

GOVERNMENT POLYTECHNIC, MAYURBHANJ**ACADEMIC SESSION-2026-27****LESSON PLAN**

Discipline: MECHATRONICS ENGG.	1ST YEAR	Name of the Teaching Faculty: SOVAKARA SING
Subject: APPLIED PHYSICS (TH2)	No. of days per week class allotted: 04	Course start from date 17.08.2026 to 17.04.2027 (No. of Weeks:32)

Month	Week	Class day	Unit	Theory/ Practical Topics
August-26	3rd	1st	Unit-1 Physical world, Units and Measurements	Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units)
		2nd		Dimensions and dimensional formulae of physical quantities
		3rd		Principle of homogeneity of dimensions, Dimensional equations
		4th		Applications of Dimensional analysis (conversion from one system of units to other)
	4rt	1st		Applications of Dimensional analysis (checking of dimensional equations)
		2nd		Applications of Dimensional equations (derivation of simple equations), Limitations of dimensional analysis.
	5th	1st		Measurements: Need, measuring instruments, least count
				Types of measurement (direct, indirect)
September-26	1st	1st		Errors in measurements (systematic and random), absolute error, relative error
		2nd		Error propagation, error estimation and significant figures.
		3rd		
	2nd	1st	Unit-2 Force and Friction	Scalar and Vector quantities – examples, representation of vector, types of vectors.
		2nd		Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only),
		3rd		Scalar Product and Vector Product
		4th		Resolution of a Vector
	3rd	1st		Newton's Laws of Motion, Force, Momentum
		2nd		Statement and derivation of conservation of linear momentum
	4th	1st		Applications of conservation of linear momentum such as recoil of gun, rockets, Impulse and its applications.
		2nd		Friction: concept, types of Friction, laws of limiting friction
		3rd		Coefficient of friction, Angle of Friction, Angle of Repose
		4th		Methods of reducing friction and its engineering applications
	5th	1st		Work: Concept and units,
		2nd		Examples of zero work, positive work and negative work
		3rd		Energy and its units

October-26	1st	1st	Unit-3 Work, Power, Energy	Kinetic energy
	2nd	1st		Work-Energy Theorem (Concepts only)
		2nd		Gravitational potential energy with examples and derivations
		3rd		Mechanical energy, conservation of mechanical energy for freely falling bodies
		4th		Power and its units
	3rd	1st		Power and work relationship
		2nd		Calculation of power (numerical problems)
		3rd	Unit-4 Circular & Rotational Motion	Circular motion, definition of angular displacement, angular velocity
		4th		Angular acceleration, frequency, time period
	4th	1st		Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
		2nd		Centripetal and Centrifugal forces with live examples
	5th	1st		Expression and applications such as banking of roads (without Friction) and bending of cyclist.
		2nd		Translational and rotational motions with examples
		3rd		Definition of torque and angular momentum and their examples,
		4th		Conservation of angular momentum (quantitative) and its applications
November-26	1st	1st		Moment of inertia and its physical significance
		2nd		Radius of gyration for rigid body
		3rd		Theorems of parallel and perpendicular axes (statements only),
		4th		Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).
	2nd	1st	Unit-5 Properties of Matter	Elasticity: definition of stress and strain, moduli of elasticity
		2nd		Hooke's law, significance of stress-strain curve
		3rd		Pressure: definition, units
		4th		Atmospheric pressure, gauge pressure, absolute pressure
	3rd	1st		Surface tension: concept, units, cohesive and adhesive forces
		2nd		Angle of contact, applications of surface tension
		3rd		Viscosity and coefficient of viscosity: Terminal velocity
		4th		Stoke's law and effect of temperature on viscosity
	4th	1st		Application in hydraulic systems.
		2nd		Hydrodynamics: Fluid motion, streamline and turbulent flow
		3rd		Reynold's number, Equation of continuity
	5th	1st		Bernoulli's Theorem (only formula and numerical) and its applications.
	1st	1st		Periodic Motion, Oscillatory Motion
		2nd		Simple Harmonic Motion (SHM): definition, expression for displacement, velocity
		3rd		Expression for acceleration, time period, frequency, Total Energy of a particle executing SHM

December-26	2nd	1st	Unit-6 Waves and Oscillations	Free, forced and resonant vibrations with examples
		2nd		Wave motion, transverse and longitudinal waves with examples
		3rd		Definitions of wave velocity, frequency and wave length and their relationship
		4th		Wave equation, amplitude, phase, phase difference
	3rd	1st		Principle of superposition of waves
		2nd		Characteristics of Sound Wave (Intensity, Loudness, Pitch & Quality)
		3rd		Reverberation, reverberation time, echo (Concepts only)
		4th		Ultrasonic waves–Introduction and properties
	4th	2nd		Engineering and medical applications of ultrasonic
		3rd	Unit-7 Thermal Physics	Concept of heat and temperature
		4th		Specific heats, Thermal Capacity, Latent Heat
	5th	1st		Principle of Heat with numerical
		2nd		Scales of temperature and their relationships
		3rd		Expansion of solids, coefficient of linear, superficial and cubical expansions of solids
January-27	1st	1st		Relation between coefficient of linear & surface expansion
	2nd	1st		Relation between coefficient of linear & cubical expansion, relation amongst them
		2nd		Modes of heat transfer (conduction, convection and radiation with examples)
		3rd		Co-efficient of thermal conductivity
		4th		Engineering applications of thermal conductivity
	3rd	1st	Unit-8 Optics	Laws of reflection, Laws of refraction, refractive index
		2nd		Image formation by spherical mirrors
		3rd		Mirror Formula with numerical
	4th	1st		Image formation by Lens
		2nd		Lens formula with numerical
		3rd		Power of lens, magnification of Lens
		4th		Critical angle, Total internal reflection
	5th	1st		Applications of total internal reflection
		2nd		Optical fiber applications in: telecommunication, medical and sensors.
		3rd		Optical Instrument: Simple Microscope and its magnifying Power
	1st	1st	Unit-9 Electrostatics	Coulomb's law, unit of charge
		2nd		Electric field, Electric lines of force and their properties
		3rd		Electric flux, Electric potential and potential difference
		4th		Gauss law, Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet
	2nd	1st		Application of Gauss law to find electric field intensity of a plane charged sheet
		2nd		Capacitance and its units. Capacitance of a Spherical conductor
		3rd		parallel plate capacitor

February-27		4th		Dielectric and its effect on capacitance
	3rd	1st		Series combination of capacitors (related numerical)
		2nd		Parallel combination of capacitors (related numerical)
		3rd	Unit-10 Current Electricity	Electric Current and its units, Drift Velocity and expression of Current in terms of drift Velocity
		4th		Direct and alternating current
	4th	1st		Resistance and its units, Specific resistance
		2nd		Conductance, Specific conductance
		3rd		Series and parallel combination of resistances. Effect of Temperature on Resistance
		4th		Ohm's law and its verification
March-27	1st	1st		Concept of terminal potential difference, Electromotive force (EMF) & Internal Resistance of Cell
		2nd		Kirchhoff's laws, Wheatstone bridge (Balanced Condition)
		3rd		Joule's Law of heating effect of current
		4th		Electric power, Electric energy and its units (related numerical problems)
	2nd	1st	Unit-11 Magnetic Effect of Current & Electromagnetism	Coulomb's Law in Magnetism
		2nd		Magnetic field and its units, magnetic intensity
		3rd		Magnetic lines of force and its properties
		4th		Magnetic flux and units, Intensity of magnetization
	3rd	1st		Types of magnetic materials: dia, para and ferromagnetic with their properties
		2nd		Biota-Savart's Law
		3rd		Magnetic Field due to Infinite straight conductor and at the Centre of a circular coil carrying current (Formula Only)
		4th		Force on moving charge in magnetic field
	4th	1st		Force on current carrying conductor placed in a magnetic Field
		2nd		Concept of electromagnetic induction, Faraday's Laws of Electromagnetic Induction, Lenz's Law (Statement only)
		3rd		Moving coil galvanometer (principle only), Conversion of a galvanometer into ammeter
		4th		Conversion of a galvanometer into voltmeter
	5th	1st	Unit-12 Semiconductor & Modern Physics	Energy bands in solids- Distinguish between conductor, semi-conductor & insulator on the basis of Band Theory
		2nd		Intrinsic and extrinsic semiconductors
April-27	1st	1st		Effect of Temperature on resistivity of a Semiconductor (Concept only)
	2nd	1st		p-n junction
		2nd		Junction diode and V-I characteristics
		3rd		Diode as rectifier – half wave and full wave rectifier (centre taped)
		4th		LASER and its Properties
	3rd	1st		Spontaneous and stimulated emission
		2nd		Population inversion, optical pumping
		3rd		Engineering and medical applications of lasers

N.B.

Portion For 1st Internal Assessment

Unit-1, Unit-2, Unit-3

Portion For 2nd Internal Assessment

Unit-4, Unit-5, Unit-6, Unit-7

Portion For 3rd Internal Assessment

Unit-8, Unit-9, Unit-10, Unit-11 & Unit-12

Portion for End Examination

Unit-8, Unit-9, Unit-10, Unit-11 & Unit-12

1. Applied Physics-I & II by Prof. Vinod Kumar Yadav (Download from <https://ekumbh.aicteindia.org/dbook.php>)
2. Text Book of Applied Physics I & II: KN Sharma, Dr. B. Mohanty, Debasish Das (Kalyani Publishers)
3. Text Book of Physics for Class XI & XII(Part-I, Part-II); N.C.E.R.T., Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Practical Physics by C.L. Arora, S. Chand Publication.
6. Text Book of Engineering Physics by Barik, Das, Sharma, Kalyani Publisher