***Programme outcome** (PO)1-M.Sc. Physics*

The Master of Science in Physics program provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in industry, consultancy, education, and research.

On completion of program, the post graduates will

- Apply the knowledge and skill in the design and development of Electronics circuits to fulfill the needs of Electronic Industry.
- Become professionally trained in the area of electronics, optical communication, nonlinear circuits, materials characterization and lasers.
- Pursue research related to Physics and Materials characterization.
- Demonstrate highest standards of Actuarial ethical conduct and Professional Actuarial behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning.

Programme specific outcome (PSO)1 :M.Sc.Physics -I

- Understanding the basic concepts of physics particularly concepts in classical mechanics, quantum mechanics, electrodynamics and electronics to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws,.
- Learn to carry out experiments in basic as well as certain advanced areas of physics such as nuclear physics, electronics and lasers.
- A research oriented learning that develops analytical and integrative problem-solving approaches.

Course specific outcome (CO):

S.No.	Subject Name	Outcome
CO1.	Mathematical methods of Physics-I	• Knowledge about Vector calculus, Bessel Functions, Legendre Differential equations, complex variable, Laplace transforms, Fourier Series etc and their physical significance is learnt by students. These mathematical concepts are widely used in various physics derivations.
CO2.	Classical mechanics	This paper enables the students to understand : • The Lagrangian and Hamiltonian approaches in classical mechanics. • The classical background of Quantum mechanics and get familiarized with Poisson brackets and Hamilton -Jacobi equation.
CO3.	Classical Electrodynamics	After successful completion of the course, the student is expected to : • have gained a clear understanding of Maxwell's equations. • have grasped the idea of electrostatics and Magnetostatics along with time varying fields

CO4.	Quantum Mechanics	After successful completion of this paper, the student will be well-versed in • Linear vector spaces, Hilbert space, concepts of basis and operators and bra and ket notation. • Both Schrödinger and Heisenberg formulations and their applications. • Theory of angular momentum and spin matrices, orbital angular momentum and Clebsh Gordan Coefficients. • Space-time symmetries and conservation laws, theory of identical particles, Oscillators
CO5.	Electronics-I	On completion of this course the student will learn about : • Field effect transistors, Bipolar junction transistors, amplifiers, Oscillators and their applications. • Digital electronics basics using logic gates and working of major digital devices like flip flops, multivibrators etc.

CO6.	Microwave and its propagation	Students will come to know about: • Microwave linear beam tubes, microwave crossed beam tubes • Microwave transistor and tunnel diodes, Microwave FET, Charged coupled devices • Transmission lines and microwave measurements
CO7.	Laboratory Practice: (i) Electronics Lab (ii) Optics Lab (iii) Laboratory Seminar	Students will have hand on experience of : • Amplifiers, diodes, various logic gates, flip-flops and multivibrator. • Solar cell, Michelson interferometer, photovoltaic cell, lasers and various optoelectronic devices • Seminars of students will be conducted on recent topics related to Physics
CO8.	Mathematical methods of Physics-II	Students will come to know about: • Hermite & Laguerre Polynomials,Tensors, Partial Differential equations and Group Theory. • The Physical Significance of each method is taught to have knowledge about their applications

CO9	Advanced Classical mechanics	This paper enables the students to understand : • Two body central force problem • Special theory of relativity • Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion. • Theory of small oscillations in detail along with basis of Free vibrations. • Theory of rigid body kinematics and dynamics.
CO10.	Advanced Classical Electrodynamics	After successful completion of the course, the student is expected to : • have gained a clear understanding of Maxwell's equations. • 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. • Boundary value problems in electrostatics
CO11.	Advanced Quantum Mechanics	After successful completion of this paper, the student will be well-versed in • Time Dependent and independent Perturbation Theory, Variational Method, WKB Method, Collision Theory and Relativistic Quantum Mechanics.

CO12.	Electronics-II	On completion of this course the student will learn about : • Operational amplifiers, comparator and applications, Voltage regulators and features of Timer 555. • Transistor Biasing Circuits • Modulation and communications • Comparator and applications
CO13.	Physics of Electronic Devices and Fabrication of Integrated Circuits and Systems	On completion of this course the student will learn about : • Microwave devices,photonic devices and all othe electronic devices. • Fabrication of integrated devices
CO14.	Laboratory Practice: (iv) Electronics Lab (v) Optics Lab (vi) Laboratory Seminar	Students will have hand on experience of : • Amplifiers, diodes, various logic gates, flip-flops and multivibrator. • Solar cell, Michelson interferometer, photovoltaic cell, lasers and various optoelectronic devices • Seminars of students will be conducted on recent topics related to Physics

Programme specific outcome (PSO) 2 - (M.Sc. Physics II)

The M.Sc.-II (Physics) Program includes various core courses such as condensed matter physics, statistical mechanics, nuclear and particle physics, spectroscopy and microprocessors. The choice of advanced elective courses offers a glimpse in the frontier areas of research and allows students to work on research projects. The program also provide adequate exposure to the students for pursuing higher education in the field of technology (M. Tech.), Physics (M.Phil./Ph.D.) and other job opportunities in academia and industry. The diverse lab experiments allow students to understand the fundamental aspects of the subject.

Course specific outcome (CO):

S.No.	Subject Name	Outcome
CO1.	Condensed matter Physics I	Students will know about: • Introducing basic concepts via diffraction methods, lattice vibrations and free electrons, Hall effect. • Understanding the basic transport properties of metals and semiconductors. • Their introduction to the band structures for studying different materials
CO2.	Nuclear Physics	On completion of this course the student will learn about : • have a basic knowledge of nuclear size ,shape , binding energy.etc and also

		the characteristics of nuclear force in detail. • be able to gain knowledge about various nuclear models and potentials associated. • Grasp knowledge about Nuclear reactions, Fission and Fusion and their characteristics.
CO3.	Statistical Mechanics and Thermodynamics	The students should be able to : • Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics. • Apply the principles of statistical mechanics to selected problems. • Grasp the basis of ensemble approach in statistical mechanics to a range of situations. • To learn the fundamental differences between classical and quantum statistics and learn about quantum statistical distribution laws. Study important examples of

		ideal Bose systems and Fermi systems
CO4.	Computational Physics-I Computational Physics-I Practical	The students will have detailed theoretical and practical understanding of C++
CO5.	Laser Physics	The students will learn about • Introductory concepts of lasers and interaction of radiation with matter, • Various types of lasers and laser spectroscopy.
CO6.	Material Science	The student will get familiar with • Crystal imperfections • Diffusion in solids and mechanical properties • Phase transformations and heat treatment
CO7.	Laboratory Practice: 1. Nuclear Physics & Counter Electronics Laboratory 2. Condensed Matter Physics and Advanced Electronics Laboratory 3. Seminar	Students will have hand on experience of : • GM-counter, Scintillation detector. • Hall coefficient, Curie temperature, B-H curve. • Digital electronics experiments. • Seminars related to recent Physics concepts
CO8.	Condensed matter Physics II	• Students will know about: • Introducing the behavior of ferroelectric and

		ferromagnetic material in terms of their properties and applications. • Superconductivity and lattice defects
CO9.	Nuclear and Particle Physics	On completion of this course the student will learn about : • acquire knowledge about nuclear decay processes and their outcomes. Have a wide understanding regarding alpha, beta and gamma decay. • understand the basic forces in nature and classification of particles and study in detail conservations laws and quark models in detail
CO10.	Atomic and Molecular Physics	After successful completion of the course, the student is expected to : • 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. • Have gained ability to apply the techniques of microwave and infrared spectroscopy to elucidate the structure of molecules.

		• Be able to apply the principle of Raman spectroscopy and its applications in the different field of science & Technology. • To become familiar with different resonance spectroscopic techniques and its applications. • to find solutions to problems related different spectroscopic systems.
CO11.	Computational Physics-II Computational Physics-II Practical	The student will learn about • classes and optics, objects, constructors, pointers • iterative methods and numerical differentiation and integration • Programs related to concepts learned in theory
CO12.	Experimental techniques in Nuclear Physics	After successful completion of the course, the student is expected to : • Have gained a clear understanding of data interpretation and analysis. • Interaction of radiation and its detection • Different types of detectors and scintillators

CO13.	Experimental techniques in Physics	After successful completion of the course, the student is expected to : • Have gained a clear understanding of different vacuum pumps and the production and maintenance of vacuum systems and its uses and needs in Physics . • Understands in depth about thin film preparation and production controlling techniques and the application of thin films in the field of science & Technology. • Have grasped the idea of Cryogenics technology and its applications . • understand about different material analysis techniques and applications.
CO14.	Laboratory Practice: 1. Nuclear Physics & Counter Electronics Laboratory 2. Condensed Matter Physics and Advanced Electronics Laboratory	Students will have hand on experience of : • GM-counter, Scintillation detector. • Hall coefficient, Curie temperature, B-H curve. • Digital electronics experiments. • Seminars related to recent Physics

	3. Seminar	concepts
CO15.	Project Work	This work would be offered to top five students of M.Sc. –I Physics and students will get a flavor of research after doing the project. The students doing project work will get the exemption from laboratory work and one theory paper of Computational Physics -II

Programme outcome (PO) 2 : *B.Sc. (Honours) Physics*

Upon completion of the B.Sc. (Hons.) Physics programme students will be able to:

- Create a hypothesis and appreciate how it relates to broader theories.
- Evaluate hypothesis, theories, methods and evidence within their proper contexts.
- Solve complex problems by critical understanding, analysis and synthesis.
- Demonstrate engagement with current research and developments in the subject.
- Critically interpret data, write reports and apply the basics of rules of evidence.
- Select, interpret and critically evaluate information from a range of sources that include books, scientific reports, journals, case studies and the internet.
- Develop proficiency in the analysis of complex physical problems and the use of mathematical or other appropriate techniques to solve them.
- Demonstrate skills in the use of computers for control, data acquisition and data analysis in experimental investigations.
- Provide a systemic understanding of core physical concepts, principles and theories along with their applications.
- Function on multidisciplinary teams by working cooperatively, creatively and responsibly as a member of a team.
- Communicate effectively by oral, written, computing and graphical means.
- Recognize the need to engage in lifelong learning through continuing education and research.
- Inculcate skill component related to practical Physics in the mind of students.

Programme specific outcome (PSO) 1 (B.Sc. (Honours)Physics -I)

On completion of the Programme student will be able to:

- Articulate in-depth understanding of core knowledge on various subjects of Physics, especially in the area of mechanics and mathematical ideas of Physics.
- Demonstrate skills and competencies to conduct scientific experiments.
- Identify their area of interest.
- Relate their knowledge and skills in carrying out independent work in the laboratories.
- Discuss, debate and communicate in a clear and logical ways to understand the basic concepts of Physics.

Course specific outcome (CO):

S.No.	Subject Name	Outcome
CO1.	Mechanics	On successful completion of the course students would have : • grasped the knowledge of the fundamentals of different types of frames of references and transformation laws. (Both Galilean and Lorentz). • learned conservation laws of energy and linear and angular momentum and apply them to solve problems. • learned the basics of potentials and fields, central forces and Kepler's laws • learned fundamental ideas of special theory of relativity such as length contraction and time dilation and

		mass –energy invariance.
CO2.	Mechanics lab	Students will have the working experience of : • Pendulums, sextant, Vanier caliper, screw gauge, traveling microscope, Maxwell needle, flywheel, Searle method
CO3.	Mathematical Physics-I	On successful completion of the course students would have grasped the knowledge of vector calculus, integration, probability, coordinate systems.
CO4.	Mathematical Physics-I lab	Students will have hand on experience of : • scientific computing, error analysis, C and C++ programming.
CO5.	(i) Atomic Structure , Bonding, general Organic chemistry, Aliphatic Hydrocarbons (ii) Computer Fundamentals	It is a Generic Elective subject where the student have the choice to choose between Chemistry and Computers. This will help the students to have basic knowledge of Chemistry/Computers which will be helpful in understanding Physics concepts in a better way.
CO6.	(i) Atomic Structure , Bonding, general Organic chemistry, Aliphatic Hydrocarbons Lab	This is the practical approach to understand the theoretical concepts of Generic Elective subjects

	(ii) Software Lab-I	
CO7.	English Communication Skills	To have basic and compulsory knowledge about English Language
CO8.	Punjabi Compulsory / Mudla Gyan	This will help the students to remain in touch with mother tongue.
CO9	Electricity and magnetism	After successful completion of the course, the student is expected to : • have gained elaborated knowledge about the electrostatics and laws governing the charge distribution. • have gained ability to apply Laplace equation for calculating potentials. • study in depth about Polarization, bound charges and boundary conditions. • realize the importance of application of Biot Savarts Law and Amperes law. • understand the relevance of different magnetization and the boundary condition of magnetic field.
CO10.	Electricity and Magnetism Lab	Students will have hand on experience of: • multimeter, ballistic galvanometer, LCR circuits, Potentiometer,Anderson's Bridge
CO11	Waves and Optics	On successful completion of the course students will be

		able to: • understand the basics of the methods to solve problems of geometrical optics. • use the principles of wave motion and superposition to explain the physics of polarisation, interference and diffraction. • Solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.
CO12	Wave and Optics Lab	Students will have hand on experience of: • Coupled oscillators, lissajous figures, Cauchy constant, Michelson's interferometer, Fresnel Biprism, Diffraction grating and Newton rings.
CO13.	(i) Chemical Energetics, equilibria and Functional Organic Chemistry-I (ii) Database management System	It is a Generic Elective subject where the student have the choice to choose between Chemistry and Computers. This will help the students to have basic knowledge of Chemistry/Computers which will be helpful in understanding Physics concepts in a better way.
CO14.	(i) Chemical Energetics, equilibria and Functional Organic Chemistry-I	This is the practical approach to understand the theoretical concepts of Generic Elective

	Lab (ii) Software Lab-II (Based on Database management System)	subjects
CO15.	English Communication Skills	To have basic and compulsory knowledge about English Language
CO16.	Punjabi Compulsory / Mudla Gyan	This will help the students to remain in touch with mother tongue.
CO17.	Drug Abuse: Problem, Management and Prevention	It is a qualifying Paper giving basic life knowledge to students about main youth problem of drug abuse.

Programme specific outcome (PSO)-2: B.Sc.(Honours)Physics-II

The B.Sc.(Honours) Physics -II Program includes core courses based on Electronics, Thermal and Mathematical Physics. It has two skill development courses so as create skill component in the learning of students. The programme aims to develop the following abilities:

- Read, understand and interpret physical information – verbal, mathematical and graphical.
- The foundation for the higher education such as M.Sc. in sciences is developed, as thermal physics along with digital systems are the foremost important subjects of pure and applied sciences.
- Perform experiments and interpret the results of observation, which includes making an assessment of experimental uncertainties.

Course specific outcome (CO):

S.No.	Subject Name	Outcome
CO1.	Mathematical Physics-II	On successful completion of the course students would have grasped the knowledge of Fourier series, frobenius methods, special Integrals, Errors, and partial Differential Equations which are an important part for higher studies and NET Examination

CO2.	Mathematical Physics-II Lab	Students will have hand on experience of : • Numerical Computation Software Scilab. • Various Mathematical related Problems used in Physics will be done with this software.
CO3.	Thermal Physics	After successful completion of the course, the student is expected to : • become familiar with various thermodynamic process and work done in each of these processes. • have a clear understanding about reversible and irreversible process and also working of a Carnot engine, and knowledge of calculating change in entropy for various process. • realize the importance of thermo dynamical functions and applications of Maxwell's relations.
CO4.	Thermal physics lab	Students will have the experience on working with: • Searle's method, thermocouple, C-B constants, Stefan's constant, Planck constant.

CO5.	Analog systems and applications	After successful completion of the course, the student is expected to : • become familiar with various Semiconductor Diodes, two terminal devices • have indepth knowledge about bipolar junction transistors and its applications • have knowledge about amplifiers and its applications
CO6.	Analog systems and applications Lab	Students will have the experience on working with: • ExpEYES-17 Kits, which are automatic kits working on computers and used to do Electronics related experiments.
CO7.	(i) Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional group organic chemistry-II (ii) Programming using C	It is a Generic Elective subject where the students have the choice to choose between Chemistry and Computers. This will help the students to have basic knowledge of Chemistry/Computers which will be helpful in understanding Physics concepts in a better way.
CO8.	(i) Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional group organic chemistry-II Lab (ii) Software Lab -III	This is the practical approach to understand the theoretical concepts of Generic Elective subjects

CO9.	Computational Physics Skills	Students will have the complete experience on working with: • Computational FORTRAN language having wide use in Research.
CO10.	Environmental and Road Safety Awareness	The field of environmental science can be divided into three main goals, which are to learn • how the natural world works, • to understand how we as humans interact with the environment, • and also to determine how we affect the environment. Road safety education is the program of educational activities around road safety that is provided to children and young people .
CO11.	Mathematical Physics III	On successful completion of the course students would have grasped the knowledge of Complex Analysis, Integral Transforms, Laplace Transform which are important topics in NET Examinations.
CO12	Mathematical Physics III-Lab	Students will have hand on experience of : • Numerical Computation Software Scilab. Various Mathematical related Problems used in Physics will be done with this software
CO13.	Elements of Modern Physics	After successful completion of the course, the student is expected to • have a basic knowledge of Quantum Physics • Different types of Lasers.

CO14.	Elements of Modern Physics Lab	Students will have hand on experience of : • Practicals related to theoretical concepts of quantum Physics so that one to one understanding of theory can be there.
CO15.	Digital systems and applications	After successful completion of the course, the student is expected to • have a basic knowledge of CRO. • acquire knowledge about integrated and digital circuits. • know about various methods of Boolean algebra and Intel 8085 Microprocessor Architecture.
CO16.	Digital systems and applications lab	Students will have hand on experience of : • Logic gates, FET, BJT pn junction diode, transistor. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder. • 8085 Microprocessor.
CO17.	(i) Chemistry of S- and P block elements, states of matter and chemical kinematics (ii) Computer Networks and Internet Technologies	It is a Generic Elective subject where the students have the choice to choose between Chemistry and Computers. This will help the students to have basic knowledge of Chemistry/Computers which will be helpful in understanding Physics concepts in a better way.
CO18.	(i) Chemistry of S- and P block elements, states of matter and	This is the practical approach to understand the theoretical concepts of Generic Elective

	chemical kinematics Lab (ii) Software Lab-IV	subjects
CO19.	Basic Instrumentation Skills	This is a skill based subject where students will have theoretical and practical knowledge about various electronic components.

➢ ***Programme specific outcome (PSO)-3: B.Sc.(Honours)Physics-III***

- At the completion of B. Sc (Honours) Physics students are able to:
- Demonstrate a rigorous understanding of the core theories & principles of physics, which includes Nuclear and Particle Physics, Solid state physics, Experimental Techniques, Statistical Mechanics, Microcontrollers, Classical and Quantum Mechanics.
- Learn the Concepts as Quantum Mechanics, Relativity, introduced at degree level in order to understand nature at atomic levels.
- Provide knowledge about material properties and its application for developing technology to ease the problems related to the society.
- Understand the set of physical laws, describing the motion of bodies, under the influence of system of forces.
- Understand the relationship between particles & atom, as well as their creation & decay. Relate the structure of atoms & subatomic particles Understand physical properties of molecule the chemical bonds between atom as well as molecular dynamics.
- Analyze the applications of mathematics to the problems in physics & develop suitable mathematical method for such application & for formulation of physical theories.
- Learn the structure of solid materials & their different physical properties along with metallurgy, cryogenics, electronics, & material science.
- Understand the fundamental theory of nature at small scale & levels of atom & sub-atomic particles.

Course specific outcome (CO):

S.No.	Subject Name	outcome
CO1.	Quantum Mechanics and Applications	After successful completion of the course, the student is expected to : • become familiar with Photoelectric effect and Compton Effect and hence be aware how quantum theory emerged • have gained a clear knowledge about wave properties of particles, De Broglie waves and its implications on the uncertainty principle. • study the Bohr Atom model in detail and understand about atomic excitations . • have grasped the idea of Wave Mechanics and gain the concept of eigen values, eigen functions and learn the basic postulates of quantum mechanics . • have detailed study about atoms with one valance electron and many electrons
CO2.	Solid state Physics	After successful completion of the course, the student is expected to : • have a clear picture of crystal structures and a clear understanding about x-ray diffraction,

		magnetic and dielectric properties of matter • expected to gain knowledge of superconductivity, its underlying principles and its applications in modern world.
CO3.	Nuclear and particle physics	After successful completion of the course, the student is expected to • have a deep knowledge about general properties of nucleus, Radio activity decays, Nuclear Models • understand the working of nuclear detectors and counters, realize the importance of Cosmic rays and its effects on earth • become familiar with nuclear particles and different particle accelerators. Student is expected to know the working of different accelerators. • Knowledge about basic particle physics
CO4.	Experimental techniques.	After successful completion of the course, the student is expected to : • Have knowledge about measurements, signals and systems • Understand in detail about Transducers and Industrial Instrumentations.

CO5.	Physics Lab	The students will have knowledge about theoretical concepts by performing the experiments related to solid state and nuclear physics.
CO6.	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry-II	The subject is included to have knowledge about basic Chemistry concepts .
CO7.	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry-II-Lab	Practical related to theoretical concepts read in the class are demonstrated in this lab.
CO8.	Electromagnetic theory	After successful completion of the course, the student is expected to : have the knowledge of em waves, polarization, waveguides, Maxwell equations.
CO9.	Statistical mechanics	After successful completion of the course, the student is expected to : • familiarize in depth about statistical distribution and have basic Ideas about Maxwell boltzman, Bose-Einstein and Fermi Dirac Statistics and their applications.
CO10.	Embedded systems – Introduction to Microcontroller	After successful completion of the course, the students understand : 8051 microcontroller, programming of embedded systems.

CO11	Classical dynamics	After successful completion of the course, the student is expected to : know about the Lagrangian and Hamiltonian approaches in classical mechanics, Special theory of relativity, and small oscillations.
CO12	Physics lab	Students will have hand on experience of : • B-H curve, Planck constant, Curie temp. solar cell, G-M counter, Scintillation counter. • Microcontroller
CO13	Chemistry of S and P block elements, states of matter and chemical kinematics	The subject is included to have knowledge about basic Chemistry concepts .
CO14.	Chemistry of S and P block elements, states of matter and chemical kinematics-Lab	Practical related to theoretical concepts read in the class are demonstrated in this lab.

Programme outcome

B.Sc.Non medical(Physics)

At the graduation in science a student should have:

- Acquired the knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc.
- Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
- Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments.
- The skills of observations and drawing logical inferences from the scientific experiments.
- Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions.
- Been able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.
- Realized how developments in any science subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.
- Developed scientific outlook not only with respect to science subjects but also in all aspects related to life.
- Realized that knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc. can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.

Programme specific outcome (PSO)-1(B.Sc.-I)

On completion of the Programme student will be able to:

- Articulate in-depth understanding of core knowledge on various subjects of Physics, especially in the area of mechanics and electricity and magnetism.
- Demonstrate skills and competencies to conduct scientific experiments.
- Identify their area of interest.
- Relate their knowledge and skills in carrying out independent work in the laboratories.
- Discuss, debate and communicate in a clear and logical ways to understand the basic concepts of Physics.

Course specific outcome (CO):

S.No.	Subject Name	Outcome
CO1.	Mechanics	On successful completion of the course students would have : • grasped the knowledge of the fundamentals of different types of frames of references and transformation laws. (Both Galilean and Lorentz). • learned conservation laws of energy and linear and angular momentum and apply them to solve problems. • learned the basics of potentials and fields, central forces and Kepler's laws • familiarize with Lagrangian and Hamiltonian formulations of classical mechanics • learned fundamental

		ideas of special theory of relativity such as length contraction and time dilation and mass –energy invariance.
CO2.	Electricity and magnetism	After successful completion of the course, the student is expected to : • have gained elaborated knowledge about the electrostatics and laws governing the charge distribution. • have gained ability to apply Laplace equation for calculating potentials. • study in depth about Polarization, bound charges and boundary conditions. • realize the importance of application of Biot Savarts Law and Amperes law. • understand the relevance of different magnetization and the boundary condition of magnetic field.
CO3.	Physics Lab (Mechanics and Electricity Magnetism Lab)	Students will have hand on experience of : • Pendulums, sextant, Vanier calliper, screw gauge, traveling microscope, Maxwell needle, flywheel. • D-sauté bridge, multimeter, ballistic galvanometer, LCR circuits, carry foster bridge and solenoid.

Programme specific outcome (B.Sc.-II)

The B.Sc.-II programme includes two core courses of Physics such as Thermal physics (including statistical mechanics), wave and optics. The programme aims to develop the following abilities:

- Read, understand and interpret physical information – verbal, mathematical and graphical.
- The foundation for the higher education such as M.Sc. in sciences is developed, as thermal and statistical physics alongwith wave and optics are the foremost important subjects of pure sciences.
- Perform experiments and interpret the results of observation, which includes making an assessment of experimental uncertainties.

Course specific outcome:

S.No.	Subject Name	Outcome
CO1.	Thermal Physics and Statistical mechanics	After successful completion of the course, the student is expected to : • become familiar with various thermodynamic process and work done in each of these processes. • have a clear understanding about reversible and irreversible process and also working of a Carnot engine, and knowledge of calculating change in entropy for

		various process. • realize the importance of Thermo dynamical functions and applications of Maxwell's relations. • familiarize in depth about statistical distribution and have basic ideas of Maxwell boltzman, Bose-Einstein and Fermi Dirac Statistics and their applications.
CO2.	Waves and Optics	On successful completion of the course students will be able to: • understand the basics of the methods to solve problems of geometrical optics. • use the principles of wave motion and superposition to explain the physics of polarisation, interference and diffraction. • understand the basics of modern optics like Fiber optics and holography. • Solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

CO3.	Physics Lab (Thermal Physics and Wave Optics Lab)	Students will have hand on experience of : • Searle's method, thermocouple, C-B constants, Stefan's constant, Planck constant • Coupled oscillators, lissajous figures, Cauchy constant, flow method, and Newton rings.
CO4.	Environmental and road safety awareness	The field of environmental science can be divided into three main goals, which are to learn • how the natural world works, • to understand how we as humans interact with the environment, • and also to determine how we affect the environment. • Road safety education is the program of educational activities around road safety that is provided to children and young people .

Programme specific outcome (B.Sc.-III)

At the completion of B. Sc. in Physics students are able to:

- demonstrate a rigorous understanding of the core theories & principles of physics, which includes solid state physics, digital and analog circuits, & quantum mechanics. alongwith nuclear physics.
- Learn the Concepts as Quantum Mechanics, Relativity, introduced at degree level in order to understand nature at atomic levels. Provide knowledge about material

properties and its application for developing technology to ease the problems related to the society.

- Understand the relationship between particles & atom, as well as their creation & decay. Relate the structure of atoms & subatomic particles.
- Understand the fundamental theory of nature at small scale & levels of atom & sub-atomic particles.
- Learn to carry out experiments in basic as well as certain advanced areas of physics.

Course specific outcome:

S.No.	Subject Name	Outcome
CO1.	Solid state Physics and Quantum mechanics	After successful completion of the course, the student is expected to : • have a clear picture of crystal structures and a clear understanding about x-ray diffraction • expected to gain knowledge of superconductivity, its underlying principles and its applications in modern world. • become familiar with Blackbody radiation, Ultraviolet catastrophe, Photoelectric effect and Compton Effect. • Have gained a clear knowledge about wave properties of particles, De Broglie

		waves and its implications on the uncertainty principle. • study the Bohr Atom model in detail and understand about atomic excitations . • have grasped the idea of Wave Mechanics and gain the concept of eigen values, eigen functions and learn the basic postulates of quantum mechanics . • find solution to Schrödinger's equation for many systems such as particle in a box, Hydrogen Atom and familiarize with different quantum numbers.
CO2.	Digital and analog circuits and instrumentations, and Nuclear and Particle physics.	After successful completion of the course, the student is expected to • have a basic knowledge of semiconductor physics. • acquire knowledge about semiconductor diodes and rectifiers. • learn how to construct a transistor amplifier and how its gain varies with frequency. • know about various number systems and their applications , flip flops and counters.

		• gain a clear picture of nuclear composition and various nuclear models. • have a deep knowledge about radio activity, nuclear fission and nuclear fusion, the relevance of nuclear transformations. • understand the working of nuclear detectors and counters, realize the importance of Cosmic rays and its effects on earth • become familiar with nuclear particles and different particle accelerators. • have Peripheral ideas about astronomy and astrophysics.
CO3.	Physics Lab (Solid state and Quantum mechanics Lab)	Students will have hand on experience of : • Solenoid working, B-H curve , hall coefficient, and curie temperature. • Frank hertz, Zeeman effect (Quantum mechanics).
CO4.	Physics Lab (Digital and analog circuits and instrumentations, and Nuclear physics lab)	Students will learn the working of : • Logic gates, FET, BJT pn junction diode, and transistors. • GM Scintillation counters (Nuclear physics).