M.SC.PHYSICS Programme Outcomes(POs)

РО	Upon completion of M.Sc Degree Programme, the graduates will be able to :
PO - 1	Recognize the scientific facts behind natural phenomena.
PO - 2	Relate the theory and practical knowledge to solve the problems of the society.
PO - 3	Prepare successful professionals in industry, government, academia, research,
10-5	entrepreneurial pursuits and consulting firms.
PO - 4	Face and succeed in high level competitive examinations like NET, GATE and
10-4	TOFEL.
PO = 5	Carry out internship programme and research projects to develop scientific skills
10-5	and innovative ideas.
PO - 6	Utilize the obtained scientific knowledge to create eco-friendly environment.
PO - 7	Prepare expressive, ethical and responsible citizens with proven expertise.

Programme Specific Outcomes (PSOs)

PSO	Upon completion of M.Sc. Degree Programme, the graduates of Physics will be able to :
PSO - 1	Have well-defined knowledge on theoretical concepts and experimental methods of advanced physics. (Classical mechanics, Mathematical physics, Quantum Mechanics, Solid state Physics, Molecular Spectroscopy, Integrated electronics, Astrophysics, Nanophysics, Microprocessor etc.)
PSO - 2	Acquire skills in performing advanced physics experiments and projects using modern technology and numerical simulations.
PSO - 3	Develop and communicate analytical skills ranging from nuclear to cosmology to progress in the expanding frontiers of physics.
PSO - 4	Apply and interpret physics principles in various physical observations.
PSO - 5	Use the techniques, skills, and modern technology necessary to communicate effectively with professional and ethical responsibility.
PSO - 6	Demonstrate proficiency in analyzing, applying and solving scientific problems.
PSO - 7	Understand the impact of Physics in a global, economic, environmental, and societal context.

Semester I

Course Name: Classical Mechanics

Course code: PP2011

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic mechanical concepts related to single and system of particles.	PSO - 1	U
CO - 2	apply various mechanical principles to find solution for physical problems.	PSO - 4	Ap
CO - 3	solve the equations of motion using Lagrangian, Hamilton and Hamilton-Jacobi equations.	PSO - 6	С
CO - 4	explain the origin of coriolis and centrifugal terms in the equation of motion in a rotating frame.	PSO - 1	R
CO - 5	understand and develop a scientific knowledge in central force problems and relativity	PSO - 7	U

Semester I

Course Name: Mathematical Physics

Course code: PP2012

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	apply the various theorems in complex analysis to evaluate definite integrals.	PSO - 4	Е
CO - 2	determine the series solutions and the recurrence relations (Bessel, Legendre and Hermite differential equations) and solve problems associated with them.	PSO - 3	Е
CO - 3	discuss the basic principles and methods used for the analysis of partial differential equations and apply the techniques to related problems.	PSO - 4	С
CO - 4	discuss the concepts of Fourier, Laplace and inverse Laplace transform, tensors, group theory and their properties.	PSO - 5	С
CO - 5	develop expertise in mathematical techniques required in physics and to enhance problem solving skills.	PSO - 6	An

Core – II

Core – I

Semester I

Course Name: Quantum Mechanics-I

Core – III

Course code: PP2013

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	summarize the concept of wave function and the postulates of quantum mechanics.	PSO - 1	U
CO - 2	formulate time dependent and timeindependent equation and solve them for simplepotentials.	PSO - 4	С
CO - 3	evaluate the eigen values and eigen function spin and total angular momenta and determine the matrices.	PSO - 4	Е
CO - 4	analyze the principles of quantum theory, equation of motion, scattering theory and angular momentum.	PSO - 4	An

Semester I

Course Name: Advanced Nuclear Physics Course code: PP2014

Elective – I

СО	Upon completion of the course, students will be able to:	PSO addressed	CL
CO-1	Understand the basic knowledge on nuclei and neutron to know other factors like properties and scattering	PSO - 1	U
CO-2	Examine the neutron interactions to formulate probability, Diffusion, Fermi-age equations	PSO - 4	Е
CO-3	Analyse the working of nuclear reactors and its reaction to produce nuclear energy	PSO - 4	An
CO-4	Study the nuclear fusion reaction and apply its principle for stellar energy	PSO - 6	Ар

Semester I

Course Name: Molecular Physics Course code: PP2015

Elective – Ib

Upon completion of the course, students will be PSO CO CL able to: addressed understand the chemical bonding of molecules and **PSO - 1** U CO1 various theories of homo and hetero nuclear diatomic molecules CO2 analyze the symmetry operations and molecular **PSO - 4** An orbital theory analyse the electronic properties of molecules, **PSO - 4** CO3 An Newtonian and Hamiltonian dynamics and Phase space trajectories Understand the molecular collisions and different CO4 PSO - 1 U energies caused by reactive collisions Evaluate the transport of electron and the formation of CO5 **PSO - 4** Ε electronic bands and spectra.

Semester I

Course Name: Numerical Methods

Elective – Ic

СО	Upon completion of this course the students will be able to :	PSO addressed	CL
CO-1	understand the various interpolation methods and finite difference concepts	PSO - 1	U
CO- 2	analyze the numerical solutions of linear and non linear equations	PSO - 4	An
CO- 3	utilize various numerical methods for differentiation and integration	PSO - 4	Ар
CO -4	discuss the concepts of ordinary differential equations	PSO - 5	С

Semester II

Course Name: Electromagnetic Theory

Course code: PP2021

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	outline the fundamental laws of electrodynamics based on Maxwell's equations.	PSO - 1	U
CO - 2	define and derive expressions for the energy of electrostatic and magnetostatic fields.	PSO - 2	R
CO - 3	explain the Poyntings theorem based on Maxwells equations and interpret the terms in the theorem physically.	PSO - 5	Е
CO - 4	solve potential problems and applications of electromagnetic waves	PSO - 6	C
CO - 5	determine the electrical properties of materials and solve the solutions of the wave equation as plane waves in source.	PSO - 5	E, C
CO - 6	analyze the wave polarization, and reflection/transmission of plane waves in homogenous Media.	PSO - 4	An

Semester II

Course Name: Quantum Mechanics -II

Core –V

Course code: PP2022

СО	Upon completion of this course, students will be able to:	PSO	CL
		addres sed	
CO - 1	enumerate time independent perturbation theory and use approximation methods. (variation principle and WKB method) to solve simple problems (ground state helium, barrier penetration, etc)	PSO-1	K
CO - 2	analyze time dependent perturbation theory to discuss absorption and emission of radiation for harmonic perturbation.	PSO-6	An
CO - 3	interpret quantum theory of atomic and molecular structure.	PSO-4	U
CO -4	formulate Klein-Gordan and Dirac equations and discuss the applications. (particle in a Coulomb field, Spin of electron)	PSO-1	С

Core – IV

Semester II

Course Name: Condensed Matter Physics-I

Core –VI

Course code: PP2023

СО	Upon completion of this course the students will be able to :	PSO addressed	CL
CO-1	differentiate between different lattice types and explain the concepts of reciprocal lattice and crystal diffraction	PSO-4	U
CO- 2	analyze various crystal imperfections and ordered phases of crystal	PSO-2	An
CO- 3	explain the theory of lattice vibrations and analyze the thermal properties of solids	PSO-2	An
CO -4	formulate the problem of electrons in a periodic potential	PSO-1	Ap

Semester II

Course Name: Experimental Design

Elective –II (a)

СО	Upon completion of the course, students will be able to:	PSO addressed	CL
CO-1	Understand the principle and working of transducers	PSO-4	U
CO-2	Examine the measurement systems and errors in it	PSO - 5	Е
CO-3	Analyse the X ray measurements and to find TEM, SEM, EDS, FESEM, AFM, UV Vis, IR, FTIR characterizations	PSO-2	An
CO-5	Get an introduction and idea on optical fibres	PSO-4	U

Semester II

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Course Name: Introductory Astronomy, Astrophysics & Cosmology (Elective – II (b))

Course code: PP2025

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	perceive the historical evolution of solar system and universe.	PSO - 3	E
CO - 2	describe the principles of physics in the formation of astronomical objects like planets-satellites – asteroids and comets.	PSO - 1	U
CO - 3	gain experience with measurement techniques and equipment and develop the ability to assess uncertainties and assumptions.	PSO - 2	An
CO - 4	develop analytical skills and the ability to understand the astronomical situation.	PSO - 7	U
CO - 5	analyse the formation of binary stars, multiple stars, neutron stars and black holes.	PSO - 4	An
CO - 6	interpret the observations of galaxies, dark matter, quasars and pulsars.	PSO - 5	Е
CO - 7	achieve a good understanding of physical laws and principles.	PSO - 6	С

Semester II

Course Name: LASER PHYSICS

Elective –II (c)

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	develop knowledge in the basics of lasers.	PSO - 4	U
CO - 2	enhance comprehension in the principles of lasers.	PSO - 1	Ap
CO - 3	explore the control of laser properties	PSO - 2	Ар
CO - 4	familiarize with the diverse applications of lasers.	PSO - 4	Е

Semester I &II Course Name : Advanced Physics Lab –I General Physics

Course Code: P20P1

СО	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	demonstrate practical skills to work with complex problems and advanced experimental equipment.	PSO - 4	U
CO - 2	develop a practical knowledge in Hall Effect and in determination of Magneto resistance	PSO - 1	Ap
CO - 3	develop practical experience in LASER experiments	PSO - 2	Ap
CO - 4	measure and compare the dielectric constant of various liquids	PSO - 4	Е
CO - 5	Apply Ultrasonic Interferometers to determine the velocity of sound	PSO - 2	Е
CO - 6	analyse the parameters of dielectric crystals experimentally.	PSO - 3	Ap

Semester: III Course Name: Electronics Course code: PP2031

Core VIII

004100			
COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO 1	Understand the basic operation, and features related to diodes, transistor, op-amps, converter and interpret their applications	PSO-1	U
CO 2	Explain about the internal circuitry and logic behind semiconductor memory devices.	PSO-2	U
CO 3	Assess the working of diodes, transistor, op-amps and converters.	PSO-3	Ε
CO 4	Design various filter circuits.	PSO-6	С
CO 5	Interpret the Internal Architecture of memory devices	PSO-4	An

Semester III

Course Name: Condensed Matter Physics - II Course code: PP2032

Core IX

Cos	Upon completion of this course, students will be able to:	PSO addressed	CL
CO – 1	Understand the theory of dielectrics and analyze the dielectric properties of materials	PSO - 1	An
CO – 2	Explain various types of magnetic phenomenon and their properties and applications	PSO - 4	E
CO – 3	Elaborate the properties and applications of superconductors.	PSO - 4	С
CO – 4	Apply the obtained concepts to challenges in condensed matter physics	PSO - 6	Ар

Semester III

Course Name: Project

Course code: PP20PR

COs	Upon completion of this course the students	PSO	CL
	will be able to:	addresse	
		d	
CO - I	explore new areas of research in physics	PSO - 5	Ap
CO - 2	analyze a research problem and construct tools for data collection.	PSO - 6	An
CO - 3	write research reports and present results in the scientific community.	PSO - 7	Ap
CO - 4	develop skills to serve in science related industries and agencies.	PSO - 5	Ар
CO - 5	develop skills to publish articles in reputed journals.	PSO - 4	An

Semester III

Course Name: Bio Physics Course Code: PP2033

Elective III (a)

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic structural unit and its different types.	PSO - 1	U
CO - 2	acquire the basic knowledge on various microscopes used to analyse the cell structure.	PSO - 2	U
CO - 3	analyse the structure of DNA, RNA and Proteins.	PSO - 1	Α
CO - 4	explain the techniques used to separate the biomolecules.	PSO - 4	Е
CO - 5	determine the interaction of molecules by using different optical and diffraction techniques.	PSO - 4	Ар

Semester III

Course Name: Microprocessor and Microcontroller

Elective III b

COs	Upon completion of this course, students will be able to	PSOs addressed	CL
CO-1	Identify/ Explain the operation of various components of the microprocessor 8085 and microprocessor 8086	PSO-1	Α
CO-2	Relate and explain the various addressing modes and the instruction set of 8085 microprocessor	PSO-1	R
CO-3	Develop skill in writing simple programs for 8085 microprocessor	PSO-2	С
CO-4	Explain the architecture of 8051 microcontroller	PSO-1	U
CO-5	Understand the various interrupts of 8085 microprocessor	PSO-2	U

Semester III Course Code: Solar Energy Utilization Course Code: PP2035

Elective III c

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic concept of heat transfer	PSO - 2	U
CO - 2	Design the solar collectors and solve the optical loss.	PSO - 6	С
CO - 3	relate the different types of solar water heaters.	PSO - 1	R
CO - 4	analyze the use of nanostructures and nanomaterials in fuel cell technology	PSO - 4	An
CO - 5	Evaluate the photo voltaic principles and compare the types of solar cells	PSO - 5	Е

Semester IV Course Name: Nuclear and Elementary Particle Physics Course Code: PP2041

Cos	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Understand the properties of Nuclear forces and outline their behavioral formulation.	PSO - 1	U
СО-2	Analyze the different nuclear models of the nucleus and examine the application of the shell model of nucleus.	PSO - 4	Е
СО-3	Explain the characteristics and effect of radioactive decay phenomena. (alpha,beta ,gamma)	PSO - 1	U
CO-4	Discuss the outcome of various types of nuclear reactions.	PSO - 4	С
CO-5	Examine the Particle Physics phenomena and their basic theoretical description.	PSO - 3	An

Semester IV

Course Name: Spectroscopy

Course Code: PP2042

Cos	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	apply basic spectroscopic techniques. (Microwave, IR, Raman and NMR)	PSO - 4	U
CO - 2	infer basic spectroscopic techniques. (Microwave, IR, Raman, ESR, NQR and NMR)	PSO - 6	Ap
CO - 3	understand the molecular interactions in different spectroscopic methods.	PSO - 1	An
CO - 4	analyze the characteristics of rotational spectra and vibrational energy of molecules.	PSO - 3	An
CO - 5	utilize various spectroscopic methods suitable for characterizing molecules.	PSO - 6	С

Semester IV

Course Name: Thermodynamics and Statistical Mechanics

Core-XII

Course Code: PP2043

Cos	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic concepts related to thermodynamics, microstates and macrostates	PSO - 4	U
CO - 2	apply principles to find relation between grand canonical and canonical partition functions	PSO - 1	Ар
CO - 3	solve the Bose-Einstein, Fermi-Dirac and Maxwell- Boltzmann distributions	PSO - 4	С
CO - 4	analyze the origin of transport and non-equilibrium processes	PSO - 3	An
CO - 5	understand the concept of heat capacities and phase transitions	PSO -4	U

Core-XI

Semester: IV

Course Name: Materials Physics and Processing Techniques Elective IV(a)

Course code : PP2044

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Remember basic principles in material physics	PSO - 1	R
CO- 2	Understand various material fabrication methods	PSO -2	U
CO -3	Analyse different characterization used for materials processing	PSO-4	An
CO- 4	Apply different methods of material processiing	PSO-5	Ар
CO- 5	Evaluate the materials and characterization tools	PSO -4	Ε

Semester IV

Course Name: Advanced Nano Physics

Elective IV (b)

COs	Upon completion of this course the students will be able to :	PSO addressed	CL
CO-1	Identify how basic physics can be used to describe the behaviour of electrons in nano-scale materials.	PSO-1	R
CO- 2	Explain the variation in the electron distribution in nanostructures for different dimensions (Quantum well, Quantum wires & quantum dots)	PSO-3	U
CO- 3	Analyze magneto electronics and applications of Nanotechnology in various fields.	PSO-6	An
CO -4	Explain Laser effect in Quantum well, Quantum wires and quantum dots .	PSO-2	U
CO- 5	Compare the structure and properties of Carbon nanostructures and their applications in the emerging nanotechnology	PSO-6	E
CO -6	Discuss the fabrication and characterization techniques of	PSO-2	U

	nanomaterials		
CO -7	Develop key concepts in Single electron transistor, Spintronics and Giant magnetoresistance	PSO-4	С

Semester IV Course Name: X-Ray Crystallography Course Code: PP2046

Elective IV (c)

Cos	Upon completion of this course students will be able to:	PSO addressed	CL
CO - 1	understand the sources and diffraction of X-rays.	PSO - 1	U
CO - 2	acquire the basic knowledge on crystal systems and various properties of crystals.	PSO - 1	U
CO - 3	explain the crystallographic data collection tools and intensity measurement method.	PSO - 2	Е
CO - 4	analyse the structure factor and intensity of diffracted peaks.	PSO - 4	Α
CO - 5	obtain the refined crystal structure by applying mathematical calculations.	PSO - 4	Ар

Semester: III & IV

Course Name: Advanced Physics Lab – III (Electronics)

Practical – III

Course Code: PP20P3

LOs	Upon completion of this course, students will be able to:	PSO addressed	CL
LO - 1	Analyse the working of code converters (BCD / Gray, excess 3)	PSO - 2	An
LO - 2	Design various synchronous and asynchronous sequential circuits and study their working	PSO - 6	Ap
LO - 3	Analyse the applications of op-amps (sine, triangular wave generator, low, high and band pass filters)	PSO - 2	An

LO - 4	Analyse the behavior of counters (up/down, mod, ring)	PSO - 2	An
LO - 5	Analyse the working of electronic circuits (multiplexer, demultiplexer, adder, subtractor)	PSO - 2	An

Semester : III & IV

Course Name: Advanced Physics Lab – IV (Microprocessor and Micro Controller) Practical IV

Course code: PP20P4

LOs	Upon completion of this course, students will be able to:	PSO	CL
		addressed	
LO – 1	Experiment with assembly language programming on 8085 microprocessor (Addition, Subtraction, Multiplication & Division)	PSO - 2	Ар
LO – 2	Apply assembly language programming on 8085 microprocessor (Data Manipulation, square of numbers, counters)	PSO - 4	Ар
LO – 3	Analyse the interfacing of microprocessor 8085 with I/O devices (A/D& D/A, Stepper motor)	PSO - 2	An
LO – 4	Apply assembly language programs for 8051 microcontroller.	PSO - 4	Ар

Semester III

Course Name: Physics for Lectureship Exam - I (CSIR/ JRF/ SLET/ GATE) Self Learning Course

Course	code:	PP20S1

Cos	Upon completion of this course, students will be able to:	PSO addressed	CL
CO – 1	familiarize with a range of mathematical methods that are essential for solving advanced problems in theoretical physics.	PSO - 1	U
CO – 2	model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations	PSO - 4	Ар
CO – 3	gain insight into the physical nature of electric and magnetic phenomena	PSO - 1	U

CO – 4	use quantum mechanical principles to analyze advanced Physical phenomena of nature	PSO - 6	Ар
CO – 5	understand the theory and methods of statistical physics and thermodynamics.	PSO - 1	U

Semester IV

Course Name: Physics for Lectureship Exam - II (CSIR/ JRF/ SLET/ GATE) Self Learning Course Course code: PP20S2

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the physical construction, working and operational characteristics of semiconductor devices	PSO-1	U
CO - 2	attain knowledge on the structure and dynamics of the molecules through various theories	PSO-3	Α
CO - 3	develop analytical thinking to understand the phenomenon that decide various properties of solids	PSO-4	С
CO - 4	Know the scientific, environmental and technological applications of nuclear physics	PSO-7	U
CO - 5	Study the fundamentals of wave mechanics	PSO-1	U