Department of Physics

M.Sc. Physics Courses offered
2017 - 2020

Semester	Subject code	Title of the paper	Hours/week	Credits
I	PP1711	Core I - Classical and Statistical Mechanics	6	4
	PP1712	Core II - Electromagnetic Theory	6	4
	PP1713	Core III - Numerical and Computational methods	6	4
	PP1714 PP1715	Elective I - (a) Experimental techniques/ (b) Photonics	6	5
	PP17P1	Practical I - Advanced Physics Lab – I (General Physics)	6	-
II	PP1721	Core IV - Condensed Matter Physics	6	4
	PP1722	Core V - Mathematical Physics	6	4
	PP1723	Core VI - Quantum Mechanics	6	4
	PP1724 PP1725	Elective II - (a) Crystal Growth Techniques and Thin film Technology (b) Communication Physics	6	5
	PP17P1	Practical I - Advanced Physics Lab - I (General Physics)	-	5
	PP17P2	Practical II - Advanced Physics Lab - II (Programming with C++)	6	5
	LST172	Life Skill Training (LST) - I	-	1
III	PP1731	Core VII - Integrated Electronics	6	4
	PP1732	Core VIII - Microprocessor and Microcontroller	6	4
	PP1733 PP1734	Elective III - (a) Physics of the Cosmos/ (b) Radiation Physics	6	5
	PP17P3	Practical III - Advanced Physics Lab – III (Electronics)	4	-
	PP17PR	Project	8	4
IV	PP1741	Core IX - Material Science	6	4
	PP1742	Core X - Nuclear and Particle Physics	6	4
	PP1743	Core XI - Molecular Spectroscopy	6	4
	PP1744 PP1745	Elective IV - (a) Nano Physics/ (b) Quantum Field Theory	6	5

	PP17P3	Practical III - Advanced Physics Lab - III (Electronics)	-	4
	PP17P4	Practical IV **-** Advanced Physics Lab - IV (Microprocessor and Micro Controller)	6	5
	LST174	Life Skill Training (LST) - II	-	1
	STP171	Summer Training Programme	-	1
		TOTAL	**120**	**90**

M.Sc. Programme Outcomes (POs)

PO	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, entrepreneurial pursuits and consulting firms.
PO - 4	Face and succeed in high level competitive examinations like NET, GATE and TOFEL.
PO - 5	Carry out internship programme and research projects to develop scientific skills 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.

M.Sc. Physics Programme Specific Outcomes (PSOs)

PSO	Upon completion of M.Sc. Degree Programme, the graduates of Physics will be able to :	PO
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.).	PO - 1
PSO - 2	Acquire skills in performing advanced physics experiments and projects using modern technology and numerical simulations.	PO - 2
PSO - 3	Develop and communicate analytical skills ranging from nuclear to cosmology to progress in the expanding frontiers of physics.	PO - 3
PSO - 4	Apply and interpret physics principles in various physical observations.	PO - 2
PSO - 5	Use the techniques, skills, and modern technology necessary to communicate effectively with professional and ethical responsibility.	PO - 5
PSO - 6	Demonstrate proficiency in analyzing, applying and solving scientific problems.	PO - 4
PSO - 7	Understand the impact of Physics in a global, economic, environmental, and societal context.	PO - 7

Course Outcome

Semester : I **Core- I**

Name of the Course : Classical and Statistical Mechanics

Course code : PP1711

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Define the basic mechanical concepts related to single and system of particles.	PSO - 2	R
CO - 2	Apply various conservation laws in solution of physical problems.	PSO - 3	Ap
CO - 3	Discuss and understand the motion of a mechanical system using Lagrange and Hamiltonian Formulation.	PSO - 7	CL
CO - 4	Explain the origin of coriolis and centrifugal terms in the equation of motion in a rotating frame.	PSO - 1	E
CO - 5	Distinguish between stable and unstable equilibrium.	PSO - 4	An
CO - 6	Develop a fundamental knowledge of classical and quantum statistical mechanics and relate the macroscopic thermodynamics and microscopic statistical mechanics using mathematical methods.	PSO - 2	Ap
CO - 7	Interpret relationship between equilibrium distributions and kinetic process leading to equilibrium.	PSO - 5	E
CO - 8	Explain different statistical ensembles, their distribution functions, ranges of applicability and corresponding thermodynamic potentials.	PSO - 1	U

Semester : I **Core- II**

Name of the Course : Electromagnetic Theory

Course code : PP1712

CO	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	E
CO - 4	Solve potential problems in simple geometries using separation of variables and the method of images for (electrostatics, Magnetostatics and stationary current distributions in linear, isotropic media).	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 : I **Core- III**

Name of the Course : Numerical and Computational methods

Course code : PP1713

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the theoretical and practical aspects of the use of numerical methods.	PSO - 3	U
CO - 2	Explain theory, algorithms, implementations and analysis of output for numerical methods.	PSO - 5	E
CO - 3	Choose appropriate numerical methods to apply for various problems in science.	PSO - 6	Ap
CO - 4	Infer numerical method for various mathematical operations and tasks. (interpolation, differentiation, integration, the solution of linear and non-linear equations and differential equations)	PSO - 1	U
CO - 5	Evaluate a function using the appropriate numerical method.	PSO - 4	E
CO - 6	Make use of numerical packages such as MATLAB.	PSO - 6	Ap

Semester : I **Elective-I (a)**

Name of the Course : Experimental Techniques

Course code : PP1714

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the different types of error and curve fitting techniques involved in physical measurement.	PSO - 4	U
CO - 2	Relate signal to noise ratio and analyse signal to noise enhancement.	PSO - 4	Ap
CO - 3	Analyse the functioning of various types of nuclear radiation measurement and thermal analysis techniques.	PSO - 1	An
CO - 4	Assess the method of measurement of mass and pressure using mass spectrometers, and gauges and vacuum production techniques.	PSO - 1	E
CO - 5	Understand the spectroscopic behaviour of molecules and working/application of different types of lasers.	PSO - 6	U
CO - 6	Analyse the behaviour of sensors and transducers.	PSO - 2	An

Semester : I **Elective-I (b)**

Name of the Course : Photonics

Course code : PP1715

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	List the optical properties of solids. (Refractive index, dielectric constant, transparency, reflectance, luminescence).	PSO - 1	R
CO - 2	Explain the theories of different optical properties.	PSO - 1	U
CO - 3	Classify different methods of interaction of light and enumerate the various characteristics.	PSO - 3	An
CO - 4	Compare different types of laser and their application.	PSO - 4	E
CO - 5	Apply new developments in laser technology.	PSO - 4	Ap

Semester : II **Core-IV**

Name of the Course : Condensed Matter Physics

Course code : PP1721

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the importance of Solid State materials and classify them based on basic concepts. (atomic arrangement, microstructure and crystal binding)	PSO - 1	U
CO - 2	Explain the theory of lattice vibrations and thermal properties of solids.	PSO - 1	E
CO - 3	Formulate the problem of electrons in a periodic potential.	PSO - 4	C
CO - 4	Understand the physical characteristics of solids in terms of their band-structure.	PSO - 4	U
CO - 5	Discuss the physical principles of different types of electric and magnetic phenomena in solid materials and relate this to macroscopically measured physical quantities.	PSO - 6	C
CO - 6	Elaborate the properties and applications of superconductors.	PSO - 6	C

Semester : II **Core-V**

Name of the Course : Mathematical Physics

Course code : PP1722

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Explain cauchy's theorem and its consequences including cauchy's integral formula.	PSO - 1	U
CO - 2	Evaluate residues and apply the residue theorem to evaluate integrals.	PSO - 2	E
CO - 3	Determine the series solutions and the recurrence relations (Bessel, Legendre and Hermite differential equations) and solve problems associated with them.	PSO - 2	E
CO - 4	Discuss the basic principles and methods used for the analysis of partial differential equations and apply the techniques to related problems.	PSO - 4	C
CO - 5	Apply Greens function to solve problems.	PSO - 4	A

CO - 6	Discuss the concepts of various tensors and their applications.	PSO - 1	C
CO - 7	Analyze the properties of Fourier and Laplace transform.	PSO - 2	An
CO - 8	Apply group theory to solve mathematical problems in physics.	PSO - 6	A

Semester : II **Core-VI**

Name of the Course : Quantum Mechanics

Course code : PP1723

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the concept of wave function and the postulates of quantum mechanics.	PSO - 1	U
CO - 2	Deduce time dependent and time independent equation and solve them for simple potentials.	PSO - 7	E
CO - 3	Evaluate the eigen values and eigen function spin and total angular momenta and determine the matrices.	PSO - 4	E
CO - 4	Developed time independent perturbation theory and use approximation methods. (variation principle and WKB method) to solve simple problems (ground state helium, barrier penetration, etc)	PSO - 4	C
CO - 5	Utilize time dependent perturbation theory to discuss absorption and emission of radiation for harmonic perturbation.	PSO - 2	Ap
CO - 6	Understand the concepts of scattering and derive expressions for scattering amplitude using Born approximation and partial wave analysis.	PSO - 3	U
CO - 7	Formulate Klein-Gordan and Dirac equations and discuss the applications. (particle in a Coulomb field, Spin of electron)	PSO - 8	C

Semester : II **Elective-II (a)**

Name of the Course : Crystal Growth Techniques and Thin Films Technology

Course code : PP1724

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the various theories and formulation related to crystal growth.(KSV, BCF theories)	PSO - 1	U
CO - 2	Analyse the different methods of crystal growth. (solution growth,gel growth techniques)	PSO - 4	An
CO - 3	Apply the advanced crystal growth techniques.(hydrothermal , melt growth)	PSO - 6	Ap
CO - 4	Assess the nature/characteristics and deposition technology of thin film.	PSO - 2	C
CO - 5	Explain the process of conduction in films. (continous,discontinous,semiconducting,intrinsic,extrinsic,insulator)	PSO - 1	Ap
CO - 6	Examine the various applications of thin film.	PSO - 6	An

Semester : II **Elective-II (b)**

Name of the Course : Communication Physics

Course code : PP1725

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the basic concepts of modulation techniques in analog and digital communications. (amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM)).	PSO - 1	U
CO - 2	Knowledge about the technologies used in wireless, satellite, fiber optics communication systems.	PSO - 2	Ap
CO - 3	Evaluate fundamental communication system parameters. (bandwidth, power, signal to quantization noise ration, and data rate).	PSO - 3	Ap

CO - 4	Outline the basic concepts and characters of a digital communication system.(sampling theorem, pulse code modulation (PCM) and principles of digital data transmission).	PSO - 1	C
CO - 5	Apply Physics principles in communication technology.	PSO - 7	Ap

Semester : I **Practical-I**

Name of the Course : Advanced Physics Lab –I

(General Physics)

Course code : PP17P1

CO	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	E
CO - 5	Apply Ultrasonic Interferometers to determine the velocity of sound	PSO - 2	E
CO - 6	Analyse the parameters of dielectric crystals experimentally.	PSO - 3	Ap

Semester : II **Practical-II**

Name of the Course : Advanced Physics Lab –II

(Programming with C++)

Course code : PP17P2

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the basic concept of Object Oriented Programming (OOP)	PSO - 1	U

CO - 2	Interpret the theoretical formulation for physical phenomena and apply experimental numerical simulations methods to find the solution	PSO - 2	Ap
CO - 3	Apply computational methods and numerical algorithms to problems in advanced physics using C^{++} programming	PSO - 4	C
CO - 4	Develop a basic knowledge in high level programming languages	PSO - 2	Ap

Course Outcome

Semester : III **Core VII**

Name of the Course : Integrated Electronics

Course code : PP1731

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the basic operation, features and parameters related to diodes, transistor, switching devices and interpret their applications. (FET,JFET,D-MOSFET,EMOSFET,SCR,DIAC,TRIAC)	PSO - 1	U
CO - 2	Explain about the internal circuitry and logic behind any digital system. (AND,OR,NOT,NAND,NOR,RTL,TTL,I^2L).	PSO - 2	U
CO - 3	Assess the working of combinational circuits.(flip flops , counters)	PSO - 3	E
CO - 4	Design various synchronous and asynchronous sequential circuits.	PSO - 6	C
CO - 5	Understand the characteristics of op-amps and the applications of op-amps.	PSO - 2	U
CO - 6	Analyse the behavior of active filters and IC555.	PSO - 4	C

Semester : III **Core VIII**

Name of the Course : Microprocessor and Microcontroller

Course code : PP1732

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Identify/ Explain the operation of various components of the microprocessor 8085.	PSO - 1	A
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	C
CO - 4	Understand the various interrupts of 8085 microprocessor.	PSO - 1	U
CO - 5	Experiment with the common applications of microprocessor. (Display of decimal numbers, Generation of waves forms, Microprocessor based traffic control, Measurement of frequency, resistance, temperature, display of speed of a motor)	PSO - 7	A
CO - 6	Explain the architecture of 8051 microcontroller.	PSO - 1	U

Semester : III **Elective- III (a)**

Name of the Course : Physics of the Cosmos

Course code : PP1733

CO	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	Examine the requirements and limitations of instrumentation for modern astrophysical observations. (Optical telescopes and Radio telescopes)	PSO - 2	An
CO - 4	Explain the basic issues involved in present day astrophysical investigations. (Red shift and the expansion of the universe)	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	E
CO - 7	Develop a deeper understanding of some important models of the universe and its observational tests.	PSO - 6	C

Semester : III **Elective- III (b)**

Name of the Course : Radiation Physics

Course code : PP1734

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the various Radiation sources and its interaction with matter.	PSO - 1	U
CO - 2	Understand the Design features of the radiation detectors and the accelerators.	PSO - 4	U
CO - 3	Acquire skills and apply it in diagnostic technology.	PSO - 2	Ap
CO - 4	Interpret the Radiation dosimeter principles.	PSO - 4	An
CO - 5	Apply the various radiations in industrial field for scientific development.	PSO - 4	Ap
CO - 6	Identify and apply the radiation for therapy and for diagnosis purposes.	PSO - 3	Ap

Semester : IV **Core-IX**

Name of the Course : Material Science

Course code : PP1741

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand phase diagrams and relate to the design and control of heat treating procedures.	PSO - 1	U
CO - 2	Analyze the elastic behavior of materials.	PSO - 2	An
CO - 3	Recognize the nature of dislocations in materials and the role they play in the deformation processes.	PSO - 6	R, An
CO - 4	Review the mechanisms involved in oxidation and corrosion of materials.	PSO - 4	U
CO - 5	Compare the different types of composites to design materials having property combinations that are better than those found in the metal alloys, ceramics and polymeric materials.	PSO - 7	E

Semester : IV **Core-X**

Name of the Course : Nuclear and Particle Physics

Course code : PP1742

CO	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
CO - 2	Interpret the behavior and properties of the deuteron in the ground and excited state.	PSO - 1	E
CO - 3	Analyze the different nuclear models of the nucleus and examine the application of the shell model of nucleus.	PSO - 4	E
CO - 4	Explain the characteristics and effect of radioactive decay phenomena. (alpha,beta ,gamma)	PSO - 1	U
CO - 5	Discuss the outcome of various types of nuclear reactions.	PSO - 4	C
CO - 6	Analyse the working of nuclear reactors.	PSO - 7	An
CO - 7	Examine the Particle Physics phenomena and their basic theoretical description.	PSO - 3	An

Semester : IV **Core-XI**

Name of the Course : Molecular Spectroscopy

Course code : PP1743

CO	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 diatomic molecules.	PSO - 3	An
CO - 5	Design spectrometers (Microwave, IR, Raman and NMR) for characterization of molecules.	PSO - 4	C
CO - 6	Utilize various spectroscopic methods suitable for characterizing a molecule.	PSO - 6	C

Semester : IV **Elective IV (a)**

Name of the Course : Nano Physics

Course code : PP1744

CO	Upon completion of this course, 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 density of states 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 & quantum dots.	PSO - 2	U
CO - 5	Compare the structure and properties of Carbon allotropes and their applications in the emerging nano technology. (carbon nanotubes as an example of nanostructure)	PSO - 4	E
CO - 6	Discuss the applications of Quantum Hetro structures and super lattices.	PSO - 5	U
CO - 7	Develop key concepts in Single electron transistor, Spintronics and Giant magneto resistance.	PSO - 7	C

Semester : IV **Elective IV (b)**

Name of the Course : Quantum Field Theory

Course code : PP1745

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Explain the need for a classical theoretical approach to quantum theory.	PSO - 1	E
CO - 2	Interpret combinations in different phases of field theories characteristics by patterns of symmetric breaking.	PSO - 2	E
CO - 3	Examine the significance of Neopher's theorem.	PSO - 3	An
CO - 4	Solve problems based on Feynman diagrams.	PSO - 2	C
CO - 5	Understand the concepts of field quantization.	PSO - 1	U
CO - 6	Design calculation techniques for quantum electrodynamics.	PSO - 7	C
CO - 7	Survey the quantization around non perturbative solutions of quantum field theory.	PSO - 6	An

Learning Outcome

Semester : III **Practical-III**

Name of the Course : Advanced Physics Lab- III (Electronics)

Subject code : PP17P3

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Analyse the working of code converters (BCD / Gray, excess 3)	PSO - 2	An
CO - 2	Design various synchronous and asynchronous sequential circuits and study their working	PSO - 6	Ap
CO - 3	Analyse the applications of op-amps (sine, triangular wave generator, low, high and band pass filters)	PSO - 2	An
CO - 4	Analyse the behavior of counters (up/down, mod, ring)	PSO - 2	An
CO - 5	Analyse the working of electronic circuits (multiplexer, demultiplexer, adder, subtractor)	PSO - 2	An

Semester : IV **Practical IV**

Name of the Course : Advanced Physics Lab IV (Microprocessor and Microcontroller)

Course code : PP17P4

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