Maratha Vidya Prasarak Samaj's

Arts, Science and Commerce College, Ozar (MIG)

Course Outcomes

Name of the department: Physics

Class	Name of the Course: Sem: (Paper): Code:	Name of the Teacher	Outcomes
F.Y.B.Sc. Term I	**Mechanics Paper I:** **Section I**	Dr. S B Nahire	1. Demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems. 2. Use the free body diagrams to analyse the forces on the object. 3. Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them. 4. Understand the concepts of elasticity and be able to perform calculations using them. 5. Understand the concepts of surface tension and viscosity and be able to perform calculations using them. 6. Use of Bernoulli's theorem in real life problems. 7. Demonstrate quantitative problem solving skills in all the topics covered.
Term II	**Heat and thermodynamics Paper I** **Section II**	Dr. S B Nahire	1. Apply the laws of thermodynamics to formulate the relations nessesory to analyses a thermodynamic process 2. Describe the properties of and relationships between the thermodynamic properties of a pure substance. 3. Describe the ideal gas equation and its limitations. 3. Describe the real gas equation. 4. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process. 5. analyse the heat engines and calculate thermal efficiency. 6. Analyze the refrigerators, heat pumps and calculate coefficient of performance. 6. Understand property 'entropy' and derive some thermo dynamical relations using entropy concept 7. Understand the types of thermometers and their usage.
F.Y.B.Sc. Term I	**Physics Principles and Applications Paper I**	Prof .P. S. Gajare	1. To demonstrate an understanding of electromagnetic waves and its spectrum. Understand the types and sources of electromagnetic waves and applications. To understand the general structure of atom, spectrum of hydrogen atom. 2. To understand the atomic excitation and LASER principles. 3. To understand the bonding mechanism in molecules and rotational and vibrational energy levels of diatomic molecules. 4. To demonstrate quantitative problem solving skills in all the topics covered
Term II	**Electromagnetism Paper II**		1. Demonstrate an understanding of the electric force, field and potential, and related concepts, for stationary charges. 2. Calculate electrostatic field and potential of simple charge distributions using Coulomb's law and Gauss's law. 3. Demonstrate an understanding of the dielectric and effect on dielectric due to electric field. 4. Demonstrate an understanding of the magnetic field for steady currents using Biot-Savart and Ampere's laws 5. Demonstrate an understanding of magnetization of materials. 6. Demonstrate quantitative problem solving skills in all the topics covered.
F.Y.B.Sc. **Term I and II**	**Practical Paper III**		1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. 2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. 3. Demonstrate an understanding of laboratory procedures including safety, and scientific methods. 4. Demonstrate a deeper understanding of abstract concepts and

			theories gained by experiencing and visualizing them as authentic phenomena. 5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.
S.Y.B.Sc. : Sem I	**MATHEMATICAL METHOD IN PHYSICS Paper I PHY211**	Prof. P. S. Gajare	1. Understand the complex algebra useful in physics courses 2. Understand the concept of partial differentiation. 3. Understand the role of partial differential equations in physics 4. Understand vector algebra useful in mathematics and physics 5. C Understand the singular points of differential equation.
S.Y.B.Sc. : Sem I	**ELECRONICS Paper II PHY212**	Dr. S. B. Nahire	1. Apply laws of electrical circuits to different circuits. 2. Understand the relations in electricity 3. Understand the properties and working of transistors. 4. Understand the functions of operational amplifiers. 5. Design circuits using transistors and operational amplifiers. 6. Understand the Boolean algebra and logic circuits
S.Y.B.Sc. : Sem I I	**Oscillations waves and sound Paper I PHY221**	Dr. S. B. Nahire	1. Understand the physics and mathematics of oscillations. 2. Solve the equations of motion for simple harmonic, damped, and forced oscillators. 3. Formulate these equations and understand their physical content in a variety of applications, 4. Describe oscillatory motion with graphs and equations, and use these descriptions to solve problems of oscillatory motion. 5. Explain oscillation in terms of energy exchange, giving various examples. 6. Solve problems relating to undammed, damped and force oscillators and superposition of oscillations.
S.Y.B.Sc. : Sem II:	**OPTICS Paper II PHY222**	Prof. P. S. Gajare	1. Acquire the basic concepts of wave optics 2. Describe how light can constructively and destructively interfere 3. Explain why a light beam spreads out after passing through an aperture 4. Summarize the polarization characteristics of electromagnetic waves 5. Appreciate the operation of many modern optical devices that utilize wave optics 6. Understand optical phenomena such as polarisation, birefringence, interference and diffraction in terms of the wave model. 7. Analyse simple examples of interference and diffraction phenomena. 8. Be familiar with a range of equipment used in modern optics.
TYBScPAPER	**III (SEM I and II): PRACTICAL COURSE PH223**	Prof. P. S. Gajare	Learning Outcomes 1. After completing this practical course students will be able to 2. Use various instruments and equipment. 3. Design experiments to test a hypothesis and/or determine the value of an unknown quantity. 4. Investigate the theoretical background to an experiment. 5. Set up experimental equipment to implement an experimental approach. Analyse data, plot appropriate graphs and reach conclusions from your data analysis.
T.Y.B.ScSem III	**Mathematical method in physics. PH331**	Prof. P. S. Gajare	1. Study of Cartesian ,spherical, polar and cylindrical co-ordinate system and orthogonal co-ordinate system. 2. Understand the concept of special theory of relativity ,transformation equation for velocity ,acceleration etc. 3. Study of mass energy relations 4. Understand the roll of partial differential equation in physics,method separation of variables . 5. Study of power series solution legendre ,hermite and Bessel differential equation 6. Study of special function.
TY.B.Sc. : Sem III	**ClassicalElectrodynamics PH332**	Prof. P. S. Gajare	1. Understanding the concept of electric field and electric potential method of image charges. 2. Demonstration and understanding of magnetic induction magnetic field for steady current using biot's and saverts law, appears law, magnetic susceptibility, permeability ,hysteresis curve. 3. Understanding the concept of electromagnetic induction, faradays law, appears lawlentzs law.

			4. Study of Maxwell's equations. 5. Study of wave equation and plane wave in free space. 6. Study of pointing theorem and pointing vectors
T.Y.B.Sc. : Sem III :	**Classical Mechanics PH333**	Dr. S. B. Nahire	1. **Mechanics of system of particles :** Applications of Newton's laws of motion Projectile motion in various medium, Rocket motion, Motion of a charged particle in constant electric, magnetic and electromagnetic field. System of particles, Centre of mass, Conservation of linear momentum, angular momentum. 2. **Study of Motion in Central Force Field :** Central force, equivalent one body problem, Motion in central force field, General features of motion, equation of orbit , Deduction of Kepler's laws of planetary motion and Orbits of artificial satellite. 3. **Scattering of particles:** Elastic and inelastic scattering, Elastic scattering - Laboratory and centre of mass system. Scattering, Relation between scattering angles in laboratory and centre of mass system. 4. Differential cross-section, impact Parameter, total cross-section. 5. **Langrangian and Hamiltonian formulation:** Limitations of Newtonian formulation, Types of constraints, degrees of freedom, generalized coordinates, configuration space, D' Alembert's principle of virtual work, Langrangian equation from D' Alembert's principle, cyclic coordinates, Phase space, Hamiltonian's equations 6. **Canonical Transformation and Poisson's Bracket: -** Generating function, condition for Canonical transformation and problems , Definition , Identities, Poisson's Bracket , Jacobi identity
T.Y.B.Sc. : Sem III	**Atomic and molecular physics PH334**	Prof. B. P. Bhangale	1. Understanding of atomic structure and different atomic models and study of differ atomic model 2. **Palui Exclusion method** : Atomic structure : Rutherford model of atom ,Electron orbits 3. **One and two valence electron systems** :Spin-Orbit Interaction (Single valence electron atom), Energy levels of Na atom, selection rules, spectra of sodium atom, sodium Doublet 4. **Zeeman Effect** : Early discoveries and developments 2 Experimental arrangement 3 Normal and anomalous Zeeman Effect . 5. **X ray spectroscopy** : Nature of Xrays , Discrete and continuous Xray spectra, Daune and Hunt's 6. **Molecular spectroscopy** : Rotational energy levels , Vibrational energy levels ,Rotational and Vibrational spectra ,Electronic spectra of molecules.
T.Y.B.Sc. : Sem III:	**Computational physics PH335-**	Prof. P. S. Gajare	**Study of Concepts of programming:** 1. Definition and Properties of algorithms, 2. Algorithm development, Flow charts- symbols and simple flowcharts. Flow charts and Algorithms for Kinematic equations, Free fall, Equation of state, Factorial of a number. Types of programming language: Lower, middle and higher level languages. 3. **Study of Functions** : Structure of C program, Character set, key words, Constants andvariables, Variable names, Data types and their declarations, Symbolic Constants. Input/output functions: scanf ( ), printf ( ), getchar ( ), putchar ( ), getch ( ), gets ( ), puts ( ). Operators and Expressions: Arithmetic Operators, Relational Operators, LogicalOperators, Assignment Operators, Conditional Operator. Formatted input/output Application: break, continue, switch- case statement, goto statement. Use of Library functions: e.g. mathematical, trigonometric, graphics. 4. **Arrays and Pointers in C:** Arrays: 1-D, 2-D and String Examples: Arranging numbers in descending and ascending order, Sum of matrices, multiplication of matrices. Concept of Pointers 5. **User Defined Function in C:** User defined functions: Definitions and declaration of function, functionprototype, passing arguments (Call by value, Call by reference). Storage Classes: Auto, External, Static, Register variables. 6. **Graphics in C**: Some simple graphic commands- Line,

			Circle, Arc, Ellipse, Bar. 7. **Computational Physics:** Errors in Computation: Inherent errors in storing numbers due to finite bit representation to use in Computer, Truncation error, round off errors (Explain with the help of examples) 8. Iterative methods: Discussion of algorithm and flowcharts and writing C programs for finding single root of equation using bi-section method, Newton Raphson method. Discussion of algorithm and flowcharts and writing C program for trapezoidal rule and Simpson's 1/3rd rule (derivation of formula is not expected).
T.Y.B.Sc. : Sem III	**Element of material science PH336-**	Prof. B. P. Bhangale	1. To study the effect of Defects in Solids Material Properties : Mechanical, Electrical and thermal , Impurities in solids,Solid solutions in metals, 2. To study the deformation in solides Single Phase Metals :Single phase alloys ,Deformation , Elastic Deformation and Plastic Deformation , Mechanism of plastic Deformation by slip, Critical resolved shear stress (CRSS), Plastic deformation in poly crystalline materials 3. Molecular Phases :Polymers, Polymerization, Molecular weight of polymers, Linear polymers addition and condensation ,Cross linked polymer vulcanization of rubber 4. Ceramic Materials: Ceramic Phases, Classification of ceramic materials, Ceramic crystal, Mechanical behavior of ceramic, Electromagnetic behavior of ceramics, Electric properties dielectrics, semiconductors, piezoelectric b) Magnetic Properties Magnetic Ceramics, hard and soft ferrites 5. To study the Phase Diagrams: Basic terms System, Surrounding, Component, Coordinates, Phase, Equilibrium, Phase Diagram definition, importance and objective , Lever rule ,Gibb's phase rule.
T.Y.B.Sc. : Sem IV	**Solid state physics : PH341-**	Prof. B. P. Bhangale	1. **To study the Crystalline State Lattice, Basis**:Translational vectors, Primitive unit cell, Symmetry operations, Different types of lattices2D and 3D (Bravais lattices) ,Miller indices, Inter planer distances, SC, BCC and FCC structures, Packing fraction, Crystal structuresNaCl, diamond, CsCl, ZnS, HCP. 2. **X ray Diffraction and Other Characterization Techniques:** Crystal as a grating, Bragg's law and Bragg's Diffraction condition indirect and reciprocal lattice Ewald's construction, Experimental methods of X-ray diffraction: Laue method, Rotating Crystal method, Powder(Debye Scherer) method, Analysis of cubic structure by powder method, Characterization Techniques: Thermal gravimetric analysis(TGA), UV-visible spectroscopy, 3. Electron microscopy(SEM). **Free Electron and Band Theory of Metals** :Free Electron model, Energy levels and Density of orbital in 1D and 3D, Bloch theorem ,Nearly free electron model, Fermi energy, Fermi level, Hall Effect, Origin of energy gap, Energy bands in Solids, Effective mass of electron (with derivation), Distinction between metal, semiconductor and insulator. 4. **Magnetism** : Diamagnetism, Langevin theory of Diamagnetism, Application of diamagnetic material:(Superconductor)Occurrence of Superconductivity, Critical magnetic field and Meissner effect,Paramagnetism, Langevin theory of Para magnetism, ferromagnetism,
T.Y.B.Sc. : Sem IV	**Quantum Mechanics : PH341-**	Dr. S. B. Nahire	1. Matter waves and De Broglie hypothesis. Davisson and Germer experiment 2. Concept of wave packet, phase velocity, group velocity and relation betweenthem 3. Heisenberg's uncertainty principle with thought experiment eg - Electron diffraction experiment, different forms of uncertainty. 4. **The Schrodinger equation:** Schrodinger time dependent equation. and Schrodinger time independent equation.(Steady state equation). Probability current density, equation of continuity, and its physical significance. Expectation value – Ehrenfest's theorem

			5. **Applications of Schrodinger Steady state equation:** Particle in infinitely deep potential well (one - dimension).Particle in three dimension rigid box. Step potential.Potential barrier. (Qualitative discussion).Barrier penetration and tunneling effect.Harmonic oscillator (one-dimension), correspondence principle. 6. **Spherically symmetric potentials:** Schrodinger's equation in spherical polar co-ordinate system.Rigid rotator (free axis). Hydrogen atom: Qualitative discussion on the radial and angular parts of thebound state energy, energy state functions, Quantum numbers n, *l*, m*l*, m*s*–Degeneracy. 7. **Operators in Quantum Mechanics:** Hermitian operator. Position, Momentum operator, angular momentum operator, and total energyoperator (Hamiltonian).
T.Y.B.Sc. : Sem IV	**Thermodynamics and statistical physics PH343**	Prof. P. S. Gajare	1. **Study of Kinetic Theory of Gases:** Transport phenomenon, Viscosity, Thermal conductivity and diffusion, Problems 2. **Study of Maxwell Relations and Application:** Thermodynamically functions: Internal Energy, Enthalpy, Helmholtz function, Gibb's function, Derivation of Maxwell Relations, First and Second TdS Equations, Specific heat and latent heat equations, Joule Thomson effect (Throttling Process) 3. **Study of** Probability, distribution functions, Random Walk and Binomial distribution, Simple random walk problem, Calculation of mean values, Probability distribution for large-scale N, Gaussian probability distributions, 4. **Understanding of Statistical Distribution of System of Particles:** Specification of state of system, Statistical ensembles, Basic Postulates, Probability calculations, Behaviors of density of states, Thermal, Mechanical and general interactions 5. Micro canonical Ensemble (Isolated System), Canonical ensembles, simple application of canonical ensemble, Molecules in Ideal gas, Calculation of mean values in canonical ensemble. 6. **Quantum Statistics:** Quantum distribution function, Maxwell-Boltzmann's statistics, Bose-Einstein Statistics, Fermi-Dirac Statistics, Comparison of the distributions.
T..Y.B.Sc. : Sem IV	**Nuclear physics: PH344**	Prof. B. P. Bhangale	1. **Understanding of basic Properties of Nucleus**Composition, charge, size, density of nucleus, Nuclear Angular momentum,Nuclear magnetic 2. dipole moment, Electric quadrupole moment, parity andsymmetry, Mass defect and Binding 3. energy, packing fraction, classificationof nuclei, stability of nuclei (N Vs Z Curve) and problems. 4. **Study of Radioactivity:** Radioactivity disintegration (concept of natural and artificial radioactivity,Properties of α, β, γrays, laws of radioactive decay, halflife, mean life,specific activity and its units, successive disintegration and equilibriumsand radioisotopes). Application of radioactivity (Agricultural, Medical, Industrial, Archiological). 5. **Study of Nuclear forces and Nuclear models :**Meson theory of nuclear forces, Properties of nuclear forces, properties ofdeuteron system, Elementary particles, Quarks model for elementaryparticles. 6. **Wprking and Applications of Particle Accelerator and Detectors:** Introduction to particle Accelerators, Linear (electron/proton Linac)Cyclic (Cyclotron) Classification of Nuclear Detector Gas filled Detectors (G. M. counter) Solid state detectors (NaI(Tl)scintillation counter) 7. **Nuclear Reactions :**Introduction to Nuclear reactions, compound nucleus, Qvalueequation,Exothermic and Endothermicreaction, Threshold energy, Conservationlaws, nuclear crosssection. 8. **Nuclear Energy:** Nuclear fission, chain reaction and critical mass, nuclear reactor and its basic components, homogeneous and heterogeneous reactors, power reactor, fast breeders, nuclear fusion, stellar energy.

T.Y.B.Sc. : Sem IV :	**Electronics PH345-**	Prof. B. P. Bhangale	1. understand the working of special purpose diodes. 2. Understand and working of transistor amplifier,field effect transistor,operational amplifier and its applications . 3. Understand and working ofregulated power supply. 4. design the circuts using SOPand POS technique ,reduction of Boolean expretion using K-Map Method 5. Disining of ADDER and SUBTRACTOR circuits
T.Y.B.Sc. : Sem IV	**: PH346-Laser**	Prof. B. P. Bhangale	1. Understand the concept of Ordinary light and laser light 2. Understand the principal of spontaneous emission and stimulated emission ,stimulated absorption. 3. Understand and explanation of laser action. 4. Understand and explanation of characteristics of laser and types of laser. 5. Undertand and demonstration of applications of lasers in different field.

H. O. D.

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