex instruction set computer principles from reduced instruction set computer principles	3	-	-	-	2
21P4PMP7	Practical–VII	Understand the usage of basic laws and theories to determine various properties of the materials given	3	1	3	-	1
		Use standard methods to measure optical property of the given material.	3	1	3	-	-
		Apply knowledge of physics fundamentals and an instrumentation to arrive solution for various problems	3	1	3	1	-
		Understand the problem and the ability to identify the necessity of equipment to a specific problem.	3	1	3	-	-
		Understand the application side of the experiments	3	1	3	-	1
21P4PMP8	Practical–VIII	Understand the usage of basic laws and theories to determine various properties of the materials given	3	1	3	-	1

		Use standard numerical methods to find the solution of the give problem.	3	1	3	-	-
		Apply knowledge of physics fundamentals and an instrumentation to arrive solution for various problems	3	1	3	1	-
		Understand the problem and the ability to identify the necessity of equipment to a specific problem.	3	1	3	-	-
		Understand the application side of the experiments	3	1	3	-	1
21P4PMR	Project	Survey scientific literature available and identify gaps in existing studies	3	3	3	3	3
		Design a scientific study taking practical constraints into account	3	3	3	3	3
		Perform the scientific study taking practical constraints into account.	3	3	3	3	3
		Analyze the results.	3	3	3	3	3
		Communicate the findings based on ethical standards of reporting.	3	3	3	3	3



Chairman/BoS

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