Department of Physics

Rajeev Gandhi Govt. P.G. COLLEGE, AMBIKAPUR-497001 (C.G.)

Course Outcomes of M.Sc. (Physics)

M.Sc. I Semester

Course Title: Mathematical Physics

Course Code: MSP 101

Course Outcomes: After completing the course the students will able to : -

1. Solve differential equations like Legendre, Bessel and Hermite that are common in physical sciences.
2. Solve the different partial differential equations encountered in physical problems and draw inferences from solutions.
3. Solve transfer functions in Instrumentation using Laplace transforms.
4. Apply Fourier transforms in Holography.
5. Apply Matrices in the study of electrical circuits, Quantum Mechanics and Optics. Apply the knowledge of Tensors to understand phenomenon like stress and strain.
6. Useful to obtain the basic knowledge of Group theory and its applications

Course Title: Classical Mechanics

Course Code: MSP 102

Course Outcomes: After completing the course the students will able to : -

1. Understand basic mechanical concepts related to discrete and continuous mechanical systems and also Cyclic coordinates and conservation theories.
2. Apply Newton's laws of motion and conservation law of energy, linear and angular momentum to solve advanced problems involving the dynamic motion of classical mechanical system
3. Solve the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulations of classical mechanics.
4. Explore the application of Hamilton's equations in solving the equation of motion of a particle in a central force field, projectile motion of a body.
5. Formulate the equations of rigid body dynamics and demonstrate the examples of non-inertial frames of reference.
6. Solve the equations of coupled oscillator and to examine the two coupled pendulums, and double pendulum related problems.

Course Title: Quantum Mechanics-I

Course Code: MSP 103

Course Outcomes: After completing the course the students will able to : -

1. Understand and explain the differences between classical and quantum mechanics
2. Learn operator formalism for observables and basic commutation relations.
3. Solve Schrödinger equation for simple potentials like linear Harmonic oscillator and Hydrogen atoms.
4. Understand the space, time and displacement symmetries.
5. Formulate the Heisenberg & Dirac formulation of quantum mechanics-explain various types of imperfections in crystals.
6. Solve the linear harmonic oscillator and hydrogen-like atom problems using Dirac formulation-analyze the mechanisms behind elastic and plastic deformation is solids and compare different strengthening techniques.
7. Demonstrate angular momentum operators associated with spherical and symmetrical systems. -summarize ceramics and its types and relate their applications with properties.
8. Explain scattering theory, formulate and solve scattering equation-classify polymers and composites based on their properties and applications.
9. Apply the Variational principle and WKB Approximation to solve the real problems-Classify nanomaterials, their fabrication techniques and co relate the effects of confinement to nanoscale on their properties.

Course Title: Electronic Devices and Applications

Course Code: MSP A02

Course Outcomes: After completing the course the students will able to : -

1. Understanding the physics of the devices their characteristics and applications, to be able to use them in electronic circuits.
2. Students would develop an insight into the technologies that go into an IC chip that they would be extensively using during and after the course.
3. In depth understanding would enable the students to appreciate the beauty of the subject and design amplifiers that are technically sound.
4. Students would develop a comprehensive understanding of contemporary integrated circuit amplifier design.
5. Understand the working of latches, flip-flops, designing registers, counters, a/d and d/a converters.
6. Students would be aware of various signal conditioning, processing and generation techniques thus being better equipped to understand their use in larger and complex systems.

M.Sc. II Semester

Course Title: Electronics

Course Code: MSP 201

Course Outcomes: After completing the course the students will able to : -

1. Acquire knowledge of operational amplifier circuits and their applications.
2. Gain knowledge and evaluate the Boolean expressions, combinational logic circuits and Simplifications using Karnaugh maps.
3. Analyze the operation of decoders, encoders, multiplexers, adders and subtractors.
4. Understand the working of latches, flip-flops, designing registers, counters, a/d and d/a converters.
5. Design and Analyze synchronous and asynchronous sequential circuits.

Course Title: Atomic and Molecular Physics

Course Code: MSP 202

Course Outcomes: After completing the course the students will able to : -

1. Deal with problems related to Hydrogen-like atomic spectra.
2. Having knowledge about the rotational, vibrational and Raman spectroscopy of molecules.
3. Developing analytical, laboratory and computing skills through problem solving, laboratory & computer based exercises which involve the applications of atomic and molecular physics.
4. Carry out experimental and theoretical studies on atomic and molecular physics with focus on structure & dynamics of atoms and molecules.
5. Account for theoretical models, terminology & working methods used in atomic and molecular physics.
6. To successfully apply the theoretical techniques presented in course to practical problems.
7. comprehend the instrumentation techniques that are used in different regions of spectra.

Course Title: QUANTUM MECHANICS II

Course Code: MSP 203

Course Outcomes: After completing the course the students will able to : -

1. Understand the kinematics of scattering process.
2. Evaluate the partial wave analysis using Born approximation method.
3. Apply time Independent perturbation theory for non-degenerate case.
4. Gain knowledge on WKB approximation method to study alpha decay. Remember time dependent perturbation theory.
5. Analyze the interaction of an atom with electromagnetic radiation and the relativistic quantum mechanics using Klein Gordon equation, Explore the properties of gamma matrices.

Course Title: ELECTRONIC INSTUMENTATION

Course Code: MSP B02

Course Outcomes: After completing the course the students will able to : -

1. Measure various electrical parameters with accuracy, precision, resolution.
2. Design different types of amplifiers and filters.
3. Select specific instrument for specific measurement function.
4. Understand principle of operation, working of different electronic instruments like digital multi meter, vector voltmeter, and power factor meter.
5. Analyze the functioning, specification, and applications of signal generators and signal analyzing instruments.

M.Sc. III Semester

Course Title: Solid State Physics

Course Code: MSP 301

Course Outcomes: After completing the course the students will able to : -

1. Acquire knowledge about different experimental approaches in the study of Fermi surfaces in different materials.
2. know Semiconductor properties and carrier concentration, effect of temperature on mobility, electrical conductivity and Hall Effect in conductors and semiconductors.
3. Understand piezo, pyro and Ferro electricity, ferroelectric domains and hysteresis.
4. Understand basic theories of magnetic materials like ferromagnetism, ferrimagnetism, anti-ferromagnetism.
5. elaborate electron in potential wells, degeneracy state, density of states, thermal and electrical conductivity of metals, and thermoelectric power.
6. Acquire basic knowledge on (low temperature) superconductivity in type I and type II super conductors, and also different theoretical approaches to super conductivity (BCS).
7. Understanding of various phenomena related to super conductivity, such as the Meissner effect, flux quantization, Giæver- and Josephson tunnelling.

Course Title: Nuclear and Particle Physics

Course Code: MSP 303

Course Outcomes: After completing the course the students will able to : -

1. Understand Nuclear Force And Nuclear Models.
2. Analyze the semi empirical mass formula and its applications using liquid drop model and shell model.
3. Understand the concept of Nuclear Decay Processes.
4. Interpret the Classification of nuclear reactions.
5. Understand the Classification of elementary Particles and their Quantum Numbers

Course Title: Classical Electrodynamics

Course Code: MSP 303

Course Outcomes: Course Outcomes: After completing the course the students will able to : -

1. Acquire knowledge on general wave equation using Maxwell's equations and able to derive Laplace equations for electrostatic potential in Cartesian, spherical and cylindrical coordinates.
2. Analyze scalar and vector magnetic potentials and the propagation of EM waves in different media.
3. Understand the propagation of EM waves in bounded and unbounded media & Boundary conditions for E, D, B and H.
4. Understand poynting theorem and its physical significance.
5. Apply vector calculus to static electric-magnetic fields in different situations.
6. Formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media.
7. Interpret the deeper meaning of the Maxwellian field equations and account for their symmetry and transformation properties.
8. Define and derive expressions for the energy both for the electrostatic and magneto statics fields, interpret Poyntings theorem derived from Maxwell's equations.

Course Title: Tribal Studies

Course Code: MSP C01

Course Outcomes: After completing the course the students will able to : -

1. Understand the Constitutional Safeguards and Tribal administration.
2. Learn tribal development planning and strategies.
3. Understand the Classification and characteristics of tribal regions.
4. Learn tribal development planning and strategies.

M.Sc. IV Semester

Course Title: Material Science and Laser Physics

Course Code: MSP 401

Course Outcomes: After completing the course the students will able to : -

1. Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.
2. know the Mechanical response of Materials under applied load such as elastic response, stress-strain curve, viscoelasticity, Plastic deformation.
3. understand and explain Corrosion and degradation of materials and corrosion inhibition
4. Understand concept of mechanical behavior of materials and calculations of same using appropriate equations
5. Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions
6. Explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.
7. Compare among different of crystal imperfections.
8. Gain knowledge on laser rate équations for Two, Three, Four-level laser systems.
9. Understand Einstein relations for émission and absorption of radiation.
10. Gain knowledge on classification of laser systems.
11. Gain knowledge on application of various laser systems

Course Title: Spectroscopy

Course Code: MSP 402

Course Outcomes: After completing the course the students will able to : -

1. Recognize spectroscopy in microwave, Rotational spectra of rigid diatomic molecules, selection rules, interaction of spectral lines
2. Study of Vibrating diatomic molecule, energy levels of a diatomic molecule, simple harmonic and anharmonic oscillator, Scattering of light and Raman Spectrum. rotational and vibrational Raman Spectra
3. Make Students aware of the fine structure of ESR absorption, Hyperfine structure, Double resonance in ESR, Techniques of ESR spectroscopy
4. Understand Principles and Applications of Mossbauer spectroscopy
5. Understand concepts of Nuclear and Radiation Chemistry. Applications of Radioisotopes.
6. Understand Micro-wave, IR and RAMAN spectroscopy and interpret the data from these
   measurements.
7. Understand the basic principles of NMR and ESR spectroscopy and its applications

Course Title: Statistical Physics

Course Code: MSP 403

Course Outcomes: After completing the course the students will able to : -

1. Explain the fundamentals of statistical physics and thermodynamics as logical consequences of the postulates
2. Gain knowledge about classical and quantum statistical mechanics, including Boltzmann, Fermi-Dirac, and Bose-Einstein statistics.
3. Apply the formalism of statistical mechanics and probability theory to derive relations between thermo dynamical quantities.
4. Understand and explain the importance of Phase transition of first and second order, Landau theory of phase transition, Ising model, Brownian motion, Langevin theory, Fokker-Planck equation. Weiss theory of ferromagnetism
5. broad understanding of Statistical Mechanics, and show a critical awareness of the significance and importance of the topics, methods and techniques.
6. Understand the physical statistics and its relation to information theory and able to Solve statistical mechanics problems for simple non-interacting systems.
7. Understand the phase transitions and universality in second order phase transitions.

Course Title: Satellite Communications

Course Code: MSP D02

Course Outcomes: After completing the course the students will able to : -

1. The knowledge about the Satellite communications Principles and Properties
2. Know about the Space craft subsystems and Launch vehicles.
3. Design the Satellite Earth station antennas.
4. analyze the effects of various parameters on Satellite System performance.
5. understand the applications of Satellite Communication.
6. learn the dynamics of the satellite.
7. understand the communication satellite design.
8. understand how analog and digital technologies are used for satellite communication networks.
9. learn the design of satellite links.
10. study the design of Earth station and tracking of the satellites.