DEPARTMENT OF PHYSICS

MSc Physics

Course Outcomes

Title of the paper	**CLASSICAL MECHANICS**
Course Code	**PHY1C01**
Credits	**4**
Total Hours	**62**

This paper enables the students to understand

CO1 TheLagrangian and Hamiltonian approaches in classical mechanics.
CO2 The classical background of Quantum mechanicsand get familiarized with Poisson brackets and Hamilton -Jacobi equation
C03 Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion
CO4 Theory of small oscillations in detail along with basis of Free vibrations.
CO5Basic ideas about Non linear equations and chaos.

Title of the paper	**MATHEMATICAL PHYSICS**
Course Code	**PHY1C02**
Credits	**4**
Total Hours	**60**

In this course the student will
CO1.Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical applications in physics.
CO2 Learn about special type of matrices that are relevant in physics and then learn about tensors.
CO3 Get introduced to Special functions like Gamma function, Beta function, Delta function, Dirac delta function, Bessel functions and their recurrence relations
CO4 Learn different ways of solving second order differential equations and familiarized with singular points and Frobenius method.
CO5 Learn the fundamentals and applications of Fourier series, Fourier and Laplace transforms,their inverse transforms etc

Title of the paper	ELECTRODYNAMICS AND PLASMA PHYSICS
Course Code	PHY1C03
Credits	4
Total Hours	60

After successful completion of the course, the student is expected to :

C01 : have gained a clear understanding of Maxwell's equations and electromagnetic boundary conditions.

C02 : know that laws of reflection, refraction are outcomes of electromagnetic boundary conditions. They will also be able design dielectric coatings which act like antireflection coatings. They will be able to distinguish between a good metal and a good dielectric.

C03 : have grasped the idea of electromagnetic wave propagation through wave guides and transmission lines.

C04 : extend their understanding of special theory of relativity by including the relativistic electrodynamics.

C05 : understand the rather complex physical phenomena observed in plasma.

Title of the paper	ELECTRONICS
Course Code	PHY1C04
Credits	4
Total Hours	62

On completion of this course the student will learn about

CO1. Field Effect Transistors, their principles and applications
CO2 Photonic devices like LED, Laser diode, photodetectors, solar cells etc and their working in detail

CO3 Basic operational amplifier characteristics, OPAMP parameters ,applications as inverter, integrator, differentiator etc

CO4. Digital electronics baiscsusing logic gates and working of major digital devices like flip flops, CMOS ,CCD etc

C05 Karunaghmaps,flipFlops,counters and working of Microprocessor in detail.

Title of the paper	**QUANTUM MECHANICS 1**
Course Code	**PHY2 C05**
Credits	**4**
Total Hours	**60**

After successful completion of this paper, the student will be well-versed in

CO1 Linear vector spaces, Hilbert space, concepts of basis and operators and bra and ket notation
CO2 Both schrodinger and Heisenberg formulations of time development and their applications
CO3 Theory of angular momentum and spin matrices, orbital angular momentum and ClebshGordan Coefficient
CO4 Space-time symmetries and conservation laws, theory of identical particles
CO5 Theory of scattering and calculation of scattering cross section, optical theorem ,Born and Elkonal approximation, partial wave analysis etc.

Title of the paper	**MATHEMATICAL PHYSICS - II**
Course Code	**PHY2C06**
Credits	**4**
Total Hours	**60**

After successful completion of the course, the student is expected to :

C01 : know the method of contour integration to evaluate definite integrals of varying complexity.

C02 : have gained ability to apply group theory to physics problems, which is a pre-requisite for deeper understanding of crystallography, particle physics, quantum mechanics and energy bands in solids.

C03 : be able to apply calculus of variations to diverse problems in physics including isoperimetric problems. Another interesting aspect is the use of Lagrange multipliers in solving physics problems.

C04 : to become familiar with the method of Green's function to solve linear differential equations with inhomogeneous term

C05 : to find solutions to integral equations using different methods.

Title of the paper	**STATISTICAL MECHANICS**
Course Code	**PHY2 CO7**
Credits	**4**
Total Hours	**50**

The students should be able to

CO1. Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics

CO2. Apply the principles of statistical mechanics to selected problems

CO3. Grasp the basis of ensemble approach in statistical mechanics to a range of situations

CO4 To learn the fundamental differences between classical and quantum statistics and learn about quantum statistical distribution laws

CO5 Study important examples of ideal Bose systems and Fermi systems

Title of the paper	**COMPUTATIONAL PHYSICS**
Course Code	**PHY2 CO8**
Credits	**4**
Total Hours	**60**

The students should be able to,

CO1.Have a strong base in Python language regarding different data type such as list,sets,dictionary etc.

CO2 It helps to understand the different modules like NUMPY, Matplotlibetc

CO3 Understand Arrays and matrices and enables data visualization

CO4. Gets a wide knowledge of numerical methods in computational Physics that can be used to solve many problems which does not have an analytic solution
C05: Solve problems in physics such as standing waves, central field motion, Kirchoffs law etc using python language.

Title of the paper	QUANTUM MECHANICS 2
Course Code	PHY2 CO9
Credits	4
Total Hours	64

This course will enable the student to have basic knowledge about advanced techniques like

CO1 Approximation methods for time-independent problems like the WKB approximation

CO2 The variational equation and its application to ground state of the hydrogen and Helium atom

CO3 Perturbation theory and Interaction of an atom with the electromagnetic field

CO4 Relativistic Quantum Mechanics using Dirac equation, Dirac matrices,. The Klein Gordon equationetc

CO5Second quantization of the Schrödinger wave field for bosons and fermions

Title of the paper	NUCLEAR AND PARTICLE PHYSICS
Course Code	PHY 3C10
Credits	4
Total Hours	60

After successful completion of the course, the student is expected to

CO1 - have a basic knowledge of nuclear size ,shape , bindingenergy.etc and also the characteristics of nuclear force in detail.

CO2 – be able to gain knowledge about various nuclear models and potentials associated.

CO3 – acquire knowledge about nuclear decay processes and their outcomes. Have a wide understanding regarding beta and gamma decay.

CO4 –Grasp knowledge about Nuclear reactions, Fission and Fusion and their characteristics.

C05 understand the basic forces in nature and classification of particles and study in detail conservations laws and quark models in detail

Title of the paper	**SOLID STATE PHYSICS**
Course Code	**PHY3C11**
Credits	**4**
Total Hours	**64**

After successful completion of the course, the student is expected to

CO1 - have a basic knowledge of crystal systems and spatial symmetries ,- be able to account for how crystalline materials are studied using diffraction, including concepts like reciprocal lattice and Brillouin zones

CO2- 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

CO3- know Bloch's theorem and what energy bands are and know the fundamental principles of semiconductors

CO4-know the fundamentals of dielectric and ferroelectric propertiesof materials

CO5- know basic models of dia, para and ferro magnetism

CO6 – be able to explain superconductivity using BCS theory

Title of the paper	**EXPERIMENTAL TECHNIQUES OF MODERN PHYSICS**
Course Code	**PHY3 E07**
Credits	**4**
Total Hours	**62**

After successful completion of the course, the student is expected to :

C01: Have gained a clear understanding of different vacuum pumps and the production and maintenance of vacuum systems and its uses and needs in Physics

C02 : Understands in depth about thin film preparation and production controlling techniques and the application of thin films in the field of science & Technology

C03: Have grasped the idea of Cryogenics technology and its applications

C04 : Extend their understanding of various particle accelerators and its industrial uses.

C05: understand about different material analysis techniques and applications.

Title of the paper	**ATOMIC & MOLECULAR SPECTROSCOPY**
Course Code	**PHY4C12**
Credits	**4**
Total Hours	**61**

After successful completion of the course, the student is expected to :

C01 : know about different atom model and will be able to differentiate different atomic systems, different coupling schemes and their interactions with magnetic and electric fields.

C02 :Have gained ability to apply the techniques of microwave and infrared spectroscopy to elucidate the structure of molecules

C03 : Be able to apply the principle of Raman spectroscopy and its applications in the different field of science & Technology.

C04 : To become familiar with different resonance spectroscopic techniques and its applications

C05 : to find solutions to problems related different spectroscopic systems.

Title of the paper	**MATERIAL SCIENCE**
Course Code	**PHY4E11**
Credits	**4**
Total Hours	**61**

This elective course acts as a bridge between a physicist and a material scientist.It gives the student

CO1 An idea about all types of crystal defects and dislocations

CO2 information about Phase diagrams and general diffusion theory in detail

CO3 A fair idea of plastic deformation and fracture of material from an engineering point of view

CO4 A comprehensive awareness of the most important engineering material of the century namely polymers

CO5 State of the art facts and techniques of the synthesis and characterization of nano materials

Title of the paper	**MICROPROCESSORS AND APPLICATION**
Course Code	**PHY4E20**
Credits	**4**
Total Hours	**60**

The student who opt this elective will

CO1, Study the Organization and internal architecture of the Intel 8085,

CO2 learn assembly language programming and arithmetic

CO2 Aware of Memory interfacing, and different Data transfer schemes, CO4

CO5 Learn interfacing with peripheral I/O devices

CO6 Learn common applications of microprocessors like E Analog to Digital convert,7 segment LED displays,; Temperature measurement and control using a microprocessor etc