Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: P. P. RAUT **Department: PHYSICS**
Program: BSc FY **Subject**: PHYSICS **Course Code**: **P-I Paper**
Title: Mechanics and Properties of Matter

Unit No.	Unit Name	Topics	Unit-wise Outcome
I	**Mechanics**	Laws of Mechanics (Newton's Laws of Motion), Newton's Law of Gravitation, Keplar's Law of Planetary Motion, Gravitational Field, Gravitational Intensity, Gravitational Potential, Gravitational Potential energy, Conservation Law, Work, Power, Kinetic Energy (Work Energy Theorem),Conservation of energy for a particle energy function, Motion of a body near the surface of earth, Types of conservative and non- conservative forces	Will be able to determine gravitational force, intensity, potential etc corresponding any two objects as well as work, power kinetic energy etc.
II	**Surface Tension**	Molecular Forces, Surface Tension & its explanation, Pressure difference across a curved surface, Expression for Excess Pressure inside a Spherical Drop and spherical Soap Bubble, Surface Tension by Jaeger's Method, Surface Tension by Ferguson Method.	Can find experimentally surface tension of any surface and excess pressure across any curved surface
III	**Viscosity**	Introduction, Coefficient of Viscosity, Streamline flow, critical velocity, Reynolds Number & its significance, Bernoulli's Theorem, Poiseuille's equation for the flow of liquid through a tube, Experimental determination of coefficient viscosity by Poiseuille's Method.	Can determine coefficient of viscosity of any fluid

IV	**Elasticity**	Introduction, Hooke's Law, Elastic Constants (**Y, K & ή**), Poisson's Ratio, Twisting couple on a cylinder or a (wire), Torsional pendulum ,Bending of Beam, Bending Moment, Cantilever (Weight of the beam is ineffective, Weight of the beam is effective), Depression of a Beam supported at the ends and loaded at the Centre, Determination of Y by bending of beam.	Can determine the young, rigidity and bulk modulus of any material

Specify Course Outcome: After completion of this course the students will be able to

1. Calculate gravitational potential, gravitational potential energy, and gravitational intensity of any objects.
2. Determine viscosity of fluids, surface tension of various surfaces and can also find all modulus of elasticity.

Signature of Teacher

Name of Teacher: M P SARWADE **Department: PHYSICS**
Program: BSc FY **Subject**: PHYSICS **Course Code**: **P-II**
Paper Title: ***Mathematical Methods in Physics***

Unit Numb er	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	**Complex variables**	Introduction, Definition, complex algebra (Addition, Subtraction, Multiplication, Division, conjugate complex number), Argand diagram, Graphical representation of Sum, Difference, product and Quotient of complex number, Properties of moduli ,arguments and geometry of complex numbers, Rectangular, polar and exponential form of complex numbers.	Will be able in solving real cubic and quadratic equations and solving contour integration and conformal mapping

II	**Vector Analysis**	Introduction to Scalars, Vectors, Dot products and Cross Product of two vectors, Vector triple product, Scalar triple product, Scalar and vector field , Gradient of a scalar field , Divergence of a vector field and Curl of a vector field and their Physical interpretation , Laplacian Operator ,Line integral, Surface integral, Volume integral, Gauss's divergence theorem, Stoke's theorem, Vector identities.	Can determine volume of a parallelepiped, line , surface and volume integrations
III	**Partial Differentiation**	Definition of Partial Differentiation, Order or Successive Differentiation, total Differentiation and Chain rule, Change of variables from Cartesian to Polar Co- ordinates, Condition for maxima and minimum (without proof), Linear Homogeneous Partial differential equations with constant coefficients, Rules for finding the complementary function.	Will be able to determine relative and absolute maxima and minima of various functions and can find complementary function
IV	**Fourier series**	Introduction of Periodic Functions, Definition of Fourier Series, Evaluation of the coefficients of Fourier series, Cosine series, Sine series, Dirichlet's Conditions, Graphical representations of even and odd functions, Advantages of Fourier series, Physical applications of Fourier series analysis: Square wave and half wave Rectifier.	Will be able to use this technique for vibration analysis, acoustics, optics, signal processing, image processing, thin-walled shell theory etc

Specify Course Outcome: After completion of this course the students will be able to

1. To solve real cubic, quadratic equations, contour integration and conformal mapping.
2. Can perform line, surface and volume integrations and also find the volume of parallelepiped
3. Can find relative and absolute maxima and minima of various functions.
4. Can use Fourier series for vibration analysis, acoustics, optics, signal processing etc.

Signature of Teacher

Name of Teacher: P . P . R A U T **Department: PHYSICS**

Program: BSc FY **Subject**: PHYSICS **Course Code**: **P-III**
Paper Title: ***Heat and Thermodynamics***

Unit Numb er	Unit Name	Topics	Unit-wise Outcome
I	**Thermo metry**	Types of Thermometers, Centigrade and Fahrenheit scale, relation between Celsius, Kelvin, Fahrenheit & Rankine scales, Platinum resistance thermometer, Seebeck effect.	Will be able to convert temperature from one scale to other
II	**Real Gases and Their Behavior**	Behavior of gases at high pressure, Boyle temperature, Andrew's Experiment on CO2, Amagat's Experiment, Vander wall's Equation of State, Critical Constants, Corresponding states, Coefficients of Vander wall's Equation, Reduced Equation of State, Joule Thomson Porous Plug Experiment, Temperature of Inversion, Relation between Boyle temperature and Temperature of Inversion	Will be able to understand relation between state parameters and process of liquefaction of gases
III	**Transpor t Phenome**	Molecular Collisions, Mean free path, Expression for mean free path, Transport Phenomena, Viscosity of Gases, Thermal Conductivity of Gases, Diffusion, Inter relation between three transport coefficients.	Will be able to determine various transport
	non in Gases		coefficients of gases
IV	**Thermod ynamics and Thermod ynamical**	First Law of Thermodynamics, Relation connecting P, V and T in an Adiabatic Process, Second Law of Thermodynamics (Kelvin and Clausius statements), Carnot's cycle, Carnot's heat Engine, Carnot's Theorem, Entropy, Entropy of Irreversible processes entropy of reversible	Will be able to determine various functions of thermodynamics.

	Relations	process, Third Law of Thermodynamics. Internal energy, Helmholtz' function, Enthalpy, Gibb's function, Maxwell's Thermodynamical Relations, **T- dS** equations, Clausius-Clapeyron latent heat equations.	

Specify Course Outcome: After completion of this course the students will be able to

1. convert temperature from one scale to other
2. understand relation between state parameters and process of liquefaction of gases
3. determine various transport coefficients of gases and various functions of thermodynamics.

Signature of Teacher

Name of Teacher: M P S A R W A D E **Department: PHYSICS**
Program: BSc FY **Subject**: PHYSICS **Course Code**: **P-IV**
Paper Title: ***Electricity and Magnetism***

Unit Number	Unit Name	Topics	Unit-wise Outcome
	Electrostatics and Magnetostatics	Concept of electric field, electric flux, Gauss's law, conservative nature of electric filed, concept of electric potential, potential energy of a system of charges, energy density in an electric field. Concept of Magnetic Field (**B)** and magnetic flux (Φ), Lorentz Force, Force on a current carrying conductor, Biot and Savert,s Law, Applications of Biot- Savert,s law to straight and circular current carrying conductor, Amperes circuital law (Integral form), Curl of magnetic field (Ampere's circuital law differential form). Motion of charged particles in uniform electric field, Motion of charged particle in magnetic field, Maxwell's displacement current.	Will be able to determine various physical quantities of static electric and static magnetic fields
II	**Magnetization**	Introduction, Magnetic Induction (**B)**, Flux density, Intensity of magnetization (**I)**, Intensity of magnetizing field (**H**) Permeability, Susceptibility, Relation between Permeability and Susceptibility, Hysteresis curve, Brief introduction of ferromagnetic, paramagnetic and diamagnetic phenomenon, I-H curve By magnetometer method, Principle and construction of Moving coil type Ballistic Galvanometer with theory (**q** $\propto$ $\boldsymbol{\theta}$).	Will be able to find various physical quantities of magnetic field and use BG with better understanding
III	**Time Varying (Dynamic) Fields (Waves)**	Definition of electromagnetic induction, Faraday's Law of Electromagnetic Induction, Lenz's law, Self induction, Self induction of a Solenoid, Mutual induction, Mutual Induction of a pair of coil, Work done in establishing current in an inductance, Mutual inductance of a Co axial solenoids, Problems.	Will be able to determine electromagnetic induction in various circuits

IV	**Alternating Current circuits**	Brief introduction to AC through Capacitor and Inductor, Nature of Impedance(z) and Reactance(**x**) of Inductance(**zL & xl**), Capacitance(**zc & xc**) and Resistance(**zR & xR**), Complex number and J-operator, Complex Impedance and reactance, Application of Complex numbers in solving AC Circuit (Not vector diagram), L-C-R (Series resonance and Parallel resonance) circuits. Power in AC circuit and Power Factor, Principle, working and types of transformers (step up and step down with figures), Current, voltage and turns ratio of transformer, Efficiency of transformer, AC bridges (Wheatstone bridge).	Will be able to determine reactance and impedance of various components and can solve various AC circuits. Can find efficiency of any transformer

Specify Course Outcome: After completion of this course the students will be able to

1. determine various physical quantities of static electric and static magnetic fields
2. find various physical quantities of magnetic field and use BG with better understanding
3. determine electromagnetic induction in various circuits
4. determine reactance and impedance of various components and can solve various AC circuits. Can find efficiency of any transformer.

Signature of Teacher

Name of Teacher: P S KACHAVE **Department: PHYSICS**
Program: BSc SY **Subject**: PHYSICS **Course Code**: **P-VI**
Paper Title: ***Waves and Oscillations***

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Waves**	Wave velocity and particle velocity, Differential equation of wave motion, Energy of a plane progressive wave, Equation of motion of a vibrating string, Velocity of transverse waves along a string, Frequency and period of vibration of a string	Will be able to determine various physical parameters of waves
II	**Stationary waves**	Analytical treatment of stationary waves (closed end& open end pipe at the other end), Investigation of pressure and density changes at displacement Nodes and Antinodes, Distribution of Energy in a stationary wave, Energy is not transferred in a stationary waves.	Will be able to find density and pressure at various positions of stationary waves
III	**Free and Forced**	Free Vibrations, Forced Vibrations, Resonance, Oscillatory Motion of a particle from	Will be able to differentiate
	Vibrations	energy considerations, Damped simple harmonic motion, Aperiodic, Critically Damped Oscillatory Motions, Effect of damping on Frequency, Forced Vibrations, resonance and sharpness of resonance.	between free and forced vibrations

IV	**Acoustics and Ultrasonics**	Reverberation, Reverberation time, Derivation of Reverberation Time (Sabine's formula), Absorption coefficient, Determination of absorption coefficient(reverberation Chamber Method), Conditions for good acoustical designs of auditorium, Ultrasonics, Piezo-electric & Magnetostriction effect, Piezoelectric Oscillator, Magnetostriction oscillator, Detection of ultrasonic waves: Acoustic grating	Will be able to determine reverberation time of an auditorium and can generate ultrasonic waves by any ofthe methods

Specify Course Outcome: After completion of this course the students will be able to

1. determine various physical parameters of waves
2. determine reverberation time of an auditorium and can generate ultrasonic waves by any of the methods
3. differentiate between free and forced vibrations
4. determine reverberation time of an auditorium and can generate ultrasonic waves by any of the methods

Signature of Teacher

Name of Teacher: M P SARWADE **Department: PHYSICS**

Program: BSc SY **Subject**: PHYSICS **Course Code**: **P-VII**

Paper Title: ***Statistical Physics, Electromagnetic Theory & Relativity***

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	**Statistical Basis and Thermodynamics**	Statistical Basis, probability , probability and frequency, permutation and combinations, Micro and Macro states, Thermodynamic probability, Entropy & probability	Will be able to apply statistics to thermodynamics

II	**Classical Statistics and Quantum Statistics**	Phase space, Maxwell-Boltzmann Distribution law, Quantum Statistics- Bose-Einstein Distribution law, Fermi- Dirac Distribution law, comparison of M. B., B.E. and F. D. statistics, Application of Quantum statistics to Photon gas and Electron gas	Will be able to understand the way of distribution of objects in classical and quantum systems
III	**Electromagnetic Theory and Maxwell' S Equations**	Ampere's Law and Steady State current, Generalization of Ampere's Law and displacement current, Maxwell's Equations, Derivation of Maxwell's Equations, The electromagnetic Energy, and Poynting Vector, The wave Equation.	Will be able to derive Maxwell equations and displacement current
IV	**Relativity**	Introduction, frame of reference, , Postulates of Special Theory of Relativity, Galilean Transformations, Lorentz Transformations, Length Contraction, Time dilation, Velocity addition, relativity of mass, Mass energy relation.	Will be able to apply theory of relativity to determine length contraction, time dilation, velocity addition and mass energy relation

Specify Course Outcome: After completion of this course the students will be able to

1. understand the way of distribution of objects in classical and quantum systems
2. derive Maxwell equations and displacement current
3. apply statistics to thermodynamics
4. apply theory of relativity to determine length contraction, time dilation, velocity addition and mass energy relation

Signature of Teacher

Name of Teacher: P S KACHAVE **Department: PHYSICS**
Program: BSc SY **Subject**: PHYSICS **Course Code**: **P-VIII**
Paper Title: ***Optics and Lasers***

Unit Numb er	Unit Name	Topics	Unit-wise Outcome
I	**Geometri cal Optics**	Cardinal Points of an Optical System(six points), Coaxial Lens System (equivalent focal length and cardinal points), Huygens Eyepiece, Ramsden Eyepiece and their cardinal points,	Will be able to determine cardinal points and focal length of lens systems
II	**Interfere nce and Diffractio n**	Newton's Rings, Determination of wavelength of Sodium light, Michelson Interferometer, Determination of wavelength of monochromatic light, Difference in wavelength between two neighboring spectral lines. Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single and double slit, Plane diffraction grating, Determination of wavelength of Sodium light, Rayleigh criterion, Resolving power of grating, Resolving power of Prism.	Will be able to determine wavelength by interference and diffraction. And also RP optical instruments
III	**Polarizati on**	Polarization by Reflection, Brewster's law, Malus law, Double refraction, Nicol prism, Nicol prism as an analyzer, Huygens's explanation of double Refraction in Uniaxial crystals , Quarter wave plate, Half wave plate, Optical Activity , Specific rotation, Laurent's half shade polarimeter.	Will be able to polarize ordinary light and analyze polarized light
IV	**Lasers**	Spontaneous & stimulated emission, absorption, Einstein coefficients (definitions), Population inversion, Optical & electrical pumping, Properties of lasers, He-Ne laser and diode laser	Will be able to understand the process of production of laser

Specify Course Outcome: After completion of this course the students will be able to

1. determine cardinal points and focal length of lens systems
2. determine wavelength by interference and diffraction. And also RP optical

instruments

3. polarize ordinary light and analyze polarized light
4. understand the process of production of laser

Signature of Teacher

Name of Teacher: M P SARWADE **Department: PHYSICS**
Program: BSc SY **Subject**: PHYSICS **Course Code**: **P-IX**
Paper Title: ***Basic Electronics***

Unit Numb er	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	**Regulate d Power supply**	Introduction, ordinary D. C. power supply, Voltage regulation, , Need of regulated power supply, Types of regulators, for low voltage, for high voltage, Zener diode voltage regulator,, Transistor series voltage regulator Series feedback voltage regulator short circuit protection, Transistor shunt voltage regulator, Definition of Line and Load regulation, Problems	Will be able to design, construct and analyze various power supply
II	**Bipolar Junction Transisto rs**	Transistor Connections: Common base, common emitter, common collector, Characteristics of common base, common emitter, common collector connections, transistor Load line Analysis, Operating point. Hybrid parameters (or h parameters) Determination of h-parameters, Analysis of common emitter amplifier and common using h-parameters (current gain, voltage gain, power gain, input resistance and output resistance)	Will be able to design, construct and analyze various amplifiers
III	**Operatio nal Amplifier :**	Operational Amplifier, Basic circuit of differential amplifier, common Mode and differential mode signals, block diagram of Op-Amp, schematic symbol, ideal Characteristics, input offset voltage; input offset current, input bias current, input impedance, Output impedance, open loop gain, Slew rate, Inverting amplifier.	Will be able to construct and analyze various circuits of op-amps

IV		Sinusoidal Oscillator, Types of sinusoidal Oscillators, Oscillatory circuit, Positive feedback Amplifier- Oscillator, Berkhausen Criterion, Hartley oscillator, Colpitt's oscillator, R-C Network, Phase shift oscillator	Will be able to design, construct and analyze LC & RC oscillators

Specify Course Outcome: After completion of this course the students will be able to

1. design, construct and analyze various power supply
2. design, construct and analyze various amplifiers
3. construct and analyze various circuits of op-amps
4. design, construct and analyze LC & RC oscillators

Signature of Teacher

Name of Teacher: M P SARWADE Department: PHYSICS
Program: BSc SY **Subject**: PHYSICS **Course Code**: **SEC I**
Paper Title: ***Skill Enhancement Course***

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	**Algorithms and Flowcharts**	Algorithm- definition and development, Flowchart-Concept, Symbols, Algorithm and Flowcharts for roots of quadratic equation, sum of two matrices, sum and product of finite series, calculation of Sin (x) as series.	Will be able to construct algorithm and flowchart for any task
II	**Scientific Programming**	Fortran: character set, Constants, Variables, Arithmetic expressions, Library functions, Arithmetic statements, Structure of program, FORMAT specification, READ, WRITE, Terminating a program, programming style, Unformatted I/O statements.	Will be able to write simple programmes

III	**Control Statements**	Unconditional GOTO**,** Computed GOTO, Arithmetic IF, Logical if, IF-THEN-ELSE, Nested IF-THEN-ELSE, ELSE-IF-THEN, Rules for DO loops, CONTINUE, Nested Do loops, DATA Statement, Double precision, Logical data, CPMPLEX data, String manipulation, WHILE structure, Array declarative statements, Implied Do loops, One & multidimensional array, Function subprograms, Subroutine subprograms, COMMON, EQUIVALENCE, Data file organization, OPEN a file, READ from a file, WRITE in a file, Closing a file, File creation programs, File processing programs.	Will be able to construct various programmes using control statements and loops. And can handle data files
	Hands on Exercises:	1. Centigrade to Fahrenheit conversion.2. Area of a triangle.3. Velocity and acceleration. 4. Fibonacci Numbers5. Quadratic equation. 6. Sum of series.7. Sum of sine series. 8. Greatest common divisor.9. Matrix addition. 10. Matrix multiplication.	Will be able to write, feed and execute programmes

Specify Course Outcome: After completion of this course the students will be able to

1. construct algorithm and flowchart for any task
2. write simple programmes
3. construct various programmes using control statements and loops. And can handle data files
4. write, feed and execute programmes

Signature of Teacher

Name of Teacher: P S KACHAVE
Department: PHYSICS
Program: BSc SY **Subject**: PHYSICS
Course Code: **SEC II Paper Title:** ***Skill Enhancement Course***

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**

I	**Refraction Through Lenses**	Types of lenses, The sign convention, principal foci, Deviation produced by a thin lens, Power of a lens, Principal planes and focal planes, Dispersion by prism, Dispersive power, Huygens eyepiece, Ramsden eyepiece.	Will be able to use principle of refraction through lenses in various optical instruments
II	**Semiconductor Sources and Detectors**	Construction of LED**,** Working principle of LED, Types of LED, Construction of LDR, Working principle of LDR, Construction of photovoltaic cell & its working principle. **Polarization of Light:** Polarization of transverse wave, Plane of polarization, Brewster law, Malus law, specific rotation, Laurent's half shade polarimeter.	Will be able to use photonic devices and can use polarisation to study optical materials
III	**Laser**	Lasers, spontaneous and stimulated emission, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.	Will be able to understand lasing
	Hands on Exercises	1. Determination of focal length of a biconvex lens.2. Determination of radius of curvature of a lens using a Spherometer.3. Determination of power of a lens.4. Determination of the grating radial spacing of a compact disc (CD) by reflection using a laser source.5. To find the width of the slit using diffraction pattern obtained by a laser. 6. To find angle of polarization using Brewster law.7. To study V-I characteristics of LED.8. Study the characteristics of solid state laser. 9. Study the characteristics of LDR. 10. Study characteristics of a photovoltaic cell.	Will be able to handle various optical instruments and photonic devices

Specify Course Outcome: After completion of this course the students will be able to

1. use principle of refraction through lenses in various optical instruments
2. use photonic devices and can use polarisation to study optical materials
3. understand lasing
4. handle various optical instruments and photonic devices

Signature of Teacher

Name of Teacher: M. P. SARWADE **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: **P-XII**
Paper Title: *Quantum Mechanics*

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	Particle Propertie s of Waves	Introduction, Photoelectric Effect, Quantum Theory of Light, The Compton Effect, de Broglie waves, Wave function, de Broglie Wave Velocity, Wave and Group velocities, G. P. Thomson experiment, The Uncertainty principle and its applications.	Will be able to understand phenomenon of microscopic physics
II	Schröding er's Equation	Introduction, Schrödinger's Equation: Time dependent form, Probability current, Expectation Values, Operators, Schrödinger's Equation: Steady-state form, Eigen values and Eigen functions, Problems.	Will be able to solve problems of microscopic physics
III	Applicati ons of Quantum	Introduction, The particle in a box: energy quantization, The particle in a box: wave functions, The particle in a box: Momentum Quantization, The	Will be able to apply quantum mechanics to solve various
	Mechanic s	Harmonic Oscillator, The Harmonic Oscillator-Energy level, The particle in a three dimensional box	microscopic physics problems
IV	Quantum Theory of Hydrogen Atom	Schrödinger's equation for the Hydrogen Atom in spherical polar co- ordinates, separation of Variables, Quantum numbers – Total quantum number, Orbital quantum number, Magnetic quantum number, spin quantum number.	Will be able to analyze hydrogen atom using quantum principles

Specify Course Outcome: After completion of this course the students will be able to

1. understand phenomenon of microscopic physics
2. solve problems of microscopic physics
3. apply quantum mechanics to solve various microscopic physics problems
4. analyze hydrogen atom using quantum principles

Signature of Teacher

Name of Teacher: P S KACHAVE **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: **P-XIII (A)**
Paper Title: *Solid State Physics*

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	Crystal structure	Introduction, Crystal Lattices and Translation vectors, Unit cell, Basis, Symmetry operations, Point groups, space group, Types of lattices, Simple crystal structure (HCP, FCC, BCC, SC), Structure of Diamond, NaCl, Problems.	Will be able to understand lattices, bases and simple crystal structures
II	Bonding in Solids and X- Ray Diffractio n	Inter atomic forces and types of bonding, ionic bond, covalent bond, metallic bond, hydrogen bond, Vander- waal's bond. X-ray diffraction, Bragg's law, Laue's method, Rotating crystal method	Will be able to understand various types of bonds in solids and x-ray diffraction
III	Thermal propertie s of Solids	Specific heat of gases, Specific heat of solids, Classical theory of Lattice heat Capacity, Einstein's theory of heat Capacity, Debye's theory of specific heat of solids, Limitations of Debye model	Will be able to determine specific heat of solids
IV	Free Electron Theory of Metals	The outstanding properties of metals, Drude-Lorentz theory, Thermal conductivity, Electrical conductivity, Widemann- Franz relation, Somerfield Model, Electrical conductivity and Ohms law, Electronic specific heat, Thermionic emission, escape of electrons from metal.	Will be able to determine various parameters of metals

Specify Course Outcome: After completion of this course the students will be able to

1. understand lattices, bases and simple crystal structures
2. understand various types of bonds in solids and x-ray diffraction
3. determine specific heat of solids
4. determine various parameters of metals

Signature of Teacher

Name of Teacher: P S KACHAVE **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: **P-XIV**
Paper Title: *Atomic, Molecular & Nuclear Physics*

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	Atomic Physics	The Vector Atom Model, Quantum numbers associated with the vector atom model, LS and J-J coupling, The Pauli's exclusion Principle, Selection rules, Intensity rules, Interval rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.	Will be able to understand various properties of atomic physics
II	Molecula r Spectra	Regions of Electromagnetic Spectra, Classification of Molecular Spectra, Theory of pure rotational spectra, Theory of rotation-vibration spectra, Raman Effect, Experimental study,	Will be able to study and analyze various types of molecular spectra
III	Nuclear Fission and Nuclear Reactions	Nuclear Fission, the fission products, energy release in fission, nuclear transmutation reactions, Conservation laws, Nuclear reaction kinematics	Will be able to understand nuclear fission and allied properties
IV	Nuclear Fusion and its applicatio ns	Nuclear fusion, p-p chain reaction as the source of energy in the Sun like stars, thermal nuclear reactor, the neutron cycle, controlled and uncontrolled thermonuclear reactions.	Will be able to apply principle of nuclear fusion to various thermonuclear process

Specify Course Outcome: After completion of this course the students will be able to

1. understand various properties of atomic physics
2. study and analyze various types of molecular spectra
3. understand nuclear fission and allied properties
4. apply principle of nuclear fusion to various thermonuclear process

Signature of Teacher

Name of Teacher: P P RAUT **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: **P-XV (A)**
Paper Title: *Digital and Communication Electronics*

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	Number Systems	Number System:- Decimal numbers, Binary numbers, Binary arithmetic, Ones complement representation, Twos complement representation, Octal Numbers, Hexadecimal numbers, Inter- conversions of number systems, Binary coded decimal (BCD), Gray code, Excess-3 code.	Will be able to convert numbers from one number system to other and can do the arithmetic
II	Logic Gates	AND gate, OR gate, NOT gate, NAND gate, NOR gate, EX-OR and EX-NOR gates, Universal properties of NAND and NOR gates. Boolean operations, logic expressions for 2,3 & 4 inputs, laws of Boolean algebra, De - Morgen's theorems, SOP form of Boolean expressions, simplification of Boolean expressions using K- maps (up to 4 variables),Half adder, Full adder	Will be able to understand working principle of gates and use of K-map
III	Modulation and Demodulation	Introduction, Types of Modulation, Expression for A. M. voltage, AM waves, Frequency spectrum of AM wave, Power Output in AM, Expression for frequency modulated voltage, Principle of demodulation, linear diode AM detector or demodulator.	Will be able to understand working principle of modulation and demodulation

IV	Communi cation Electronic s	Introduction, Block diagram of basic communication system, Essential elements of A.M. Transmitter. A.M. receiver: Turned Radio Frequency (TRF) Receiver, Super heterodyne receiver, Characteristics of radio receivers: sensitivity, selectivity, fidelity & their measurements	Will be able to understand working principle of communication system

Specify Course Outcome: After completion of this course the students will be able to

1. convert numbers from one number system to other and can do the arithmetic
2. understand working principle of gates and use of K-map
3. understand working principle of modulation and demodulation
4. understand working principle of communication system

Signature of Teacher

Name of Teacher: **P P RAUT** **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: SEC III (B)
Paper Title: *Electrical Circuit Analysis Skill*

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**
I	Understanding Electrical Circuits	Main electric circuit elements and their combinations, rules of analyzing the DC electrical circuits, quantifying current and voltage drops across the circuit elements. A.C. Circuits: Single-phase and three phase alternating current sources, rules to analyze the AC	Will be able to check troubling shooting of various electrical circuits and analyze them
II		electrical circuits, understanding real, imaginary and complex power components of the AC source, power factor and approaches to save energy and money. Electrical circuit drawing symbols, blueprints, reading schematics, ladder network diagrams. Electrical Schematics, Power circuits, Control circuits and reading the circuit schematics. Tracking the connections of elements and identifying current flow and voltage drop.	
II	Electrical Transformers, Generators and Motors	DC Power sources, AC and DC generators, characteristics of the circuit elements inductance, capacitance, and impedance, transformer workings and characteristics Working of electric motors, single-phase, three-phase AC and DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.	Will be able to understand working principle of transformers, generators and motors

III	Electrical Circuit Protectio n	Relays, fuses and disconnect switches, circuit breakers, overload protection devices, electrical ground-fault protection, grounding and isolating electric circuits, phase reversal, surge protection. Interfacing DC or AC sources to control elements	Will be able to use electrical circuit protectors
IV	Electrical Wiring	Different types of conductors and cables, basics of wiring: star and delta connections, voltage drops and electrical losses across the connecting cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays.	Will be able to understand electrical wiring and to measure voltage, current and power
	HANDS ON	1. Awareness of electrical safety tools and rescue of person in contact with live wire 2. Studying electrical performance and power consumption of a given number of bulbs connected in series and parallel circuits3. Checking specific gravity of lead acid batteries in home UPS and toping-up with distilled water 4. Practicing soldering and de- soldering of various electrical and electronic components 5. Identifying Phase, Neutral and Earth on power sockets and checking the healthiness of mains using a test lamp 6. Identifying primary and secondary windings and measuring primary and secondary voltages in various types of transformers 7. Connecting an ELCB and testing the leakage of an electrical motor control circuit 8. Connecting battery and load to an UPS and testing its performance in battery mode 9. Studying construction and working of AC and DC motors 10. Trouble shooting electrical circuits 11. Studying electrical circuit protection using relays, fuses and circuit breakers 12. Dismantle electric fan / motor and identify the damaged / burnt part of winding in it 13. Drawing blueprints and wiring of single phase electrical circuit for a house hold supply	Provides practice for electrical circuit analysis

Specify Course Outcome: After completion of this course the students will be able to

1. check troubling shooting of various electrical circuits and analyze them
2. understand working principle of transformers, generators and motors

3. use electrical circuit protectors
4. understand electrical wiring and to measure voltage, current and power
5. practice for electrical circuit analysis

Signature of Teacher

Name of Teacher: B K KAJALE **Department: PHYSICS**
Program: BSc TY **Subject**: PHYSICS **Course Code**: SEC IV (A)
Paper Title: *Semiconductor Devices Application Skill*

Unit Number	Unit Name	Topics	Unit-wise Outcome
I	Semiconductor Diodes	Construction, working and characteristics of different types of P-N junction diodes, Construction, working and characteristics of Zener diode, Construction, working and characteristics of Photo diode and Varactor diode.	Will be able to understand working principle of various types of diodes
II	Field Effect Transistors	Construction, working and characteristics of JFET, Construction, working and characteristics of MOSFET	Will be able to understand working principle of JFET and MOSFET
III	Rectifiers	Block diagram of power supply, half wave rectifier, Full wave rectifier, ripple factor and efficiency of half and Full wave rectifiers	Will be able to understand working principle of rectifiers
IV	Thyristor and UJTs	Construction, working and characteristics of SCR and Construction, working and characteristics of UJT.	Will be able to understand working principle of thyristor and UJT

	HANDS ON EXERCISE	1. Study and compare the V-I Characteristics of various types of P-N junction diodes (e.g. general purpose, LEDs, Zener Diode, etc.) 2. Study and compare the working of Photo diode and Varactor diode 3. Study and compare the working properties of the *n*-channel and *p*- channel JFETs 4. Study and compare the working properties of the *n*-channel and *p*-channel MOSFETs 5. Construct and test the performance of a FET Amplifier 6. Study the working of half wave rectifier and determine ripple factor for different R, L, C filters 7. Study the working of full wave rectifier and determine ripple factor for different R, L, C filters 8. Study of SCR characteristics 9. Study of UJT characteristics 10. Construct UJT based free running oscillator and change its frequency. 11. Construct a test circuit of SCR using UJT triggering	Will be able to construct and analyze various semiconductor circuits

Specify Course Outcome: After completion of this course the students will be able to

1. understand working principle of various types of diodes
2. understand working principle of JFET and MOSFET
3. understand working principle of rectifier
4. understand working principle of thyristor and UJT
5. construct and analyze various semiconductor circuits

Signature of Teacher

OUTCOME OF THE PROGRAMME: Students after completing their graduation in Physics will

1. be eligible to get employment as a teacher in private, semi-government, government schools after fulfilling the requirements.

2. pursue their higher studies in related fields such as M.SC, MBA, MCA in the national and international universities depending upon the eligibility conditions of the concerned universities

3. handle standard and advanced laboratory equipment, modern instrumentation and various techniques to carry out experiments.

4. work as entrepreneurs.

6. be eligible to get employment in various industries

7. prepare for civil services examinations conducted by state government agencies and central government agencies.