

MECHANICAL ENGINEERING

SEC (A)

1st Year

FROM :17/08/2026 TO :17/04/2027

NAME OF THE FACULTY : Mrs. NIHARIKA PANDA

SUBJECT : Applied Physics

TOTAL CLASS AVAILABLE IN SEMESTER: 128 nos

NO. OF PERIODS : 04/ WEEK

Class	Topic	Teaching Method	Learning Outcome
1	Introduction to Applied Physics, Physical Quantities	Lecture	Define physical quantities and their importance in engineering.
2	Fundamental & Derived Quantities	Lecture with Examples	Differentiate fundamental and derived quantities.
3	Systems of Units (FPS, CGS & SI)	Lecture + PPT	Compare different systems of units.
4	Dimensions and Dimensional Formula	Lecture & Board Work	Write dimensional formulae correctly.
5	Dimensional Formulae of Physical Quantities	Problem Solving	Determine dimensional formulae of engineering quantities.
6	Applications of Dimensional Analysis	Lecture + Numerical	Apply dimensional analysis in unit conversion and equation verification.
7	Limitations of Dimensional Analysis	Discussion	Identify the limitations of dimensional analysis.
8	Errors in Measurement	Lecture	Differentiate systematic and random errors.
9	Absolute Error, Relative Error & Significant Figures	Numerical Practice	Calculate errors and use significant figures correctly.
10	Revision & Class Test (Unit-I)	Quiz & Discussion	Apply Unit-I concepts to solve numerical problems.
11	Scalar and Vector Quantities	Lecture	Differentiate scalar and vector quantities.
12	Vector Representation and Types	Lecture + Demonstration	Represent vectors graphically.
13	Vector Addition & Subtraction	Problem Solving	Solve vector addition and subtraction problems.
14	Triangle & Parallelogram Laws	Lecture + Numerical	Apply vector laws in engineering problems.
15	Scalar Product, Vector Product & Resolution of Vector	Lecture + Practice	Resolve vectors into components.
16	Newton's Laws of Motion	Lecture	State and explain Newton's laws.
17	Momentum, Conservation of Momentum & Impulse	Lecture + Numerical	Apply conservation of momentum in practical situations.
18	Concept of Friction & Types	Lecture	Explain different types of friction.
19	Laws of Friction, Coefficient, Angle of Friction & Repose	Lecture + Numerical	Solve friction-related problems.
20	Engineering Applications of Friction	Discussion + Quiz	Apply friction concepts in engineering applications.

Class	Topic	Teaching Method	Learning Outcome
	& Revision		
21	Concept of Work	Lecture	Define work and identify positive, negative and zero work.
22	Work Done in Different Situations	Lecture + Numerical	Calculate work done in engineering applications.
23	Energy and Its Types	Lecture	Differentiate kinetic and potential energy.
24	Kinetic Energy	Lecture + Numerical	Calculate kinetic energy.
25	Potential Energy	Lecture + Numerical	Calculate gravitational potential energy.
26	Mechanical Energy	Lecture	Explain mechanical energy.
27	Conservation of Mechanical Energy	Lecture + Demonstration	Apply conservation law in practical situations.
28	Power and Units	Lecture	Define power and its SI unit.
29	Power-Work Relationship	Problem Solving	Solve numerical problems on power.
30	Revision & Unit Test	Quiz	Solve work, power and energy problems.
31	Circular Motion	Lecture	Explain circular motion.
32	Angular Displacement & Angular Velocity	Lecture + Numerical	Calculate angular displacement and velocity.
33	Angular Acceleration, Frequency & Time Period	Lecture + Numerical	Relate angular quantities.
34	Relation Between Linear & Angular Quantities	Problem Solving	Solve related numerical problems.
35	Centripetal & Centrifugal Force	Lecture + Demonstration	Differentiate centripetal and centrifugal forces.
36	Applications: Banking of Roads & Bending of Cyclist	Lecture	Explain engineering applications.
37	Translational & Rotational Motion	Lecture	Compare translational and rotational motion.
38	Torque & Angular Momentum	Lecture	Explain torque and angular momentum.
39	Conservation of Angular Momentum	Lecture + Numerical	Apply conservation principle.
40	Moment of Inertia & Radius of Gyration	Lecture	Explain moment of inertia.
41	Parallel & Perpendicular Axis Theorems	Lecture	State axis theorems and use standard formulae.
42	Revision & Unit Test	Quiz	Solve rotational motion problems.
43	Elasticity: Stress & Strain	Lecture	Define stress and strain.
44	Modulus of Elasticity & Hooke's Law	Lecture + Numerical	Apply Hooke's law in engineering problems.
45	Stress-Strain Curve	Lecture	Interpret the stress-strain curve.
46	Pressure: Atmospheric, Gauge & Absolute	Lecture	Differentiate types of pressure.
47	Surface Tension	Lecture	Explain surface tension and its applications.
48	Cohesive & Adhesive Forces	Lecture + Demonstration	Differentiate cohesive and adhesive forces.

Class	Topic	Teaching Method	Learning Outcome
49	Viscosity & Coefficient of Viscosity	Lecture	Explain viscosity and its significance.
50	Terminal Velocity & Stoke's Law	Lecture + Numerical	Solve problems using Stoke's law.
51	Effect of Temperature on Viscosity	Lecture	Explain variation of viscosity with temperature.
52	Fluid Motion & Reynolds Number	Lecture	Differentiate streamline and turbulent flow.
53	Bernoulli's Theorem & Applications	Lecture + Numerical	Apply Bernoulli's theorem to engineering problems.
54	Revision & Unit Test	Quiz & Discussion	Apply concepts of properties of matter to solve numerical problems.
55	Periodic Motion and Oscillatory Motion	Lecture	Differentiate periodic and oscillatory motion.
56	Simple Harmonic Motion (SHM): Definition and Characteristics	Lecture	Explain the characteristics of SHM.
57	SHM: Displacement, Velocity and Acceleration	Lecture + Numerical	Calculate displacement, velocity and acceleration in SHM.
58	Time Period, Frequency and Total Energy of SHM	Lecture + Numerical	Determine time period, frequency and energy of SHM.
59	Free, Forced and Resonant Vibrations	Lecture + Demonstration	Compare different types of vibrations.
60	Wave Motion: Transverse and Longitudinal Waves	Lecture	Differentiate transverse and longitudinal waves.
61	Wave Parameters: Velocity, Frequency, Wavelength and Wave Equation	Lecture + Numerical	Solve problems related to wave motion.
62	Amplitude, Phase and Phase Difference	Lecture	Explain the characteristics of wave motion.
63	Principle of Superposition of Waves	Lecture	Explain superposition of waves.
64	Characteristics of Sound: Intensity, Loudness, Pitch and Quality	Lecture + Audio Demonstration	Distinguish the characteristics of sound.
65	Reverberation, Echo and Ultrasonic Waves	Lecture + Video	Explain reverberation, echo and applications of ultrasonic waves.
66	Revision & Unit Test	Quiz + Discussion	Apply wave and sound concepts to solve problems.
67	Heat and Temperature	Lecture	Differentiate heat and temperature.
68	Specific Heat, Thermal Capacity and Latent Heat	Lecture + Numerical	Calculate heat-related quantities.
69	Principle of Heat and Numerical Problems	Lecture + Problem Solving	Apply the principle of heat to engineering problems.
70	Temperature Scales and Conversion	Lecture + Practice	Convert temperatures between different scales.
71	Expansion of Solids	Lecture	Explain thermal expansion of solids.
72	Coefficients of Linear, Superficial and Cubical Expansion	Lecture + Numerical	Solve problems on thermal expansion.
73	Modes of Heat Transfer: Conduction	Lecture	Explain heat transfer by conduction.
74	Convection and Radiation	Lecture + Demonstration	Compare convection and radiation.

Class	Topic	Teaching Method	Learning Outcome
75	Thermal Conductivity and Engineering Applications	Lecture	Explain applications of thermal conductivity.
76	Revision & Unit Test	Quiz	Apply thermal physics concepts.
77	Laws of Reflection	Lecture	State and apply the laws of reflection.
78	Laws of Refraction and Refractive Index	Lecture	Explain refraction and refractive index.
79	Spherical Mirrors and Mirror Formula	Lecture + Numerical	Solve problems using the mirror formula.
80	Image Formation by Mirrors	Demonstration	Interpret image formation by mirrors.
81	Lenses and Lens Formula	Lecture + Numerical	Apply the lens formula.
82	Power and Magnification of Lens	Lecture + Numerical	Calculate power and magnification of a lens.
83	Critical Angle and Total Internal Reflection	Lecture	Explain total internal reflection.
84	Optical Fibre and Its Applications	Lecture + Video	Explain the working and applications of optical fibre.
85	Optical Instrument: Simple Microscope	Lecture	Explain the principle of a simple microscope.
86	Revision & Unit Test	Quiz	Apply optical principles to solve numerical problems.
87	Electric Charge and Coulomb's Law	Lecture	Explain electric charge and Coulomb's law.
88	Electric Field and Electric Lines of Force	Lecture	Describe electric field and field lines.
89	Electric Flux and Electric Potential	Lecture	Explain electric flux and electric potential.
90	Potential Difference and Gauss's Law	Lecture	Apply Gauss's law in simple cases.
91	Electric Field Due to Charged Conductor and Sheet	Lecture + Numerical	Calculate electric field intensity.
92	Capacitance and Unit of Capacitance	Lecture	Explain capacitance.
93	Spherical Conductor and Parallel Plate Capacitor	Lecture + Numerical	Calculate capacitance of conductors.
94	Dielectric and Effect on Capacitance	Lecture	Explain the role of dielectric materials.
95	Series and Parallel Combination of Capacitors	Problem Solving	Solve capacitor combination problems.
96	Revision & Unit Test	Quiz	Apply electrostatic concepts.
97	Electric Current and Drift Velocity	Lecture	Explain electric current and drift velocity.
98	Direct Current and Alternating Current	Lecture	Differentiate DC and AC.
99	Resistance, Resistivity and Conductance	Lecture	Explain electrical resistance and conductance.
100	Series and Parallel Combination of Resistances	Lecture + Numerical	Solve resistance combination problems.
101	Effect of Temperature on Resistance	Lecture	Explain variation of resistance with temperature.

Class	Topic	Teaching Method	Learning Outcome
102	Ohm's Law, EMF and Internal Resistance	Lecture + Numerical	Apply Ohm's law to electrical circuits.
103	Kirchhoff's Laws	Lecture + Problem Solving	Solve electrical network problems using Kirchhoff's laws.
104	Wheatstone Bridge (Balanced Condition)	Lecture + Numerical	Apply Wheatstone bridge principles.
105	Joule's Law, Electric Power and Electric Energy	Lecture + Numerical	Calculate electric power and energy consumption.
106	Revision & Unit Test	Quiz & Discussion	Solve numerical problems on current electricity.
107	Introduction to Magnetism, Coulomb's Law in Magnetism	Lecture	Explain the basic concepts of magnetism and Coulomb's law in magnetism.
108	Magnetic Field, Magnetic Intensity and Magnetic Lines of Force	Lecture with Demonstration	Describe magnetic field, magnetic intensity and magnetic lines of force.
109	Magnetic Flux, Intensity of Magnetization and Magnetic Materials	Lecture	Differentiate magnetic flux, magnetization and classify magnetic materials.
110	Diamagnetic, Paramagnetic and Ferromagnetic Materials	Lecture + Discussion	Compare the properties and applications of magnetic materials.
111	Biot-Savart's Law	Lecture	State Biot-Savart's law and explain its applications.
112	Magnetic Field due to Straight Conductor and Circular Coil	Lecture + Numerical	Calculate magnetic field using standard formulae.
113	Force on Moving Charge and Current Carrying Conductor	Lecture + Numerical	Apply magnetic force equations to engineering problems.
114	Electromagnetic Induction: Concept and Faraday's Laws	Lecture	Explain the principle of electromagnetic induction and Faraday's laws.
115	Lenz's Law and Applications of Electromagnetic Induction	Lecture + Demonstration	Explain Lenz's law and its engineering applications.
116	Moving Coil Galvanometer: Principle and Construction	Lecture with Model	Describe the working principle of a moving coil galvanometer.
117	Conversion of Galvanometer into Ammeter and Voltmeter	Lecture + Numerical	Explain and perform the conversion of a galvanometer into an ammeter and voltmeter.
118	Unit-11 Revision, Numerical Practice & Class Test	Quiz + Discussion	Apply magnetic and electromagnetic concepts to solve numerical problems.
119	Energy Bands in Solids	Lecture	Explain the energy band theory of solids.
120	Conductors, Semiconductors and Insulators	Lecture + Discussion	Differentiate conductors, semiconductors and insulators based on band theory.
121	Intrinsic and Extrinsic Semiconductors	Lecture	Explain intrinsic and extrinsic semiconductors and their characteristics.
122	P-N Junction Diode and V-I Characteristics	Lecture + Demonstration	Describe the construction and characteristics of a p-n junction diode.
123	Half-Wave Rectifier	Lecture + Circuit Diagram	Explain the working of a half-wave rectifier.
124	Full-Wave Rectifier (Centre-Tapped)	Lecture + Circuit Diagram	Explain the working and advantages of a full-wave rectifier.

Class	Topic	Teaching Method	Learning Outcome
125	LASER: Principle, Properties and Population Inversion	Lecture + PPT	Explain the principle and properties of LASER.
126	Optical Pumping, Spontaneous & Stimulated Emission	Lecture	Differentiate spontaneous and stimulated emission and explain optical pumping.
127	Engineering and Medical Applications of LASER	Lecture + Video Demonstration	Describe various engineering and medical applications of LASER technology.
128	Unit-12 Revision, Comprehensive Revision & Final Assessment	Revision, Problem Solving & Test	Integrate and apply the concepts of semiconductor devices, LASER and modern physics in engineering applications.

