Department of Physics

Programme and Course Outcomes

The department offers **B.Sc Physics model-1** programme for students under choice based credit system which was revised latest in 2017 by M.G. University. The programme comprises a total of 41 courses which include 12 core courses, 10 common courses, 8 complementary courses, 6 core practicals, 2 complementary practicals and 1 course of project, 1 open course and a choice based course with a total of 120 credits. The syllabus of each course is framed so as the programme is able to raise the scientific temper of the scholar and provide a firm foundation in every aspect of Physics and to explain a broad spectrum of modern trends in Physics and to develop experimental, computational and mathematical skills.

Programme Outcomes

By the successful completion of the undergraduate programme, the student will be competent in

- Logical and critical thinking

- Achieving a desire for higher education and self learning

- Academic as well as extracurricular activities that will enable them to become skilled professionals.

- Developing a sensible and unbiased conclusion by gathering information from various reliable sources.

- Developing communication and coordination skills for employment and entrepreneurship.

- Growing into an accountable social reformer by igniting own scientific temper

- Acquiring awareness of environmental issues and ethics and taking responsibilities that promote sustainable and green habitat.

- Attaining harmony and compassion with different socio-cultural traditions

Programme Specific Outcomes

Through the B.Sc Physics programme, the students will be able to

- Understand the contributions of the scientific community and to develop research aptitude and scientific temper

- Develop various communication skills such as reading, listening, speaking, etc., which will help in expressing ideas and views clearly and effectively.
- Get strong foundations in Physics and develop basic experimental skills.
- Acquire fundamental concepts of Mathematics and Chemistry.
- Understand the theories behind various physical phenomena.
- Acquire skills to solve both theoretical and experimental scientific problems
- Interpret the inferences from verbal, mathematical and graphical data.
- Perform various task using their creativity, intellectual capacity, innovative thoughts and enthusiasm with precision and responsibility
- Ascertain their area of interest in academics and R&D and get prepared for competitive exams.

Course Outcomes

Course Outcome No.	Outcome	Knowledge Level
Semester 1		
PH1CRT01-Methodology and Perspectives of Physics		
CO.1	Acquire an overview on the early scientific development of Physics giving emphasis on the scientific contributions of the great scientists.	K1
CO.2	A thorough understanding of different number systems.	K2
CO.3	Learn the relevance of vectors in physics and coordinate systems with applications in different fields of physics. Apply vector calculus to solve relevant problems	K2, K3
CO.4	Develop a comprehensive knowledge of various measuring instruments used in Physics.	K2
CO.5	Gain insight into the generation and propagation of errors during experimental measurements.	K2, K3
Semester II		
PH2CRT02- Mechanics and Properties of Matter		
CO.1	Establish a solid foundation in the theory of wave motions and oscillations.	K2
CO.2	Apply the principles of harmonic motion to different types of oscillators	K2,K3
CO.3	Gain an understanding of various elastic moduli and the experimental aspects of rigidity modulus	K1
CO.4	Know the insights of deriving formulae for young's modulus by	K3

	uniform bending and non uniform bending	
CO.5	Develop a strong theoretical understanding of rotational mechanics and key mechanical properties of materials.	K3
CO.6	Introduce hydrodynamics principles and their practical applications in real-life scenarios	K1
PH2CRP01 – Mechanics and Properties of Matter		
CO.1	Acquire engineering skills in setting up of the experiment, systematic analysis of the experimental data and to estimate errors in measurement.	K3
CO.2	Provide a practical training with experiments in areas of rotational mechanics, hydrodynamics and properties of matter	K2, K3

Semester III

PH3CRT03: Optics, Laser and Fiber Optics		
CO.1	Understand the optical phenomenon Interference and the cause or origin of it.	K1, K3
CO.2	Assimilate the concept of polarization, explore the optical activity, effect of magnetic and electric field on optical activity	K1, K3
CO.3	Describe key concepts, principles of diffraction and understand the limitations imposed by them on optical instruments.	K2
CO.4	Understand the basic working principle of Laser and different types of lasers. Familiarize applications of lasers in different fields.	K2,K3
CO.5	Describe the ideas and applications of light - matter interaction and lasers	K2, K3
CO.6	Understand the ideas of light wave guides and discuss the applications	K2, K3

Semester-IV

PH4CRT04: Semiconductor Physics		
CO.1	Understand and design basic electronic circuits	K3
CO.2	Defend that wave shaping and differentiator & integrator circuits plays an important role to change shape of sinusoidal wave and convert from one wave into another wave pattern.	K5
CO.3	Understand the working and designing of transistor circuits such as amplifiers and oscillators.	K2
CO.4	Solving of various transistor circuits	K3
PH2CRP02 – Optics and Semiconductor Physics		
CO.1	Determine different physical parameters using optical methods	K3
CO.2	Construct various electronic circuits and analyze their performance	K3, K4

Semester-V

PH5CRT05: Electricity And Electrodynamics		
CO.1	Analyze the growth and decay of current in transient circuits and also to analyze the alternating current in resonance circuits	K4
CO.2	Apply the concept of Gauss' law , Coulomb's theorem and electric potential to different physical objects	K3

CO.3	Analyze the magnetic effects of current under different situations	K4
PH5CRT06: Classical And Quantum Mechanics		
CO.1	Apply basic concepts of classical mechanics in simple mechanical systems.	K3
CO.2	Describe the correspondence between D'Alembert's Principle, Lagrange's equations, Newton's equations, Hamilton's principle, Hamilton's equations	K2
CO.3	Apply the formulation of Lagrangian and Hamiltonian in Simple Classical Mechanics Problems.	K1,K2,K3
CO.4	Distinguish between classical mechanics and quantum mechanics.	K2
CO.5	Describe the experiments that interest the development of quantum mechanics and apply the basic principles to solve relevant problems.	K1,K2,K3
CO.6	Describe the mathematical methods and principles in quantum mechanics and apply the methods	K2
CO .7	Analyze and apply Schrodinger equation for simple systems(a particle in a box)	K4
PH5CRT07: Digital Electronics And Programming		
CO.1	Gain an introduction to the fundamental concepts and techniques employed in digital electronics.	K1
CO.2	Develop the ability to design various logic gates and simplify Boolean equations effectively.	K2, K3
CO.3	Acquire knowledge of Boolean algebra and the skills to simplify Boolean expressions using various methods.	K1, K2, K3
CO.4	Design basic combinational and sequential logic circuits.	K2, K3
CO.5	Understand the basic concepts of Object-Oriented Programming (OOPs).	K2
CO.6	Write coding using C++ to solve various problems	K3, K6
PH5CRT08: Environmental Physics And Human Rights		
CO.1	Apply the principle of heat transfer in different solar energy storage systems	K3
CO.2	Understand the system of waste management in various scenarios	K2
CO.3	Introduction to the major environmental problems its causes and potential solutions	K1, K2
CO.4	Introduction to various types of natural resources(renewable and non renewable), impact of humans on these resources, and general resource management practices	K2,K3
CO.5	Understand the fundamentals and applications of remote sensing	K2
CO.6	Understand their basic rights as well as ways and means to prevent the violation of Human Rights.	K2
PH5OPT01: Our Universe		
CO.1	Comprehend the cosmos and its origin and to develop scientific attitude and aptitude	K1
CO.2	Describe introductory ideas of origin of universe and stellar evolution	K2
CO.3	Understand optical astronomy, coordinate systems and familiarize different type of telescopes	K2
CO.4	Outline the understanding the relative sizes of the planets within the solar system.	K3
Semester-VI		

	PH6CRT09: Thermal And Statistical Physics	
CO.1	Determine thermal conductivity of good and bad conductors, appreciate Planck's law of radiation	K4
CO.2	Learn laws of thermodynamics and to appreciate the working of heat engines and refrigerators.	K2
CO.3	Derive Maxwell's thermo dynamical relations and to learn their applications	K2
	PH6CRT10: Relativity And Spectroscopy	
CO.1	Explain the basic concepts in special theory of relativity and its applications to dynamical systems.	K3
CO.2	Develops interest in Special and general Theory of Relativity. Describe Lorentz transformations on space-time and its consequences, Einstein's mass energy equivalence, Lorentz transformation for force, momentum and energy, and apply them in relevant situations.	K1,K2,K3
CO.3	Describe the basics of atomic spectroscopic methods and apply them in relevant situations.	K1,K2,K3
CO.4	Understand the concepts of molecular spectroscopy - Electronic, IR and Microwave Spectroscopies	K2, K3
CO.5	Understand the concepts of NMR and ESR instrumentation techniques	K2
	PH6CRT11: Nuclear, Particle Physics and Astrophysics	
CO.1	Explain the basic properties of the nucleus and nuclear models for study of the nuclear structure behavior	K1,K2
CO.2	Compute half life, age of the earth and Q values of nuclear reaction and understand the concept of nuclear fission and fusion	K2, K3
CO.3	Compare the working of different types of particle detectors and particle accelerators	K3
CO.4	Introduction of the concept of radioactivity and the theory of α, β and Υ-decay in radioactivity	K1,K2,K3
CO.5	Explain the fundamental interactions, quantum numbers associated with elementary particles and also to understand the basics of cosmic rays	K1, K2
CO.6	Introduction to Astrophysics - concepts of stellar evolution	K1, K2
	PH6CRT12: Solid State Physics	
CO.1	Realize the importance of crystallography in solid state physics. Classify various lattices and find simple crystal structures.	K1, K2
CO.2	Illustrate the bond formation in solids and free electron theory of metals.	K4
CO.3	Enables one to understand basic electric and magnetic properties of solids and the theoretical framework of the same	K2
CO.4	Understand the basics of different semiconducting, dielectric, magnetic and superconducting properties of materials.	K2

	PH6CBT02: Material Science (Choice based Course)	
CO.1	Understand the relationship between structure and properties of the materials	K2
CO.2	Familiarize modern engineering materials -principles and applications	K2
CO.3	Describe various properties of nanomaterials and their applications	K2
CO.4	Learn different material characterization techniques qualitatively	K2
	PH6CRP03-Electricity, Magnetism and Laser	
CO.1	This course offers experiments in electricity, magnetism and Laser	K3
CO.2	Gain practical knowledge on the working and applicability of potentiometer, galvanometer and magnetometers in different areas.	K2,K3
	PH6CRP04-Digital Electronics	
CO.1	Understand the concept and the working of digital logic circuits	K2
CO.2	Foundation and practical knowledge in basic digital electronics devices	K3
	PH6CRP05- Thermal Physics, spectroscopy and C++programming	
CO.1	Measure, calculate and analyze various thermal and spectroscopic parameters in the lab.	K3
CO.2	Enabled to write C++ programmes to solve different problems.	K3
	PH6CRP06-Acoustics,Photonics, and Advanced semiconductor physics	
CO.1	Understand and analyze experiments with acoustics and photonics devices.	K2, K3
CO.2	Design and construct electronic circuits to get desired output.	K3

Complementary Physics for Mathematics

	Semester I	
	PH1CMT01-Properties of Matter and Error Analysis	
CO.1	To know the insights of deriving formulae for young's modulus by uniform bending and non uniform bending.	K3
CO.2	To gain an understanding of various elastic moduli and the experimental aspects of rigidity modulus.	K1,K2
CO.3	Understand the basic theories of hydrodynamics	K2
CO.4	Learn How to calculate or report errors occurred in a measurement and calculation.	K3
	Semester II	
	PH2CMT01-Mechanics And Astrophysics	
CO.1	Introduction of gravity and experimental arrangements for measuring acceleration due to gravity at a place.	K3
CO.2	Understand the theories of oscillations- simple harmonic motion, damped oscillations, forced oscillations and progressive waves	K2, K3
CO.3	Understand the theories of stellar evolution qualitatively	K2
CO.4	Understanding in rotational dynamics -Angular momentum, torque, moment of inertia of various systems, concept of flywheel and application level problems	K2, K3
	Semester III	
	PH3CMT01-Modern Physics and Electronics	

CO.1	Gain knowledge about the history of atom models from plum pudding model to vector atom model	K1
CO.2	Gain basic ideas of properties of nucleus, binding energy and radioactivity	K2, K3
CO.3	Gain a general idea about the Physics of semiconductors and the working of diodes, rectifiers and transistors and their applications in various problems	K2, K3
CO.4	Introduction of different types of number systems and binary arithmetic and basic logic circuits	K2
CO.5	Explain the inadequacies of classical physics and experimental evidence for quantum theory.	K2
CO.6	Obtain the Schrodinger equation and use it for solving the problem of a particle in a box	K2, K3

Semester IV

PH4CMT01-Optics and Electricity

CO.1	Appreciate the phenomenon of Diffraction, discuss technical applications of simple optical instruments	K2,K3,K4
CO.2	Analyze the growth and decay of current in transient circuits and also to analyze the alternating current in resonance circuits	K4
CO.3	Students will gain deeper understanding in ideas of dielectrics	K2
CO.4	Develop a knowledge on the theory of light propagation through fibres.	K2
CO.5	Outline the laser fundamentals, principles, processes of laser systems. Evaluate the different types of lasers, its principle, properties of laser beam.	K3

Complementary Physics for Chemistry

Semester I

PH1CMT02-Properties of Matter and Thermodynamics

CO.1	to know the insights of deriving formulae for young's modulus by uniform bending and non uniform bending.	K3
CO.2	to gain an understanding of various elastic moduli and the experimental aspects of rigidity modulus.	K1
CO.3	Learn basics principles and theories of hydrodynamics and solve problems.	K2, K3
CO.4	solve various thermodynamic problems using Basic thermodynamic principles	K2, K3

Semester II

PH2CMT02-Mechanics and Superconductivity

CO.1	Apply the law of gravitation in different physical situations and experimental arrangements for measuring acceleration due to gravity at a place.	K2,K3
CO.2	Understand and Apply the theories of oscillations- simple harmonic motion, damped oscillations, forced oscillations and progressive waves.	K2,K3
CO.3	The course provide understanding in rotational dynamics -Angular momentum, torque, moment of inertia, flywheel	K3,K3
CO.4	Qualitative understanding of superconductivity	K2

Semester III

PH3CMT02-Modern Physics and Magnetism

CO.1	Gain knowledge about the history of atom models from plum pudding model to vector atom model	K1

CO.2	Gain basic ideas of properties of nucleus, binding energy and radioactivity	K1, K2,K3
CO.3	Gain a general idea about the Physics of semiconductors and the working of diodes, rectifiers and transistors and their applications in various problems	K2, K3
CO.4	Understand the basic concepts of magnetism	K1
CO.5	Explain the inadequacies of classical physics and experimental evidences for quantum theory.	K2
	Obtain the Schrodinger equation and use it for solving the problem of a particle in a box	K2, K3

Semester IV

PH4CMT02-Optics and Solid State Physics

CO.1	Appreciate the phenomenon of Diffraction, discuss technical applications of simple optical instruments	K2,K3,K4
CO.2	classify various lattices and find simple crystal structures.	K2
CO.3	Students will gain deeper understanding in ideas of dielectrics	K2
CO.4	Develop a knowledge on the theory of light propagation through fibres.	K2
CO.5	Outline the laser fundamentals, principles, processes of laser systems. Evaluate the different types of lasers, its principle, properties of laser beam.	K3

Complementary Physics Practicals

PH2CMP01 - Complementary Physics Practical I (Semester I and II)

CO.1	Acquire engineering skills in setting up of the experiment, systematic analysis of the experimental data and to estimate errors in measurement.	K3
CO.2	Provide a practical training with experiments in areas of rotational mechanics, hydrodynamics and properties of matter	K3

PH2CMP02 - Complementary Physics Practical II (Semester III and IV)

CO.1	Determine different physical parameters using optical methods	K3
CO.2	Construct various electronic circuits and study various parameters	K3, K4