SRI A S N M G D C (A) PALAKOL

DEPARMET OF PHYSICS

Course	Module/ local needs	Module/ Regional needs
MECHANICS& PROPERTIES OF MATTER PHY-1A		
Vector Analysis		Divergence and curl of a vector field with derivations and physical interpretation. Vector integration
Mechanics of particles	motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions	motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering
Mechanics of Rigid bodies	rotational kinematic relations, equation of motion for a rotating body, angular momentum,	rotational kinematic relations, equation of motion for a rotating body, angular momentum, Euler equations and its applications, precession of a top, Gyroscope, precession of the equinoxes.
Mechanics of continuous media	Classification of beams	Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams,
Central forces	Motion of satellites, idea of Global Positioning System (GPS)	conservative nature of central forces, conservative force as a negative gradient of potential energy, equatglobal ion of motion under a central force.Derivation of Kepler's laws.Motion of satellites, idea of Global Positioning System (GPS)
Special theory of relativity		.Postulates of special theory of relativity.Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation
Waves & Oscillations PHY-1B		
Simple Harmonic oscillations	, Principle of superposition, beats. Lissajous figures.	Physical characteristics of SHM, torsion pendulum-measurements of rigidity

		modulus, compound pendulum measurement of 'g', Principle of superposition, beats. Lissajous figures.
Damped and forced oscillations		un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance.
Complex vibrations	Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave	Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave
Vibrating strings	modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance.	modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance.
Vibrations of bars		Longitudinal vibrations in bars-wave equation and its general solution
Ultrasonic's		Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves, SONAR
Mechanics, waves & oscillations PHY-1A		
Mechanics of Particles	Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations,	Laws of Motion, Motion of variable mass system, Motion of a rocket, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford scattering- Gyroscope, Precession of the equinoxes
Motion in a Central Force Field		conservative nature of central forces, Equation of motion under a central force, Kepler's laws of planetary

		motion-Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS), weightlessness,
Relativistic Mechanics		Frames of reference, Galilean transformations, absolute frames, Michelson-Morley experiment. Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity, Einstein's mass-energy relation.
Undamped, Damped and Forced oscillations	Resonance, Logarithmic decrement, Relaxation time and Quality factor Coupled oscillations: Coupled oscillators	Simple harmonic oscillator and solution of the differential equation, Damped harmonic oscillator, Forced harmonic oscillator
Vibrating Strings	Modes of vibration of stretched string clamped at ends, Overtones and Harmonics.	Transverse wave propagation along a stretched string
Ultrasonic's		Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves, SONAR
WAVE OPTICS **PHY-2A**		
Aberrations		Monochromatic aberrations, Spherical aberration, Chromatic aberration
Interference of light		Stokes' treatment, Interference in thin films: Plane parallel and wedge-shaped films, colours in thin films, Newton's rings in reflected light, Michelson interferometer
Polarisation of light	Nicol prism as polarizer and analyzer,Quarter wave plate, Half wave plate	Double refraction,Brewster's law, Malus law, Nicol prism, Nicol prism as polarizer and analyzer,Quarter wave plate,

		Half wave plate, Plane, Circularly and Elliptically polarized light- Laurent's half shade polarimeter: determination of specific rotation, *Babinets's compensator*,
Fibre Optics	different types of fibers, rays and modes in an optical fiber, Principles of fiber communication	different types of fibers, rays and modes in an optical fiber, Principles of fiber communication
Lasers and Holography	He-Ne laser, Ruby laser, Applications of lasers; Holography	Laser principle, Einstein coefficients, Types of lasers- He-Ne laser, Ruby laser, Applications of lasers; Holography: Basic principle of holography, Applications of holography.
Diffraction of light	Fresnel and Fraunhoffer diffractions	Fresnel and Fraunhoffer diffractions, Fresnel's half period zones, Explanation of rectilinear propagation of light, Zone plate,
THERMODYNAMICS & RADIATION PHYSICS PHY-2B		
Kinetic theory of gases	Viscosity of gases-thermal conductivity-diffusion of gases	Transport phenomena – Mean free path - Viscosity of gases-thermal conductivity-diffusion of gases.
Thermodynamics	Entropy and disorder-Entropy of Universe– Temperature-Entropy (T-S) diagram and its uses	Carnnot's engine and its efficiency-Carnot's theorem-Second law of thermodynamics. Kelvin's and Claussius statements-Entropy, Entropy and disorder-Entropy of Universe– Temperature-Entropy (T-S) diagram and its Uses
Thermodynamic potentials and Maxwell's equations	Joule Kelvin effect	Thermodynamic potentials-Derivation of Maxwell's thermodynamic relations-Clausius-

		Clayperon's equation-Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect-
Low temperature Physics	Joule Kelvin effect-Porous plug experiment effects of chloro and fluoro carbons on ozone layer. *Principles of Refrigeration*	Joule Kelvin effect-Porous plug experiment Joule Thomson cooling-Liquefaction of helium, Kapitza's method-Adiabatic demagnetization, Production of low temperatures effects of chloro and fluoro carbons on ozone layer. *Principles of Refrigeration*
Quantum theory of radiation	*Ferry's total radiation pyrometer*-Wein's displacement -Disappearing filament optical pyrometer	Ferry's black body-distribution of energy in the spectrum of black body-*Ferry's total radiation pyrometer*-Wein's displacement -Disappearing filament optical pyrometer-experimental determination – Angstrom pyrheliometer-determination of solar constant, Temperature of Sun.
ELECTRICITY, MAGNETISM &ELECTRONICS PHY 5 – 3A		
Electric field intensity and potential	potential due to i) a point charge, ii) charged spherical shell	Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces-potential due to i) a point charge, ii) charged spherical shell
Dielectrics:		Electric dipole moment and molecular

		polarizability- Electric displacement D, electric polarization P –relation between D, E and P- Dielectric constant and susceptibility
Electric and magnetic fields	*Comparison of magnetic shell and circular coil* – Hall effect	Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid- *Comparison of magnetic shell and circular coil* – Hall effect
Electromagnetic induction	energy stored in magnetic field. Transformer - energy losses - efficiency.	Faraday's law-Lenz's law- Self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid, energy stored in magnetic field. Transformer - energy losses - efficiency.
Alternating currents and electromagnetic	LCR series and parallel resonant circuit, Q –factor, power in ac circuits	Relation between current and voltage in LR and CR circuits using vector diagrams, LCR series and parallel resonant circuit, Q – factor, power in ac circuits
Maxwell's equations		Maxwell's wave equation (with derivation) transverse nature of electromagnetic waves. Poyinting theorem s
Basic electronics:	PN junction diode, Zener diode, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation betweenα, β and γ - transistor (CE) characteristics , Transistor as an amplifier.	PN junction diode, Zener diode, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation betweenα, β and γ - transistor (CE) characteristics , Transistor as an amplifier.
Digital electronics	De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, Ex-OR gate, Half adder and Full adder	Conversion of binary to decimal system and vice versa. Binary subtraction Laws of Boolean algebra - De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as

		universal gates, Ex-OR gate, Half adder and Full adder
MODERN PHYSICS PHY 6—3A		
Atomic and molecular physics	*Zeeman Shift* -Raman effect, hypothesis, Applications of Raman effect	Vector atom model and Stern-Gerlach experiment - quantum numbers associated with it. L-S and j- j coupling schemes. Zeeman effect- *Experimental arrangement- Derivation for Zeeman Shift* - Raman effect, hypothesis, Applications of Raman effect
Matter waves & Uncertainty Principle	*Gaama ray microscope*	Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves – Group velocity and Phase velocity Davisson and Germer experiment – Heisenberg's uncertainty principle. *Gaama ray microscope*
Quantum (wave) mechanics	Application of Schrodinger wave equation to particle in one dimensional infinite box	Schrodinger time independent and time dependent wave equations- derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box
General Properties of Nuclei		nucleus -size, mass, charge density (matter energy), binding energy, magnetic moment, electric moments. Liquid drop model and Shell model
Radioactive Decay	Alpha decay: basics of α-decay processes. Theory of a-decay,	Alpha decay: basics of α-decay processes. Theory of a-decay, Gamow's theory, Geiger Nuttal law. ß-decay, Energy kinematics for ß-decay, positron emission
Crystal Structure	diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method. Powder method	Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals,

		Bragg's law, experimental techniques, Laue's method. Powder method
Superconductivity	Type I and type II superconductors - applications of superconductors	critical temperature - critical field - Meissner effect – Isotope effect - Type I and type II superconductors - applications of superconductors
Renewable Energy PHY7-3C		
UNIT-I	Forms of energy, Energy flow diagram to the earth. Role of energy in economic and social development. Environmental Effects: air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation.	Forms of energy, Energy flow diagram to the earth. Role of energy in economic and social development. Environmental Effects: air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation.
UNIT-II	Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, nuclear energy - promise and future	Energy consumption in various sectors, energy resources, coal, oil, natural gas, nuclear and hydroelectric power. Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, nuclear energy - promise and future
UNIT-III		solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells. Wind Energy: Introduction, Principle of wind energy conversion, Components of wind turbines
UNIT-IV		Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves. Hydrogen Energy

UNIT-V		Sources of biomass – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion

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Solar Thermal and Photovoltaic Aspects PHY8-1-3C		
Unit I	Anti-reflective coating.	Solar intensity measurement –pyrheliometer. 2. Radiative Properties and Characteristics of Materials: Kirchoff's law – Relation between absorptance, emittance and reflectance; Selective Surfaces - preparation and characterization, Types and applications; Anti-reflective coating.
UNIT-II		Description of flat plate collector, Liquid heating type FPC, Energy balance equation, Efficiency, Temperature distribution in FPC
Unit-III	Physics of solar cell –Type of interfaces, homo, hetero andschottky interfaces, Photovoltaic Effect, Equivalent circuit of solar cell	Physics of solar cell –Type of interfaces, homo, hetero andschottky interfaces, Photovoltaic Effect, Equivalent circuit of solar cell
UNIT-IV	Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance	Solar cell module assembly – Steps involved in the fabrication of solar module, Module performance. Solar PV system and its components, PV array, inverter, battery and load.
UNIT-V	Solar hot water system (SHWS), Types of SHWS, Standard method of testing the efficiency of SHWS; Passive space heating and cooling concepts, Solar desalinator and drier, Solar thermal power generation	Solar hot water system (SHWS), Types of SHWS, Standard method of testing the efficiency of SHWS; Passive space heating and cooling concepts, Solar desalinator and drier, Solar thermal power generation