JAMAL MOHAMED COLLEGE (AUTONOMOUS),
TIRUCHIRAPPALLI - 620 020

P.G. & RESEARCH DEPARTMENT OF PHYSICS

Programme & Course Learning Outcomes 2017-18

B.Sc Physics Programme

Programme Objectives:

The B.Sc. Physics Programme has been carefully designed to

1. introduce the students to the world of Physics
2. to help the students to know the constitution of matter, the microscopic and macroscopic properties they possess
3. the motion of bodies from the smallest constituents of matter to the heavenly bodies that lend beauty to this universe
4. the various forces of interaction from the weakest gravitational field to the strong nuclear forces
5. simulate the physical phenomena using scientific programming techniques and enjoy the underlying Physics behind them
6. to motivate the students for a higher academic pursuit in Physics if he/she so desires

In order to realize these objectives, the subject courses are designed with sufficient coverage of the fundamental aspects, and laboratory courses focused on understanding of the physical concepts learnt, setting up the base and triggering the students to go in for a deeper study of Physics.

Programming Outcomes:

The under-graduates of the Physics Programme will be able to

1. have a grasp of the basic principles of Physics
2. appreciate the necessity for hands on experimental observations
3. design and develop scientific programs to explain simple concepts in Physics

Sem	Course Code	Course Title	Course Outcomes
I	17UPH1C1	Properties of Matter	On the completion of this course the student will be able to understand the ➢ principles of stress and strain set up in materials and to determine the various coefficients of elasticity ➢ principles of surface tension and its explanation based on the molecular interactions and its variations based on different factors ➢ differentiate stream lined and turbulent flows and the laws governing them as well as experimental ways of their determination ➢ principles of diffusion and osmosis and the methods for their determination
	17UPH1C2P	Properties of Matter – Practicals	On the completion of this course the student will be able to carry out the ➢ experimental determination of moduli of elasticity, coefficients of viscosity, surface tension of liquids and thermal conductivity and electrical conductivity of solids ➢ verify the laws of transverse vibrations as well as the laws of propagation of light ➢ construct logic gates using discrete components and verify their truth tables
II	17UPH2C3	Mechanics	On the completion of this course the student will be able to understand the ➢ principles impulse and impacts of rigid bodies, the changes in energies due to direct and oblique impact ➢ principles of projectile motion, the time of flight, range and the maximum height reached by the projectiles during their motion ➢ dynamics of rigid bodies and the causes and effects of friction ➢ laws of gravitation, theory behind the determination of the acceleration of gravity, center of mass, gravity and center of pressure of different objects ➢ laws of floatation and equations determining the continuous flow ➢ principles of rocket motion and its propulsion
	17UPH2C4P	Heat and Optics – Practicals	On the completion of this course the student will be able to carry out the ➢ experimental determination of moduli of elasticity, coefficients of viscosities, specific gravities, specific heat capacities ➢ determination of the acceleration due to gravity, thickness of thin objects by using the principles of interference ➢ voltage-current characteristics of a PN junction and Zener diodes

III	17UPH2C5	Acoustics	On the completion of this course the student will be able to understand the ➢ principles of simple harmonic motion, principle of linear superposition, form Lissajous' figures and determination of the unknown frequencies ➢ production and propagation of sound waves, expressions for their velocities in different media, laws of transverse motion ➢ reverberation effects of sound wave, Sabine's reverberation formula, production, properties and applications of ultrasonic waves
	17UPH2C6P	Thermal and Electricity – Practicals	On the completion of this course the student will be able to carry out the ➢ experimental determination of moduli of elasticity, coefficients of viscosities, specific gravities, specific heat capacities, specific resistances of electrical conductors ➢ determination of magnetic field intensity and the horizontal component of earth's magnetic field ➢ find the current and voltage sensitivities of a spot galvanometer and calibrate a low range voltmeter ➢ construct a bridge rectifier and voltage regulator with Pi filters and Zener diodes
IV	17UPH4C7	Thermal and Statistical Physics	On the completion of this course the student will be able to understand the ➢ principles of kinetic theory of heat, expressions for pressure, determination of specific heat capacities ➢ theories of transmission of heat, Stefan's law, Planck's law, determination of Stefan's constant ➢ Einstein's and Debye's theories of heat capacities ➢ laws of thermodynamics and Statistical Physics
	17UPH4C8P	Measurement and Calibration – Practicals	On the completion of this course the student will be able to carry out the ➢ experimental determination of moduli of elasticity, coefficients of viscosities ➢ frequency response of a LCR circuit and find its quality factor ➢ determination of magnetic field intensity and horizontal component of earth's magnetic field ➢ find the current and voltage sensitivities of a spot galvanometer and calibrate a high range voltmeter and determination of EMF of a thermo-couple ➢ determination of wavelengths of light ray components and band energy of semiconductors
V	17UPH5C9P1	Optics and Numerical Programming-Practicals	On the completion of this course the student will be able to carry out the ➢ experimental determination of modulii of elasticity, dispersive power and refractive index of glass medium, band gap energy of a semiconductor ➢ write programs to solve a quadratic equation, conversion of temperature from Celsius to Fahrenheit sclae and vice-versa, find factorial of a number, construction of a multiplication table and matrix operations

	17UPH5C9P2	Analog Electronics and Microprocessor-Practicals	On the completion of this course the student will be able to design ➢ single stage RC coupled transistor amplifier, Hartley oscillator, analog circuits using op amps to carry out simple arithmetic operations ➢ sorting and block transfer of data, carrying arithmetic operations using microprocessor Intel 8085 and encode binary data in BCD code
	17UPH5C10	Electricity and Magnetism	On the completion of this course the student will be able to understand the ➢ fundamentals of Electrostatics, Gauss Law, principles capacitor and storage of energy in a capacitor ➢ concepts of magnetic field, properties of dia, para and ferro magnetism, hysteresis, retentivity and coercivity of magnetic materials ➢ laws of current electricity and magnetism, such asKirchoff's law, principles of Wheatstone's bridge and the instruments based on them, Biot-Savart's law, ballistic galvanometer ➢ laws of electromagnetic induction, principles of transformers, eddy currents, working of series and parallel resonance circuits
	17UPH5C11	Optics	On the completion of this course the student will be able to understand the ➢ fundamentals of geometric optics such as chromatic and spherical aberration, construction of eyepieces ➢ dispersive effects and principles of interferrence, diffraction and polarization
	17UPH5C12	Atomic Physics	On the completion of this course the student will be able to understand the ➢ fundamentals of positive rays, principles of working of spectrographs ➢ principles of photoelectricity, Einstein's equation, photoelectric cells and photomultiplier tubes ➢ Vector atom models, spatial and spin quantization, Pauli's Exclusion principle, Stern-Gerlach experiment ➢ Stark and Zeeman effects, fine structure of spectral lines and the reasons for their occurrence ➢ principles of X-rays, determination of crystal structures by Bragg's spectrometer, Mosely's law, Compton effect
	17UPH5M1A	Semiconductor Devices and Circuits	On the completion of this course the student will be able to understand the ➢ voltage-current characteristics of diodes and their applications ➢ operations of bipolar and field effect transistors in various configurations ➢ construction and operation of LC oscillatory circuits ➢ principles and theory of modulation and demodulation ➢ characteristic properties of operational amplifiers and their applications in anlalog circuitry

	17UPH5M1B	Nanoscience	On the completion of this course the student will be able to understand the ➢ electrical, thermal and magnetic properties of nanomaterials ➢ classification of nanomaterials and nanotubes ➢ quantum dots, quantum wires and their applications ➢ instruments involved in evaluating the characteristics such as TEM, SEM, AFM and STM
	17UPH5S2A	Scientific programming in C	On the completion of this course the student will be able to ➢ write down programs in C language using different constructs in C to solve certain simple problems related to Physics
	17UPH5S2B	Programming in C++	On the completion of this course the student will be able to ➢ to have an introduction to object oriented programming using C++
	17UPH5S3A	Electronic Instrumentation	On the completion of this course the student will be able tounderstand the ➢ principles, construction and working of different analog, digital instruments, signal and waveform generators ➢ carry out wave form analysis ➢ principles of transducers and their classification and applications
	17UPH5S3B	Electrical and Electronic Appliances	On the completion of this course the student will be able tounderstand the ➢ principles, construction and working of audio and video equipments like stereos, MP3, CD, DVD players, transceivers ➢ diagnostic tools in medicine such as EEG, ECG, CT-Scan, digital X-ray machines ➢ winding, rewinding and testing of AC and DC machines, electrical motors
	17UPH5EC1	Mobile Telephony	On the completion of this course the student will be able tounderstand the ➢ concepts of wireless transmission, spread spectrum communication and cellular systems, telecommunication systems ➢ Data services such as GPRS and Bluetooth
VI	17UPH6C13P1	General Physics and Scientific Programming – Practicals	On the completion of this course the student will be able tocarry out the ➢ experimental determination of refractive index of glass, self incuctance of a coil, magnetic field intensity and the horizantal component of earth's magnetic field ➢ calibration of a high range voltmeter ➢ simple programming excercises in C language
	17UPH6C13P2	Digital Electronics and Microprocessor– Practicals	On the completion of this course the student will be able to design ➢ logic gates and verify their truth tables ➢ simple analog and digital circuits to perform arithmetic operation and their simplification using Karnaugh map ➢ simple arithmetic operations using Intel 8085 Microprocessor

	17UPH6C14	Wave Mechanics and Relativity	On the completion of this course the student will be able to understand the ➢ inadequacy of Classical Mechanics and the need for development of Quantum Mechanics ➢ foundation and formulation of wave mechanics, derivation of Schroedinger's wave equation, physical interpretation of wavefunction and concepts of probability ➢ principles of relativity, Lorentz transformations and Einstein's mass – energy relation
	17UPH6C15	Nuclear Physics	On the completion of this course the student will be able to understand the ➢ basic concepts of nuclear structure, radioactivity and nuclear radiations, law of radioactive disintegration, Geiger-Nuttal law ➢ principle, construction and working of particle accelerators and detectors ➢ nuclear fission, fusion and transmutation, nuclear reactions and elementary particles
	17UPH6C16	Laser and Spectroscopy	On the completion of this course the student will be able to understand the ➢ basic concepts of lasers such as spontaneous and stimulated emissions, population inversion and pumping methods ➢ types of lasers and their applications ➢ principles and applications of UV, IR and Raman Spectroscopy
	17UPH6M2A	Digital Electronics and Microprocessor	On the completion of this course the student will be able to understand the ➢ basic concepts number systems, simple binary operations, binary codes and logic gates ➢ Boolean algebra and simplification of logic expressions using Karnaugh map ➢ design and working of combinational, sequential circuits ➢ fundamentals of microprocessors and their applications in carrying out simple arithmetic operations
	17UPH6M2B	Material Science	On the completion of this course the student will be able to understand the ➢ basic concepts of crystallography such as crystal lattices, Miller indices ➢ structures of crystals and their defects ➢ electron theory of solids, properties of dielectric and magnetic materials ➢ material characterization techniques
	17UPH6M3A	Solar Energy	On the completion of this course the student will be able to understand the ➢ basic concepts of solar radiation such as spectral distribution, estimation of radiation intensity and their related instruments ➢ solar devices such as solar collectors, solar storage devices ➢ solar refrigeration and solar heating systems ➢ photovoltaic cells

	17UPH6M3B	Astrophysics	understand the ➢ basic elements of solar dynamics, solar radiation, asteroids, meteorites and comets, ➢ our planet earth and its satellite, the moon ➢ conditions for existence of life in the universe
	17UPH6EC2	Physics for Competitive Examination	➢ solve problems involving various fundamental topics in Physics so as to equip oneself to face competitive examinations

M.Sc Physics Programme

Programme Objectives:

The MSc Physics Programme has been carefully designed to

1. familiarize the students to the various branches of Physics and help them identify its innumerable applications
2. inculcate an inquisitive attitude in them through carefully formulated mathematical analysis, computer simulations and laboratory experiments
3. help the students prioritize their objectives and hone up their skills necessary to realize them
4. help the students obtain gainful employment by exposing them to the various avenues and opportunities open to them
5. facilitate the students, if they so desire to opt for higher academic pursuits and help them to equip themselves with knowledge and skills necessary for attaining them
6. develop a mindset to continuously educate themselves as per the demands of their chosen profession
7. groom students to cohabitate as a collective group in their place of employment or in their academic career
8. make them conscious of their responsibilities to the society and to grow up as a grateful individuals and good citizens

In order to realize these objectives, the subject courses are designed with sufficient coverage of the fundamental aspects, theoretical details and real time applications encountered in various branches of Physics. Mathematical concepts and theorems necessary to the understanding of Physics are included as two full courses. Numerical Analysis and implementation using high level language programming in a Linux environment are covered in two full laboratory courses. Further to have a hands-on experience, as much as six laboratory courses covering General Physics, Solid State Physics, Heat, Optics, Analog and Digital Electronics and Microprocessors are included. For the students to imbibe morals and accountability in their life, tutorial and mentoring sessions are conducted frequently.

Programme Outcomes:

The post-graduates of the Physics Programme will be able to

1. understand the basic principles of Physics and apply them to the problems that may arise in different walks of life

2. implement their ideas either through mathematical modelling, or numerical solutions and confirm them with experimental evidence

3. succeed in their chosen profession, either in industry or academia and infuse fresh thinking and perspectives

4. adjust themselves to the demands of collective responsibility of a large or small group and contribute immensely to its success

5. gratefully look back at the help and facilitation they received from the society for their growth and contribute their might to the social causes and societal development in acknowledgement thereof.

Sem	Code	Course Title	Course Outcomes
I	17PPH1C1	CLASSICAL DYNAMICS	On completion of this course the student will be able to ➢ solve simple problems in Physics in the light of Lagrangian and Hamiltonian Formulations. ➢ realize canonical transformations using Poisson Bracket and solve the Kepler problem as well as harmonic oscillator using Hamilton-Jacobi theory ➢ understand the vibrations of molecule using the theory of small oscillations and also visualize the motions of rigid bodies ➢ appreciate the relativistic dynamics in a four-dimensional space-time continuum
	17PPH1C2	MATHEMATICAL METHODS FOR PHYSICS	On completion of this course the student will be able to ➢ visualize physical and geometrical quantities in Mechanics such as force, velocity, acceleration, etc., in Cartesian and different orthogonal curvilinear coordinate systems using the concepts of vector calculus and linear vector spaces ➢ make use of the compact forms of matrices and tensors to study many problems that could be reduced to systems of linear equations in Mechanics, Networks in Electricity and Electronics, statistics and transportation problems ➢ use the elegant and powerful tools of Analytic Functions and Fourier Transforms to solve interesting problems in Heat, Fluid Dynamics, Electrostatics, Quantum Mechanics etc.,

	17PPH1C3	ELECTRONIC DEVICES AND CIRCUITS	On completion of this course the student will be able to understand ➢ the design and fabrication of integrated circuits ➢ the functioning of analog electronic circuits using solid state devices as well as operational amplifiers ➢ the functioning of digital circuits using 555 timer and phase locked loops
	17PPH1C4P1	GENERAL PHYSICS PRACTICALS	On completion of this course the student will be able to ➢ appreciate the experimental evidence for the concepts that were put forward by pure theoretical arguments, such as the specific charge of an electron, magnetic susceptibility of paramagnetic liquids, relation between the elastic constants ➢ observe the Fourier Spectra of harmonic waveforms and confirm them with the results from theoretical calculations as well as the polarization effects shown by liquids
	17PPH1C4P2	OPTICS AND HEAT PRACTICALS	On completion of this course the student will be able to ➢ observe experimentally the theory of Hydrogen Spectra, Polarization effects of light leading to the confirmation of charge of an electron etc. ➢ observe and confirm the theory of heat propagation in solids, interference effects in liquids due to the presence of ultrasonic waves. ➢ determination of the values of Stefan's constant, magnetic susceptibility of anhydrous paramagnetic specimen and wavelengths using interferometry
	17PPH1CE1A	MEDICAL PHYSICS AND ULTRASONICS	On completion of this course the student will be able to understand the functioning of ➢ diagnostic devices used for analysis of blood pressure, eye pressure, electric signals from the heart, brain and muscles ➢ therapeutic devices such as ventilators, defibrillators, electro-stimulators, anesthesia machines, dialysis units and nuclear and brachyo-therapy systems ➢ Laser based blood cell counters, Doppler flow meters, Angioplasty, Fluorescence and Raman Spectroscopy based cancer detection techniques and Photodynamic therapy of tumors Further the student will be familiarised with the ➢ preparation of multicomponent mixtures, binary mixtures and pure liquids and their characterization using thermodynamic parameters and ultrasonic interferrometry ➢ applications of low frequency and high intensity ultrasound in industry

	17PPH1CE1B	CRYSTAL GROWTH AND THIN FILMS	On completion of this course the student will be able to carry out ➢ growth of crystals using several techniques such as Slow Evaporation Method, Melt Method, Physical Vapour Deposition (PVD) and Chemical Vapour Deposition (CVD) and Gel Growth ➢ preparation of thin films using various Physical and Chemical Methods ➢ characterization of thin films using Scanning Electron Microscopy (SEM), Electron Probe Micro-analysis, X-Ray Photo Electron Spectroscopy and Mass Spectroscopy
II	17PPH2C5	ADVANCED MATHEMATICAL PHYSICS	On completion of this course the student will be able to ➢ solve partial differential equations (PDEs) using separation of variables method as well as to transform and classify them into their canonical forms ➢ solve differential equations using the concept of special functions and use Dirac's Delta function as well as Greens' function to solve problems in Electrostatics, Quantum and Nuclear Physics ➢ use Laplace's Integral Transforms to solve easily problems involving differential equations in Physics and the concepts of group theory to find symmetry transformations in physical system
	17PPH2C6	ATOMIC AND MOLECULAR SPECTROSCOPY	On completion of this course the student will be able to ➢ classify molecules based on rotational spectra obtained using a microwave spectrometer and vibration spectra obtained using IR Spectrometry and Fourier Transform techniques ➢ classify molecules based on Raman scattering of monochromatic light in the visible, near infra-red and near ultra-violet regions ➢ detect free radicals in solution and possible environmental contamination using Electron Spin Resonance Spectroscopy (ESR) techniques ➢ study magnetic properties of nuclei using Nuclear Magnetic Resonance (NMR) and Nuclear Quadrapole Resonance (NQR) spectroscopy techniques

	17PPH2C7	ELECTROMAGNETIC THEORY	On completion of this course the student will be able to ➢ solve boundary value problems (BVPs) in Electrostatics and Magneto-statics ➢ understand the propagation of electromagnetic waves, the energy carried by these waves and electromagnetic potentials ➢ understand the generation and interaction of electromagnetic waves with matter and their different modes of propagation in wave guides ➢ understand the covariance of the electro-dynamical equations in four dimensional vector space under relativistic limits and the propagation of a relativistically charged particle
	17PPH2C8P1	SOLID STATE PHYSICS PRACTICALS	On completion of this course the student will be able to ➢ understand the concepts of Photoelectric Effect, Hall Effect ➢ verify the law of Ferro-electricity, Hysteresis in magnetic materials and Band Gap Energy in semiconductors ➢ determine the Landau's splitting factor 'g' using Electron Spin Resonance Spectrometer
	17PPH2C8P2	ANALOG ELECTRONICS PRACTICALS	On completion of this course the student will be able to ➢ verify the laws of thermionic emission ➢ study the characteristics of a Light Dependent Resistor (LDR) ➢ construct relaxation oscillator, Wein's Bridge oscillator, high pass, low pass and band pass filters ➢ determine the dielectric constant of a liquid using ultrasonic interferrometry ➢ construct digital to analog (D/A) converters and verify them using theoretical equations
	17PPH2CE2A	COMPUTATIONAL METHODS FOR PHYSICS	On completion of this course the student will be able to ➢ use constants, variables, operators, expressions, control statements, control structures, functions and file operations in writing his/her own program in C language ➢ solve polynomial equations, simultaneous linear equations, ordinary differential equations, curve fitting, numerical integration, matrix operations, special functions and evaluate statistical parameters using appropriate numerical methods and codes in C

II	17PPH2CE2B	NANOSCIENCE AND TECHNOLOGY	On completion of this course the student will be able to ➢ have a grasp of the basics of nanoscience, thermal, electric, optical and magnetic properties of nanomaterials, their classification and preparation techniques ➢ know the types, properties, defects, synthesis and applications of nanotubes ➢ know the essentials of nanophysics such as quantum confinement, quantum dots, quantum points, fabrication of nanocrystals, nanowires and their applications ➢ understand the biological and medical applications of nanotechnology in drug delivery, diagnosis and therapeutical purposes ➢ know characterization of nanoparticles using TEM, AFM, STM and have an introduction to green technology
III	17PPH3C9	NUCLEAR AND PARTICLE PHYSICS	On completion of this course the student will be able to ➢ understand the general properties of atomic nuclei and the various nuclear forces that govern their behaviour ➢ understand the theory underlying the alpha and beta decay in nuclei ➢ understand the processes of nuclear fission and nuclear fusion and their ramifications ➢ understand nuclear transmutation by alpha particles, protons and neutrons and other nuclear reactions ➢ have a grasp of the classification and properties of the elementary particles discovered so far
	17PPH3C10	QUANTUM MECHANICS	On completion of this course the student will be able to ➢ understand the concepts and formalism of Quantum Mechanics ➢ solve some exactly solvable problems such as a LHO, angular momentum problem, Hydrogen Atom and find expressions for their eigen functions and eigen values ➢ have an introduction to Hilbert Space, Matrix Mechanics and Equations of Motion ➢ solve slightly complicated problems using approximation methods such as time independent and time dependent perturbation theories, vatiation methods etc. ➢ have an introduction to raising and lowering operators, addition of angular momenta, spin states and construction of symmetric and antisymmetric wave functions for a system of particles ➢ understand the motion of a charged particle in a relativistic field using Klein-Gordon and Dirac's Equations

	17PPH3C11	STATISTICAL MECHANICS	On completion of this course the student will have an understanding of ➢ the concepts of phase space, ensembles, partition functions and the relations between statistical and thermodynamic quantities and classical MB statistics ➢ the transport phenomena in fluids, entropy, thermodynamical potentials and reciprocity relations ➢ the quantum statistical distribution laws- BE and FD statistics, the phase transitions and critical phenomena
	17PPH3C12P 1	DIGITAL ELECTRONICS - PRACTICALS	On completion of this course the student will be able to ➢ construct regulated dual power supplies, analog circuit to implement arithemetic operations, comparators and multiplexers ➢ construct combinational and sequential digital circuits
	17PPH3C12P 2	NUMERICAL PROGRAMMING IN PHYSICS - PRACTICALS	On completion of this course the student will be able to ➢ solve numerically polynomial and systems of linear equations ➢ perform matrix operations ➢ evaluate statistical parameters ➢ understand Monte Carlo technique
	17PPH3CE3A	MICROPROCESSOR AND MICROCONTROLLER	On completion of this course the student will be able to ➢ grasp the fundamentals of the Intel 8085 microprocessor architecture, memory mapping and data transfer schemes, know the addressing modes and perform arithmetic operation and sorting of a given data ➢ know the architecture and memory organization of the Intel 8051 Microcontroller and the design of timers, counters and registers using it as well as understand the modes of operation and control ➢ learn the instruction set and assembly language programming for implementing arithmetic operations and sorting of a given data set using Intel 8051 ➢ know the various peripheral devices of Intel 8051 and interfacing them
	17PPH3CE3 B	FIBRE OPTICS	On completion of this course the student will be able **to** ➢ know the basic structure of optical fibres, their classification, propagation of light in them as well as the various losses that occur in them ➢ know the different sources for the optical fibres designed using solid state devices and implementation of communication using optical fibres

	17PPH3EC1	NONLINEAR ELECTRONICS	On completion of this course the student will be able to ➢ grasp the concepts of nonlinearity, nonlinear oscillations and resonance phenomenon ➢ understand the qualitative features of nonlinear systems such as equilibrium points, their stability, limit cycle motions, tori, quasiperiodic and chaotic attractors ➢ know the bifurcations and route to chaos in discrete as well as time continuous dynamical systems, their visualization using bifurcation diagrams and confirmation using Lyapunov Exponents ➢ observe and verify both numerically and experimentally, the onset of chaos in nonlinear electronic circuits such as Chua's Oscillator, Murali-Lakshmanan-Chua (MLC) oscillator and a Duffing oscillator
	17PPH4C13	SOLID STATE PHYSICS	On completion of this course the student will be able to ➢ know the various crystal lattices, crystal structures and imperfections in crystals ➢ understand lattice vibrations in semiconductors and apply them to know their thermal properties ➢ understand thermal and electrical conductivities of metals using Free electron gas model and Kronig-Penney Model ➢ know polarizability and magnetic properties, such as para-magnetism, ferromagnetism, anti-ferromagnetism and ferrimagnetism in solids ➢ have an elementary of the phenomenon of superconductivity and its applications
IV	17PPH4C14	ELECTRONIC COMMUNICATIONS	On completion of this course the student will be able to ➢ know digital modulation techniques such as Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) and digital transmission schemes such as Pulse Code Modulation (PCM), Adaptive Delta Modulation, Time Division Multiplexing etc. ➢ understand the basics of fibre optics such as cofiguration of optic fibre cables, modes of propagation of light and the losses suffered in them and the functioning of satellite communication systems ➢ know the various type of antennae such as half-wave dipole antenna, Hertzian dipoles, loop antenna etc., used for transmitting and receiving of information

	17PPH4C15P 1	MICROPROCESSOR AND MICROCONTROLLER - PRACTICALS	On completion of this course the student will be able to ➢ perform experiments using Intel 8085 microprocessor such as conversion of decimal numbers to hexa-decimal and vice versa, constructing waveform generators and interfacing experiments ➢ perform experiments using Intel 8051 micro-controllers such as arithmetic operations and ➢ interfacing experiments such as seven segment display, stepper motor control, traffic light control
	17PPH4C15P2	NUMERICAL SIMULATIONS IN PHYSICS - PRACTICALS	On completion of this course the student will be able to ➢ evaluate numerically the wave functions of some quantum systems and calculate energy changes in nuclear scattering experiments ➢ simulate some important concepts in Physics like beats, Brownian motion, radioactive decay, motion of freely falling bodies, motion of a body in a central potential, electromagnetic oscillations in an oscillatory circuit
	17PPH4CE4A	ADVANCED TOPICS IN PHYSICS	On completion of this course the student will be able to have a glimpse of advanced topics in Physics such as the ➢ low energy scattering phenomena using phase shift analysis and high energy scattering phenomena using Born's Approximation and Green's Functions and hence validate Rutherford's scattering formula ➢ Physics of many electron systems using Molecular Orbital Theory, Heitler-London theory, Hybridisation techniques and statistical methods such as Thomas-Fermi's model and Hartree-Fock's equations ➢ dispersion of linear and nonlinear waves, Scott-Russell phenomena that led to the discovery of solitons, Fermi-Ulam-Pasta paradox, numerical experiments of Kruskal and Zabusky, derivation of Kortweg-deVries equation and its solution using Hirota'sbilinearisation technique ➢ electro-optic effects and accousto-optic effects ➢ principles, construction and working of astronomical instruments such as astrographs, spectrographs, etalon etc
	17PPH4CE4B	PHYSICS OF LIQUID CRYSTALS	On completion of this course the student will be able to have ➢ an understanding of symmetry, structure and classification of liquid crystals, nature of phase transitions and critical phenomena in them ➢ continuum theory of liquid crystals, their optic properties and cholesterics, symmetry, structure and mean-field description of discotic liquid crystals.

	17PPH4PW	Project Work	on completion of this the student will be able to ➢ master at least certain chosen topics ➢ carry out an investigation on the topic with the help and guidance of his/her project supervisor and report it as a dissertation
	17PPH4EC2	NON – CONVENTIONAL ENERGY SOURCES	On completion of this course the student will be able to have ➢ an understanding of characteristics of solar radiation, solar energy devices such as solar collectors, solar heaters, photo-voltaic power generation ➢ principles of wind energy conversion, bio-mass, photosynthesis, generation of power from bio-mass, geothermal and tidal power generation, fuel cells and dry batteries ➢ Hydrogen as source of energy and concepts of Nuclear energy

M.Phil Programme

Programme Objectives:

The M.Phil. Programme in Physics has been designed to help the scholar

1. have a good knowledge in the advanced areas of Physics
2. learn the techniques of effective teaching should he/she decide opt for a career in teaching
3. learnthe tools most essential for carrying out independent research and equip himself/herself the art of presenting his/her results in a most pleasant manner.
4. to independently carry out a small project under the advice and supervision of a guide
5. to lay the foundation for a successful and meaningful research in Physics

Programme Outcomes:

After the successful completion of the M.Phil., Programme the scholar should be able to

- have a thorough grasp of at least the area of his/her interest
- successfully select a research problem, make a literature survey of it, investigate it and then present his/her observations in a coherent manner so as to add up to the body of knowledge in that subject
- improve and hone his/her teaching skills and motivate his/her students to the broad areas and applications of Physics

Sem	Course Code	Course Title	Course Outcomes
I	18MPPH1C1	Research Methodology	the scholar should upon completion be able to ➢ identify a research problem, make a literature survey, find out the status of knowledge and awareness of the problem , work on the problem with the suggestive support of the guide and successfully present his/her results and outcomes ➢ write his/her own dissertation ➢ have a good mathematical grounding for tackling the problem identified, use the methods of data analysis and advanced computations using computing software packages such as MATLAB, Mathematica etc., ➢ have a good grasp of some advanced analytical tools and techniques
	18MPPH1C2	Advanced Topics in Physics	the scholar should upon completion will possess ➢ a good knowledge of Statistical Physics, elements of field theory, Relativistic Dynamics and Quantum Computing
	18MPPH1C3	Guide Paper - based on a Research Topic	the scholar should upon completion will possess ➢ a good grounding in his/her field of interest ➢ a good knowledge of the advanced theoretical tools for understanding a problem chosen, programming skills to simulate numerically and the experimental skills to have a good demonstration of his/her chosen field ➢ ability to report his/her findings in a presentation and write his/her dissertation ➢ serve as a spring board to launch his/her project work
	18MPPH1C4	Teaching & Learning Methodology	the scholar should upon completion will possess ➢ a knowledge of communication technology and apply it to improve teaching and learning ➢ a knowledge of the necessity of electronic media in higher education such as digital library, online teaching, role of EDUSAT ➢ a knowledge of virtual learning resources such as teleconferencing, ICT in education ➢ necessary networking skills such as FTP, design of web based courses
II	18MPPH2PW	Dissertation	the scholar should upon completion of his/her project would have ➢ ability to apply the knowledge gained to investigate his/her project and present it in dissertation form as well as PPT presentation