Two Year M.Sc. Programme in Physics

PROGRAM OUTCOMES (PO)

The recent developments in Physics, has been included in the enriched M.Sc. (Physics) Syllabus to meet the present day needs of Academic and Research Institutions and Industries. An important objective of the course is to develop an understanding of "core physics" at deeper levels, each stage revealing new phenomena and greater insight into the behavior of matter and college and university level physics to bring all students to a common point. These courses also aim to consolidate the college level knowledge of physics by providing much more logical and analytical framework which will be essential for the specialization courses in the this and fourth semesters. After the completion of their M.Sc., Students will have

PO1: Strong analytical abilities.

PO2: Qualities needed for teaching of science and doing research.

PO3: Knowledge of theoretical as well as experimental areas of Physics.

PO4: Capabilities to generate self-employment.

PO5: Computational Skill and ICT development.

PROGRAM SPECIFIC OUTCOMES (PSO)

Upon completion of the program, the students will attain the ability to:

PSO1: Acquire fundamental knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory, electronics, optics, special theory of relativity and modern physics.

PSO2: Develop a written and oral communication skill in communicating physics-related topics.

PSO3: Design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.

PSO4: Learn the applications of numerical techniques for modelling physical systems for which analytical methods are inappropriate or of limited utility.

PSO5: Develop an understanding of the impact of physics and science on society**.**

PSO6: Apply conceptual understanding of the physics to general real-world situations. Also, discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.

COURSE OUTCOME (CO)

MPHYCC – 101. Mathematical Physics (5 Credits)

Course Outcomes (CO):

After completion of the course, the students will be able to:

CO1: master the basic elements of complex mathematical analysis.

CO2: solve differential equations that are common in physical sciences.

CO3: apply group theory to solve mathematical problems of interest in Physics.

CO4: understanding how to use tensors in various physics problems.

MPHY – CC102: Classical Mechanics (5 Credits)

Course Outcomes (CO):

After completion of the course, the students will be able to:

CO1: know the difference between Newtonian mechanics and Analytic mechanics.

CO2: solve the mechanics problems using Lagrangian formalism, a different method from Newtonian mechanics.

CO3: understand the connection between classical mechanics and quantum mechanics from Hamiltonian formalism.

CO4: understand of basic concepts of special and general theory of relativity.

MPHY – CC103: Electrodynamics and Plasma (5 Credits)

Course Outcomes (CO):

After completion of the course, the students will have understanding of:

CO1: Time-varying fields and Maxwell equations.

CO2: Various concepts of electromagnetic waves.

CO3: Radiation from localized time courses, and the charged particle dynamics.

PHY – CC104: Physics Laboratory – I (5 credits)

Course Outcomes (CO):

At the end of the course:

CO1: The student should have knowledge of the different experimental techniques.

CO2: The student should have understood the basics of physics involved in experiments.

CO3: The student should be able to apply the concepts of physics and do the interpretation and acquire the result.

Ability Enhancement Compulsory Course (5 Credits Each)

MAECC101: Environmental Sustainability & Swachha Bharat Abhiyan Activities

Course Outcomes (CO):

After completion of the course, the student will

CO1: understand the concept of environmental Sustainability.

CO2: understand the concept and types of natural resources and environmental pollution.

CO3: evaluate the anomalies created due to haphazard population growth and its impact on biodiversity and population.

CO4: understand the concept of Swachha Bharat Abhiyan and importance of cleanliness.

Physics (M.Sc.) Details of CBCS Syllabus

SEMESTER – II

Core Courses (5 Credit Each)

MPHY – CC205: Numerical Analysis and Simulation (5 credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: Learn how to interpret and analyze data visually, both during and after computation.

CO2: Gain an ability to apply physical principles to real-world problems.

CO3: Acquire a working knowledge of basic research methodologies, data analysis and interpretation.

CO4: Understand various simulation techniques which can be used in future by students to analyze the data.

MPHY – CC206: Quantum Mechanics (5 Credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: Have a working knowledge of the foundations, techniques and key results of quantum mechanics.

CO2: to comprehend basic quantum mechanical applications at the research level.

CO3: gain an ability to competently explain/teach quantum physics to others.

MPHY – CC207: Electronics (5 Credits)

Course Outcomes (CO):

Students will have understanding of

CO1: Fundamental designing concepts of different types of logic gates, minimization techniques etc.

CO2. Designing of different types of the Digital circuits, and to give the computational details for Digital circuits.

CO3: Characteristics of devices like PNP, and NPN junction diode and truth tables of different gates.

CO4: Basic elements and to measure their values with multimeter and their characteristic study.

CO5: How to construct electronic circuit.

MPHY – CC208: Atomic, Molecular Spectroscopy and Laser (5 credits)

Course Outcomes (CO):

Students will have understanding of

CO1: Atomic spectroscopy of one and two valence electron atoms.

CO2: The change in behavior of atoms in external applied electric and magnetic field.

CO3: Rotational, vibrational, electronic and Raman spectra of molecules.

CO4: Electron spin and nuclear magnetic resonance spectroscopy.

CO5: Principle, working and applications of Laser.

MPHY – CC209: Physics Laboratory – II (Programming: Numerical Methods using C/C++/MATLAB/Python Software) (5 Credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: Understand the basic idea about finding solutions using computational methods basics.

CO2: Learn how to interpret and analyze data visually, both during and after computation.

CO3: Gain an ability to apply physical principles to real-world problems.

CO4: Acquire a working knowledge of basic research methodologies, data analysis and interpretation.

CO5: Realize the impact of physics in the global/societal context.

MPHY – SEC201: Physics and Workshop Training (5 Credits)

Course Outcomes (CO):

After completion of the course, the students will be able to:

CO1: solve the problem and also think methodically, independently and draw a logical conclusion.

CO2: use modern techniques, decent equipments and scientific softwares. Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.

CO3: describe the methodology of science and the relationship between observation and theory & learn to minimize contributing variables and recognize the limitations of equipment.

CO4: develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.

Physics (M.Sc.) Details of CBCS Syllabus

SEMESTER – III

Core Courses (5 Credit Each)

MPHY – CC310: Statistical Mechanics (5 Credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: understand basic knowledge of thermodynamic systems.

CO2: understand the basic idea about statistical distributions.

CO3: Impart the knowledge about the phase transitions and potentials.

CO4: Understand the applications of statistical laws.

MPHY – CC311: Condensed Matter Physics (5 Credits)

Course Outcomes (CO):

Students will have understanding of

CO1: Structure in solids and their determination using XRD.

CO2: Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties.

CO3: Electrical, Thermal, Magnetic and Dielectric properties of Solids.

MPHY – CC312: Nuclear and Particle Physics (5 Credits)

Course Outcomes (CO):

At the end of the course, the students will be able to

CO1: Acquire basic knowledge about nuclear and particle physics.

CO2: Develop the nuclear reactions and neutron physics.

CO3: Understand the nuclear fission and fusion reactions.

CO4: Impart the knowledge about the nuclear forces and elementary particles.

MPHY – CC313: Biophysics (5 Credits)

Course Outcomes (CO):

At the end of the course, students will be able to

CO1: understand basic knowledge of Biomolecular chemistry and functions.

CO2: understand the basic idea about the Structure and Function of Nucleic Acids.

CO4: impart the knowledge about the Function of Carbohydrates and Proteins.

CO5: understand the applications of Biomolecules.

MPHY – CC314: Physics Laboratory – III (5 Credits)

Course Outcomes (CO):

At the end of the course,

CO1: The student will have a knowledge on the different experimental techniques involved in electronics.

CO2: The student should be able to independently construct the circuits.

CO3: The student should be able to apply the concepts of electronics and do the interpretation and acquire the result.

Physics (M.Sc.) Details of CBCS Syllabus

SEMESTER – IV

Discipline Specific Elective Courses (5 Credit Each)

MPHY-DSE-401: A. Plasma Physics (5 Credits)

Course Outcomes (CO):

After completion of the course, the students will be able to:

CO1: Understand the introduction to the field of Biophysics.

CO2: Comprehend the study of heat transfer in biomaterials.

CO3: Develop knowledge on study of chemical thermodynamics.

CO4: Visualize the important connection between theory and experiment.

MPHY-DSE-401: B. Nano Science (5 Credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: understand the basic knowledge on nanoscience and nanotechnology.

CO2: understand the basic idea about the nanostructure.

CO3: Impart the knowledge about the properties and characteristics techniques of nanomaterials.

CO4: Understand the applications of nanomaterials.

MPHY-DSE-401: C. Laser and Photonics (5 Credits)

Course Outcomes (CO):

At the end of this course, the student will be able to

CO1: understand the theory behind laser and learn about the different types of Lasers.

CO2: Knowledge of fundamental physics of photonics is developed to a high level.

CO3: The course prepares students to be able to use sophisticated instrumental intelligently, with a good understanding of its capabilites and limitations.

MPHY-DSE-401: D. Crystal Physics and X-ray Crystallography (5 Credits)

Course Outcomes (CO):

At the end of this course, structure will be able to

CO1: know the structure of various crystals.

CO2: know the theoretical framework like symmetry and space groups.

CO3: know to characterize the crystal using X – Ray diffraction experiments and

CO4: also would be able to analyze the collected experimental data.

MPHY-DSE-401: E. Environmental Physics (5 Credits)

Course Outcomes (CO):

At the end of this course, students will be able to

CO1: understand the importance of basics of environmental processes.

CO2: get opportunities of working metrological stations and even establish metrological stations in remote places for better future.

CO3: develop his/her understanding of global and regional climate change.

MPHY-DSE-401: F. Advanced Electronics (5 Credits)

Course Outcomes (CO):

Students will have understanding of

CO1: Fundamental designing concepts of different types of logic gates, Minimization techniques etc.

CO2. Designing of different types of the Digital circuits, and to give the computational details for Digital circuits.

CO3: Characteristics of devices like PNP, and NPN junction diode and truth tables of different gates.

CO4: Basic elements and to measure their values with multimeter and their characteristic study.

CO5: Working of Flip-flops, registers and counters.

Generic Elective Course (5 Credits)

MPHY-GE-401: Renewable Energy and Energy Harvesting (5 credits)

Course Outcomes (CO):

The students will be able to

CO1: understand the importance of solar energy and renewable energies.

CO2: understand essential components of renewable energy applications and limitations.

CO3: design renewable energy systems as requirements.

CO4: contribute towards reduction of our dependence on conventional energy sources.