

Name of the Department: **Physics**

Name of Programme: **M.Sc. Physics**

Vision

- To Impart quality education and appropriate training to develop qualified and competent Physicists for the welfare of the society.
- To Develop the Department as a Centre for Advanced Studies in Material Science, Nano Science and Technology.

Mission

- Provide effective teaching , hands on laboratory training and exposure to research and development activities.
- To Start the Courses in the Emerging Areas (as per UGC guidelines) Like Nanotechnology, Computational Physics so as to develop it as Advanced Centre of Material Science, Nano Science and Engineering.

Program Outcomes (PO)

- PO1** To create, apply, and disseminate knowledge of physics in theoretical and experimental domains under different specializations.
- PO2** To develop the ability to identify, formulate, analyze and solve problems in in theoretical and experimental domains of physics at both curricular and research level through critical thinking.
- PO3** To enable students to apply ICT based skills and making them scientific software literate to use in academics.
- PO4** To encourage research culture, provide research ambience and develop related technical proficiency.
- PO5** To develop attitude to pursue further research and finding placement avenues through it.
- PO6** To inculcate academic and social ethical values among the students

Program Specific Outcomes (PSO)

PSO1

Students are able to apply the knowledge of core concepts of physics in semester exams, in the NET, SET and GATE, national level exams as well as in the research level projects work which is suitable to communicate/present further in workshops and conferences

PSO2

Through assignments, NET-SET coaching workshops and research based project work in both theoretical and experimental domains, students are able to reveal analytical skills and critical thinking

PSO3

In day today access to study material, through presentations, students are capable enough to make use of PowerPoint presentations, Moodle (LMS), Web-based academic links and can also get hands on experience of using proprietary software like MATLAB, Mathematica under

experiential learning.

PSO4

Through the research cultural of the department and skills acquired therein, students are capable of sustaining subsequent academic progression inside the country and overseas as well

PSO5

Regular practice of Self-declaration of the authenticity, uniqueness of project work, plagiarism check, and

Course Outcomes

Semester-I

Course code	Course title	Course outcomes
101	Mathematical Physics	<ol style="list-style-type: none">1. Students are able to understand the different ways of solving first and second order differential equations.2. 3.Students are able to understand and solve the problems based on special functions like Hermite, Bessel, Laguerre and Legendre functions.3. 4.Students are able to understand fundamentals and applications of Fourier series, Fourier and Laplace transforms, their inverse transforms etc.4. Students are able to apply statistical numerical methods for performing statistical analysis.
102	Classical Mechanics	<ol style="list-style-type: none">1. Students are able to understand and solve the problems related to Kepler's laws.2. Students are able to understand variation principle and Hamiltonian formulation.3. Students are able to understand and solve central force problems and understands the conservation of energy, linear momentum and angular momentum in system4. Students are able to understand how to impose constraints on a system in order to simplify the methods used in solving physics problems.5. Students are able to understand the concept of Poisson Brackets and canonical transformations and are able to solve problems on Poisson brackets and canonical transformations.6. Students are able to understand the concept of special theory of relativity.

103	Solid State Physics	<ol style="list-style-type: none"> 1. Students are able to understand electron and neutron diffraction methods. 2. Students are able to understand types of crystal defects. 3. Students are able to understand theory of diamagnetism. 4. Students are able to understand fundamental dielectric and magnetic properties of the material. 5. Students are able to understand and calculate crystal structure and F.C.C. & B.C.C 6. Students are able to understand concept of interference from Fabry-Parrot etal. on experiment. 7. Students are able to understand Hall Effect and solve problems related to it. 8. Students are able to understand and design experimental setup of heat capacity of material.
104	Analog and Digital Electronics	<ol style="list-style-type: none"> 1. Know the characteristics of various components. 2. Understand the utilization of components. 3. Design and analyze small signal amplifier circuits. 4. Learn Postulates of Boolean algebra and to minimize combinational functions. 5. Design and analyze combinational and sequential circuits. And to Know about the logic families and realization of logic gates.
Semester-I –Labs:		
105	General Physics -I	<ol style="list-style-type: none"> 1. Know the characteristics of Laser. 2. student is able to understand the calculation of thermal expansion co-efficient of different metals. 3. Using single slit finding of Sodium wave length. 4. know the calculation of Rydberg constant using Halogen lamp source. finding the values of Ultrasonic Velocity of some 5. Execute the MATLAB programs using MATLAB software.
106	Electronics -I	<ol style="list-style-type: none"> 1. Students are able to understand and design circuits of astable and monostable multivibrators. 2. Students are able to understand concept of thermal and electrical conductivity of copper. 3. Students are able to understand fundamental of Mathematics and are able to solve various problem using it. 4. Students are able to understand basics phenomenon of amplifier.
Semester -II		

201	Statistical Mechanics	<ol style="list-style-type: none"> 1. Micro and macroscopic systems and phase space concept. 2. Understanding of different types of ensembles. 3. F.D, B.E and M.B particle distribution and statistical weight. 4. Partition functions and Sacker tetrode equation. 5. Ideal F.D, B.E AND 1-D & 2-D ising models etc. some statistical mechanics applications.
202	Quantum Mechanics I	<ol style="list-style-type: none"> 1. Students are able to understand and calculate matrix Algebra and Eigen value problems. 2. Students are able to understand complex variables like complex numbers, complex algebra etc. 3. Students are able to understand calculus of Residues- Residues theorem. 4. Students are able to apply Fourier series analysis to solve numerical methods. 5. Students are able to understand fundamental concept and formalism of quantum mechanics. 6. Students are able to understand and solve the problems related to one-dimensional problems and Schrödinger equation for NET-SET exam. 7. Students are able to understand and able to calculate Eigen values and Eigen vectors of angular momentum. 8. Students are able to analyses Ket and Bra spaces and inner products.
203	Integrated circuits & Analog modulation	<ol style="list-style-type: none"> 1. Analyze the types of integrated circuits. 2. To study and design various linear applications of OP Amps. 3. Analyse feedback and its effect on the performance of Op Amp. 4. Understand the terminal characteristics of Op Amps and to design circuits for particular applications. 5. Use of different modulation and demodulation techniques used in analog communication. 6. Analyse transmitter and receiver circuits. Advantages, disadvantages and limitations of analog communication systems.
204	MATLAB and Applications	<ol style="list-style-type: none"> 1. Students are able to understand MATLAB software. 2. Students are able to understand Symbolic Manipulations 3. Students are able to understand and apply Mathematica functions. 4. Students are able to analysis MATLAB plots

		<p>and design the electronic figures.</p> <ol style="list-style-type: none"> 5. Students are able to understand Numerical Methods. 6. Students are able to understand Numerical approximation methods. 7. Students are able to understand Numerical differentiation and integration. 8. Students are able to understand Graphics and Curve fitting using MATLAB.
Semester II Labs		
205	General Physics -II	<ol style="list-style-type: none"> 1. The students gain knowledge in some apparatus and can undertake the measurements of Ultrasonic interferometer, newton rings, elastic constants of glass, etc. 2. The students develop skill in assembling various kinds of apparatus, data taking manually and skill developed to analyse data and optimize errors in a measurement. 3. The students are competent enough to do practical.
206	Electronics -II	<ol style="list-style-type: none"> 1. Design oscillators and amplifiers using Op Amps. 2. Design filters using Op Amp and perform experiment on frequency response. 3. Analyse the performance of oscillators and multivibrators using SPICE.
Semester -III		
301	Quantum Mechanics - II	<ol style="list-style-type: none"> 1. Students are able to understand different types of operators used in quantum mechanics and are able to use them to solve different problems. 2. Students are able to understand and solve problems related to different types of potential like, Square-well, Bloch wave, Kroning-Penney square periodic potential. 3. Students are able to understand and solve hydrogen atom problem 4. Students are able to understand the angular momentum operators & their Eigen values 5. Students are able to understand time independent perturbations theory. 6. Students are able to understand and calculate Time- dependent potentials and are also able to understand time-dependent potentials 7. Students are able to understand scattering theory. 8. Students are able to understand Spin Angular Momentum and theory of wave function. 9. Students are able to understand and think the concept of radiation and selection rule

302	Nuclear Physics	<ol style="list-style-type: none"> 1. The students gather advanced knowledge in Nuclear physics. The different nuclear interactions and the corresponding nuclear potentials and its dependence on the couplings are learned. The knowledge helps to choose for an Advance course in Nuclear Physics. 2. The skill gained by this course gives an understanding of nucleus at low energy. 3. Students are able to analyze the single particle nuclear shell model and related phenomena. 4. Students are able to understand and apply selection rule of elementary particles and fission, fusion reactions. 5. The students develop basics to solve some of the problems of nuclear
303A	Solid State Physics -I	<ol style="list-style-type: none"> 1. Students are able to understand different crystal structures, interaction with X-ray and also understands various properties about crystals. 2. Students are able to understand different types of crystal defects. 3. Students are able to understand different properties of semiconducting and superconducting properties. 4. Students are able to understand theoretical background of dielectric and magnetic properties of material.
303B	Electronics –I (Microprocessors)	<ol style="list-style-type: none"> 1. Demonstrate the various features of microprocessor, memory and I/O devices including concepts of system bus. 2. Identify the hardware elements of 8085 microprocessor including architecture and pin functions and programming model including registers, instruction set and addressing modes. 3. Select appropriate 8085 instructions based on size and functions to write a given assembly language program. 4. Design a given interfacing system using concepts of memory and I/O interfacing. 5. Demonstrate the features of the advance microprocessors.
303C	Material Science -I	<ol style="list-style-type: none"> 1. Students will learn different types of materials and their properties. 2. To understand the deformation in solids. 3. To gain the knowledge of Diffusion Laws. 4. Students also study and gain the knowledge of Dielectric materials and their applications. 5. Students also learn about ferroelectrics and Liquid crystals and application of Liquid crystals.
304A	Solid State	<ol style="list-style-type: none"> 1. Students are able to understand for Powder

	Physics -II	<p>Crystal Structure.</p> <ol style="list-style-type: none"> 2. Students are able to understand different types of the experiments. (Debye-Scherrer) etc. 3. Students are able to understand Fourier Analysis of Electron density and Limitations of X-Ray diffractions. 4. Students are able to understand High Frequency Dielectric Constants and Dielectric Dispersion. 5. Students are able to understand Dipole Theory of Ferro Electrics and Ferro Electric Catastrophe.
304B	Electronics (Special –II) Comm.systems	<ol style="list-style-type: none"> 1. To acquire a fundamental understanding of communication system and modulation. 2. Students will able to understand the effect of noise and performance of noise in AM modulation. 3. Students will learn concept of transmitter and various types of receivers and detection techniques. 4. To analyze the various filters and receivers. 2. To understand the basic types of modulation 5. To acquire knowledge on transmission line equations with various type of constants. 6. To gain better understanding on transmission line at radio frequencies. To frame details on signal propagation through rectangular and circular waveguides.
304C	Nanoscience: Special –II	<ol style="list-style-type: none"> 1. Students are able to understand band structure and various conduction mechanisms at nanoscale. 2. Students are able to understand quantum behaviour of nanometric world. 3. Students are able to understand various synthesis methods like physical, chemical and biological for nanomaterials and their differences. 4. Students are able to understand lithography techniques for synthesis of nanomaterials.
Semester III Labs		
305	General Physics –II	<ol style="list-style-type: none"> 1. To gain knowledge on ESR spectrometer and finding of 'g' factor. 2. Students can do the Fourier analysis (Square wave, clipped sine wave, saw tooth wave). 3. Students are able to do the helical method and for finding e/m of an electron. 4. Students also get the hands-on experience of four probe method. 5. To study operating voltage and characteristics of G.M counter and also study the characteristics of photo conductive cell.
306A	Solid State Physics-I	<ol style="list-style-type: none"> 1. Students are able to understand all the thin film deposition techniques. 2. Students are able to understand different

		<p>synthesis techniques of thin films.</p> <ol style="list-style-type: none"> Students are able to study the physical properties of thin films using XRD, FTIR and analyses them. 4 Students are able to study the structural properties of thin film by SEM, FESEM and analyses them.
306B	Electronics –I(Special)	<ol style="list-style-type: none"> Select appropriate 8085 instructions based on size and functions to write a given assembly language programs like Addition, subtraction, division and multiplication .. Etc. Write an ALP to interface different peripherals like DAC, ADC, Stepper motor and LED. Perform different modulation and demodulation techniques. Design of active filters like low pass, High pass , Band pass etc.
306C	Nanoscience-I(Special)	<ol style="list-style-type: none"> Students are able to understand and able to do the synthesis of metallic nanoparticles like silver and study the structural and optical behaviour using XRD and spectrophotometer. Students are able to do the synthesis of nanomaterials using sol-gel method. Students are able to understand the concept of thermal decomposition of materials and able to synthesize the nanoparticles by using thermal decomposition process. Students are able to calculate the particle size and optical absorption of the synthesized nanomaterials using characterization techniques like XRD, UV-vis spectroscopy.
Semester -IV		
401	Electromagnetic Theory and Optics	<ol style="list-style-type: none"> Students are able to understand Maxwell's Equations and E.M. wave equations in waveguide of the arbitrary cross section. Students are able to calculate TE and TM modes of waveguide. Students are able to understand and apply scalar and vector potentials, retarded potentials, Lienard–Wiechert potentials. Students are able to understand radiation from accelerated charges and different radiation reaction. Students are able to understand the different aspects of the special theory of relativity in electrodynamics.

402	Molecular Resonance and Spectroscopy	<ol style="list-style-type: none"> 1. Students are able to understand and apply LL coupling, SS-coupling, LS coupling in atomic spectra and able to calculate and their selection rules. 2. Students are able to understand Zeeman effect and Paschen-Back of two electrons, Stark effect of hydrogen and Compton effect. 3. Students are able to understand techniques and instrumentation of infra-red spectroscopy. 4. Students are able to understand and apply Frank- Condon principle, Born-Oppenheimer approximation
403A	Solid State Physics -III	<ol style="list-style-type: none"> 1. To learn about the Magnetism in that they go through Heisenberge model, Dispersion relation for magnons in a ferromagnet, Susceptibility and Hubbard model and energy bands. 2. Students can acquire knowledge of Superconductivity –I and Sper conductivity –II.
403B	Electronics-III (Microcontrolle rs)	<ol style="list-style-type: none"> 1. Demonstrate the various features of microcontroller 8051. 2. Identify the hardware elements of 8051 microcontroller including architecture and pin functions and programming model including registers, instruction set and addressing modes. 3. Select appropriate 8051 instructions based on size and functions to write a given assembly language program. 4. Design a given interfacing system using concepts of memory and I/O interfacing, LCD interfacing, LED interfacing, ADC and DAC interfacing with 8051. 5. Demonstrate the features of other Microcontrollers E.g.: ATMEL, PIC microcontrollers
403C	Material Science -II	<ol style="list-style-type: none"> 1. Understanding Luminescence spectra (emission and absorption). 2. Students will get the knowledge of Radiative and nonradiative processes. 3. About the Different kinds of Luminescence 4. Student s able to understand the different kinds of colour centres in alkali halides. 5. Ceramic materials and their Phase diagram rules for binary oxide systems students can gain knowledge. 6. Students are able gain the knowledge of Composite and polymer materials.

404A	Solid State Physics -IV	<ol style="list-style-type: none"> 1. Students can learn the preparation and characterization techniques of thin film. 2. Students are gain the knowledge of Nano-structured materials –preparation and characterization. 3. students get the knowledge of polymers and Ceramic materials.
404B	Electronics –IV Optical, Satellite and Mobile Comm.System	<ol style="list-style-type: none"> 1. To learn about the historical development, advantages, disadvantages and applications of optical fiber communication. 2. To learn the basic elements of optical fiber transmission link, fiber modes, configurations and structures. 3. To understand the different kind of losses, signal distortion. 4. Gather fundamental knowledge about optical fiber communication system and its application. 5. Describe the satellite orbits and its trajectories with the definitions of parameters associated with it. 6. Analyze the satellite orbits. 7. Analyze the earth segment and space segment. 8. Describe the subs systems of satellite and earth station. 9. Describe the satellites used for applications in remote sensing, weather forecasting and navigation. 10. Understand the cellular mobile system design and concepts. 11. Interpret the Co-channel interferences and their parameters. 12. Illustrate the importance of Handoff for preventing loss of interruption of services to a caller. 13. Interpret the channel sharing and cell splitting to reduce the call dropping or blocking rates in a mobile cellular network. Extend the concepts of channel assignment, dropped call rate to improve cell coverage for better network services.
404C	Nanoscience Special -IV	<ol style="list-style-type: none"> 1. Students are able to understand and study the various characterization techniques (Electron microscopes) like SEM, TEM, STM, AFM and SNOM for synthesized nanomaterials and the differences and advantages of these microscopes. 2. Students are able to how calculate crystallite size using XRD techniques. 3. Students are able to understand mechanical,

		<p>structural, thermal, electrical, optical and magnetic properties nanomaterials.</p> <p>4. Students are able to understand the synthesis and physicochemical properties of carbon based nanomaterials like CNT's, Fullerene materials and B-N tubes and single electron transistors.</p> <p>5. Students are able to understand the synthesis and properties of advanced nanomaterials like aerogels, zeolites and porous silicon materials and their applications</p>
Semester –IV Labs		
405	General Physics-II	<ol style="list-style-type: none"> 1. Students can the analysis of an audio amplifier using optical fiber, Numerical aperture of an optical fiber, characteristics of a Laser Diode. 2. Students are able to do calculation of susceptibility of a salt. 3. Using G.M Counter students can find the Gamma-attenuation coefficients for lead, copper and aluminium.
406A	Solid State Physics(Special)	<ol style="list-style-type: none"> 1. Students are able to do synthesis different metal oxides using different techniques. 2. Students are able to do characterization of thin films. 3. Students are able to analysis results of thin films. 4. Students are expertise in the preparation and characterization of thin film. Student will be able to create, apply, and disseminate the basic properties of semiconductors materials and Physics behind them through solving problems. 5. Student will be able to create the ability to identify, formulate, analyze and solve problems in semiconductors physics. 6. Student will be able to create the quantitative and qualitative understanding of semiconductors. 7. Student will be able to apply quantitative and qualitative studies for designing the electronic devices under various fields
406B	Electronics(Special)	<ol style="list-style-type: none"> 1. Select an appropriate 8051 instructions based on size and functions to write a given assembly language programs for arithmetic Operations, Logical operations 2. Design a given interfacing system using

		<p>concepts of memory and I/O interfacing, LCD interfacing, LED interfacing, ADC and DAC interfacing with 8051.</p> <p>3. Perform different modulation and demodulation techniques.</p>
406C	Nanoscience(Special)	<ol style="list-style-type: none"> 1. Students are able to synthesize ZnO nanoparticles and analyse their structure and optical behaviour at RT. 2. Students are able to study the dielectric behaviour of glass, wood, BaTiO₃ materials with frequency variation and get the concept how the dielectric constant of these different materials changes. 3. Students are able to synthesize nanoparticles using high energy ball-milling and able to analyse the results. 4. Students are able to understand the various characterization techniques like XRD, UV-vis spectroscopy to know the structural and optical behaviour of nanomaterials 5. Student will be able to create the ability to identify, formulate, analyse and solve problems in semiconductors physics.