Masters of Science (Physics)

Program Outcome

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 radiation. The various courses in the first two semesters, are designed to bridge the gap between college and university level physics and 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 third and fourth semesters. After the completion of their M.Sc. Students will have:

PO-l) Strong analytical abilities.

PO-2) Qualities needed for teaching of Science and doing research.

PO-3) Knowledge of theoretical as well as experimental areas of Physics.

PO-4) Capabilities to generate self-employment.

PO-5) Computational Skill and ICT development.

PO-6) To develop strong student competencies in Physics and its applications in a technology-rich, interactive environment.

PO-7) To develop strong student skills in the research, analysis and interpretation of complex information.

PO-8) To prepare the students to successfully compete for employment in Electronics, Manufacturing and Teaching industry.

PO-9) To develop human resource with a solid foundation in theoretical and experimental aspects of respective specializations as a preparation for career in academia and industry.

Course Outcome

SI. No.	Course Code	Course Name	Learning Outcome
SEMESTER-I			
1.	CC 1	Classical Mechanics	CO1. To give students a solid foundation in classical mechanics. CO2. To introduce general methods of studying the dynamics of particle systems. CO3. To give experience in using mathematical techniques for solving practical problems. CO4. To apprise the students of Lagrangian and Hamiltonian formulations and their applications. CO5. To apprise the students regarding the concepts of electrodynamics and its use in various situations. CO6. Know the difference between Newtonian mechanics and Analytic mechanics. CO7. Solve the mechanics problems using Lagrangian formalism, a different method from Newtonian mechanics. CO8. Understand the connection between classical mechanics and quantum mechanics from Hamiltonian formalism. CO9. Understanding of basic concepts of special and general theory of relativity.
2.	CC 2	Mathematical Physics	CO1. To develop knowledge in mathematical physics and its applications. CO2. To develop expertise in mathematical techniques that are required in physics. CO3. To enhance problem solving skills. CO4. To give the ability to formulate, interpret and draw inferences from mathematical solutions. CO5. Master the basic elements of complex mathematical analysis. CO6. Solve differential equations that are common in physical sciences CO7. Apply group theory and integral transforms to solve mathematical problems of interest in Physics.

SI. No.	Course Code	Course Name	Learning Outcome
			CO8. Understanding how to use special functions in various physics problems.
3.	CC 3	Quantum Mechanics	CO1. To illustrate the inadequacy of classical theories and the need for a quantum theory. CO2. To explain the basic principles of quantum mechanics. CO3. To develop solid and systematic problem solving skills. CO4. To apply quantum mechanics to simple systems occurring in atomic and solid state physics. CO5. To have a working knowledge of the foundations, techniques and key results of quantum mechanics. CO6. To comprehend basic quantum mechanical applications at the research level. CO7. Gain an ability to competently explain/teach quantum physics to others.
4.	CC 4	Lab-I	CO1. To make the student familiarize with the basics of experimental physics. CO2. To enable the student to explore the concepts involved in the thermodynamics and heat. CO3. To make the student understand the basic concepts in modern optics. CO4. To allow the student to understand the fundamentals of instruments involved. CO5. The student should have knowledge of the different experimental techniques. CO6. The student should have understood the basics of physics involved in experiments. CO7. The student should be able to apply the concepts of physics and do the interpretation and acquire the result.
5.	AECC 1	Environmental Sustainability and Swachha Bharat Abhiyaan Activities	CO1. Students will get the knowledge about the environment and its components in which one survives.

SI. No.	Course Code	Course Name	Learning Outcome
			CO2. Students will learn how to take care of the surroundings in general. The field work during the completion of the course will make student responsible for their ecosystem. CO3. During the course, students will get to know about so many elements of general studies that can really help them in competitive examinations as well as in day to day activities.
SEMESTER-II			
6.	**CC 5**	**Modelin and simulation**	CO1. To encourage students to "discover" physics in a way how physicists learn by doing research. CO2. To address analytically intractable problems in physics using computational tools. CO3. To enhance the various computational technique with programming basic in C++/Python/ Java to face the world of problems using high performance iteration techniques. CO4. To show how physics can be applied in a much broader context than discussed in traditional curriculum. CO5. Learn how to interpret and analyze data visually, both during and after computation. CO6. Gain an ability to apply physical principles to real-world problems. CO7. Acquire a working knowledge of basic research methodologies, data analysis and interpretation. CO8. Understand various simulation techniques which can be used in future by students to analyse the data.
7.	**CC 6**	**Electrodynamics and Plasma Physics Course**	CO1. To apprise the students regarding the concepts of electrodynamics and its use in various situations. CO2. Time-varying fields and Maxwell equations. CO3. Various concepts of electromagnetic waves. CO4. Radiation from localized time varying sources, and the charged particle dynamics.
8.	**CC 7**	**Electronics 1**	CO1. To make the student familiarize with the basics of electronics.

SI. No.	Course Code	Course Name	Learning Outcome
			CO2. To enable the student to explore the concepts involved in the oscillators. CO3. To make the student understand the basic concepts in IC and digital devices. CO4. To allow the student to understand the fundamentals of multivibrators. CO5. To provide in-depth theoretical base of Digital Electronics. CO6. Fundamental designing concepts of different types of Logic Gates, Minimization techniques etc. CO7. Designing of different types of the Digital circuits, and to give the computational details for Digital Circuits. CO8. Characteristics of devices like PNP, and NPN junction diode and truth tables of different logic gates. CO9. Basic elements and to measure their values with multimeter and their characteristic study. CO10. How to construct electronic circuit.
9.	**CC 8**	**Statistical Mechanics**	CO1. The course is to understand the basics of Thermodynamics and Statistical systems. CO2. Understand the various laws of thermodynamics. CO3. Acquire the knowledge of various statistical distributions. CO4. To comprehend the concepts of Enthalpy, phase transitions and thermodynamic functions. CO5. Basic knowledge of thermodynamic systems. CO6. Understand the basic idea about statistical distributions. CO7. Impart the knowledge about the phase transitions and potentials. CO8. Understand the applications of statistical laws.

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10.	CC 9	Lab-II	CO1. To encourage students to "discover" physics in a way how physicists learn by doing research. CO2. To address analytically intractable problems in physics using computational tools. CO3. To enhance the various computational technique with programming basic in C to face the world of problems using high performance iteration techniques. CO4. To show how physics can be applied in a much broader context than discussed in traditional curriculum. CO5. Understand the basic idea about finding solutions using computational methods basics. CO6. Learn how to interpret and analyze data visually, both during and after computation. CO7. Gain an ability to apply physical principles to real-world problems. CO8. Acquire a working knowledge of basic research methodologies, data analysis and interpretation. CO9. Realize the impact of physics in the global/societal context.
11.	SEC 1	Skill Enhancement Course: Yogic Science	CO1. Students will learn the theoretical foundations of Yoga philosophy. CO2. Students will equip themselves with a fair number of yogic practices including meditative techniques. CO3. Yogic knowledge and practices will help the students to revitalise themselves and work with more attention.
SEMESTER-III			
12.	CC 10	Atomic and Molecular Physics, Lasers	CO1. Objective of this course is to learn atomic, molecular and spin resonance spectroscopy. CO2. To understand mechanism and working of lasers. CO3. To be able to understand atomic and molecular transitions and selection rules. CO4. To understand the Raman effect and its applications.

SI. No.	Course Code	Course Name	Learning Outcome
			CO5. Atomic spectroscopy of one and two valance electron atoms. CO6. The change in behavior of atoms in external applied electric and magnetic field. CO7. Rotational, vibrational, electronic and Raman spectra of molecules. CO8. Electron spin and nuclear magnetic resonance spectroscopy. CO9. Principle, working and applications of laser.
13.	**CC 11**	**Condensed Matter Physics**	CO1. To study some of the basic properties of the condensed phase of materials especially solids. CO2. To study electrical and magnetic properties of solids. CO3. To understand superconductivity and various properties of semiconductors. CO4. Structures in solids and their determination using XRD. CO5. Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties. CO6. Electrical, thermal, magnetic and dielectric properties of solids.
14.	**CC 12**	**Electronics II (Analog and Digital Electronics)**	CO1. To understand the working of advanced semiconductor devices and digital circuits and the utility of OP□AMP. CO2. To learn the basics of integrated circuit fabrication, applications of timer IC-555 and building block of digital systems. CO3. Fundamental designing concepts of different types of Logic Gates, Minimization techniques etc. CO4. Designing of different types of the Digital circuits, and to give the computational details for Digital Circuits. CO5. Characteristics of devices like PNP, and NPN junction diode and truth tables of different logic gates. CO6. Basic elements and to measure their values with multimeter and their characteristic study.

SI. No.	Course Code	Course Name	Learning Outcome
			CO7. Working of Flip-flops, registers and counters.
15.	CC 13	Nuclear and Particle Physics	CO1. To study the general properties of nucleus. CO2. To study the nuclear forces and nuclear reactions. CO3. To introduce the concept of elementary particles CO4. To impart knowledge about basic nuclear physics properties and nuclear models for understanding of related reaction dynamics. CO5. Acquire basic knowledge about nuclear and particle physics. CO6. Develop the nuclear reactions and neutron physics. CO7. Understand the nuclear fission and fusion reactions. CO8. Impart the knowledge about the nuclear forces and elementary particles.
16.	CC 14	Lab-III	CO1. To make the student familiarize with the basics of electronics. CO2. To enable the student to explore the concepts involved in the oscillators. CO3. To make the student understand the basic concepts in IC and digital devices. CO4. To allow the student to understand the fundamentals of multivibrators. CO5. The student will have knowledge on the different experimental techniques involved in electronics. CO6. The student should be able to independently construct the circuits. CO7. The student should be able to apply the concepts of electronics and do the interpretation and acquire the result.
17.	AECC 2	Human values and professional ethics and gender sensitisation	CO1. Students will get the knowledge about values regarding humanity, gender equality and professionalism.

SI. No.	Course Code	Course Name	Learning Outcome
			CO2. Students will learn how to work together in an empathetic and unbiased way. The field work during the completion about the dignity of a human being. CO3. During the course, students will acquaint themselves with such notions of morality that they will find it easier to work together in a group in a co-operative and productive way.
SEMESTER-IV			
18.	**EC I A**	**Advanced Quantum Mechanics**	Students will have understanding of: CO1. Importance of relativistic quantum mechanics compared to non-relativistic quantum mechanics. CO2. Various tools to understand field quantization and related concepts. CO3. Exposure to quantum field theory and universal interactions.
19.	**EC II A**	**Practical-50 Marks Dissertation-50 Marks**	-
20.	**EC I B**	**Advanced Condensed Matter Physics**	At the end of this course, students will be able to: CO1. Basic knowledge of crystal structures and systems CO2. Understand the basic idea about the Electronic Properties of Solids CO3. Impart the knowledge about the properties magnetic Properties of Solids CO4. Understand the applications of superconductivity.
21.	**EC II B**	**Practical-50 Marks Dissertation-50 Marks**	-
22.	**EC I C**	**Atmospheric Physics**	At the end of the course, students will be able to: CO1. Acquire knowledge on earth atmosphere governing by physical laws. CO2. Achieve basic inputs for the global circulation of atmosphere. CO3. Create a scope to identify new areas of research in the field of atmospheric science.

SI. No.	Course Code	Course Name	Learning Outcome
23.	EC II C	Practical-50 Marks Dissertation-50 Marks	-
24.	EC I D	Biophysics	At the end of this course, students will be able to CO1. Basic knowledge of Biomolecular of chemistry and functions. CO2. Understand the basic idea about the Structure and Function of Nucleic Acids. CO3. Impart the knowledge about the Function of Carbohydrates and Proteins. CO4. Understand the applications of Biomolecules.
25.	EC II D	Practical-50 Marks Dissertation-50 Marks	-
26.	EC I E	Lasers and Photonics	At the end of this course, Students will have understanding of: CO1. Knowledge of fundamental physics of photonics is developed to a high level. CO2. The course prepares students to be able to use sophisticated instrumentation intelligently, with a good understanding of its capabilities and limitations.
27.	EC II E	Practical-50 Marks Dissertation-50 Marks	-
28.	EC I F	Measurement and Instrumentation	At the end of the course: CO1. The student should have had knowledge on 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.
29.	EC II F	Practical-50 Marks Dissertation-50 Marks	-
30.	EC I G	Computational Methods	At the end of this course, students will be able to: CO1. Understand the basic idea about finding solutions using computational methods basics.

SI. No.	Course Code	Course Name	Learning Outcome
			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.
31.	**EC II G**	**Practical-50 Marks Dissertation-50 Marks**	-
32.	**EC I H**	**Nano Science**	At the end of this course, Students will have understanding of: CO1. Basic knowledge of Nanoscience and nanotechnology. CO2. Under the basic idea about the nano structure. CO3. Impart the knowledge about the properties and characteristics techniques of nano materials CO4. Understand the applications of nanomaterials.
33.	**EC II H**	**Practical-50 Marks Dissertation-50 Marks**	-
34.	**EC I I**	**Plasma Physics**	Students will have understanding of: CO1. Theoretical method to study the charge particle motion. CO2. Process to generate plasma in the laboratory. CO3. Mechanism plasma production is helpful to make fusion reactors.
35.	**EC II I**	**Practical-50 Marks Dissertation-50 Marks**	-

SI. No.	Course Code	Course Name	Learning Outcome
36.	EC I J	Crystal Physics and X — Ray Crystallography	Student would have understood: CO1. The structure of various crystals. CO2. Know the theoretical framework like symmetry and space groups. CO3. Know to characterize the crystal using X-ray difTraction experiments and CO4. Also would be able analyze the collected experimental data.
37.	EC II J	Practical-50 Marks Dissertation-50 Marks	-
38.	EC I K	Energy Science	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. 4. Contribute towards reduction of our dependence on conventional energy sources.
39.	EC II K	Practical-50 Marks Dissertation-50 Marks	-
40.	EC I L	Environmental Physics	The 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.

SI. No.	Course Code	Course Name	Learning Outcome
41.	EC ll L	Practical-50 Marks Dissertation-50 Marks	-
42.	GE	Generic Electives: Human Rights	CO1. Students will get themselves familiar with the various aspects of human rights, their importance and the contribution of various thinkers in the conceptual development of the Human Rights. CO2. Students are expected to emulate whatever they have learned in the course in their daily lives. CO3. This course of human rights is almost inevitable to appear in the question paper of any competitive exams and interviews.