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Date: 11-11-2026

PHYSICS

SYLLABUS for CET-2027

KEA, Sampige Road, 18th Cross, Malleswaram, Bangalore – 560 012

CLASS XI (THEORY)

(Total Periods: 160)

Unit I: Units and Measurements (Periods: 04)

Units of measurement; Systems of Units; SI units, fundamental and derived units, significant figures. Dimensions of physical quantities, dimensional formulae and equations, dimensional analysis and its applications.

Unit II: Kinematics (Periods: 26)

The frame of reference, motion in a straight line: position-time graph, speed and velocity; Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity-time graph and relations for uniformly accelerated motion (graphical treatment).

Scalars and vectors: position and displacement vectors, equality of vectors, multiplication of vectors by real numbers; addition and subtraction of vectors, unit vector, resolution of a vector in a plane– rectangular components. Scalar and vector products.

Motion in a plane: projectile motion, uniform circular motion.

Unit III: Laws of Motion (Periods: 16)

Force and inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces.

Common forces in mechanics: static and kinetic friction, laws of friction, rolling friction, methods of reducing friction.

Dynamics of uniform circular motion: centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road.

Unit IV: Work, Energy and Power (Periods: 16)

Work done by a constant force and a variable force; kinetic energy, work-energy theorem.

Notion of potential energy, the potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); non-conservative forces; motion in a vertical circle, power.

Elastic and inelastic collisions in one and two dimensions.

Unit V: System of Particles and Rotational Motion (Periods: 16)

Centre of mass of a two-particle system, motion of centre of mass, centre of mass of a rigid body.

Moment of a force (torque), angular momentum, conservation of angular momentum with some examples.

Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration, moment of inertia of some regular bodies about specific axes. (no derivation).

Unit VI: Gravitation (Periods: 14)

Kepler's laws of planetary motion. The universal law of gravitation and gravitational constant. Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy; gravitational potential. Escape velocity, Earth satellites - orbital velocity and time period of a satellite, energy of an orbiting satellite.

Unit VII: Properties of Solids and Fluids (Periods: 26)

Elastic behaviour, stress and strain, Hooke's law, stress-strain curve, Young's modulus, bulk modulus, shear modulus, Poisson's ratio; elastic potential energy. Applications of elastic behavior of materials.

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift & hydraulic brakes). Fluid Dynamics - Equation of continuity, streamline and turbulent flow. Bernoulli's theorem and its applications. Viscosity: Stokes' law, terminal velocity.
Surface tension: Surface energy, angle of contact, excess of pressure, application of surface tension - drops, bubbles and capillary rise.

Thermal properties of matter: Heat and temperature, ideal gas equation and absolute temperature, thermal expansion of solids, liquids and gases. Specific heat capacity: C_p, C_v, calorimetry; change of state - latent heat. Heat transfer: Conduction and thermal conductivity, convection and radiation. Qualitative ideas of Black Body Radiation, Wein's displacement law, Stefan-Boltzmann's law and Newton's law of cooling.

Unit VIII: Thermodynamics (Periods: 12)

Thermal equilibrium and definition of temperature (the zeroth law of Thermodynamics). Heat, work and internal energy. The first law of thermodynamics. Specific heat capacity, thermodynamic state variables and equation of state, thermodynamic processes- isothermal and adiabatic processes.
The second law of thermodynamics: reversible and irreversible processes. Carnot engine.

Unit IX: Kinetic Theory (Periods: 8)

Equation of state of a perfect gas, kinetic theory of gases: assumptions, the concept of pressure, kinetic energy and temperature; RMS speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and its application to specific heat capacities of gases; concept of mean free path.

Unit X: Oscillations and Waves (Periods: 22)

Periodic motion – time period, frequency, displacement as a periodic function of time.
Simple harmonic motion (SHM) and its equation; phase, oscillations of a spring – restoring force and force constant; energy in SHM – kinetic and potential energies; simple pendulum – derivation of expression for its time period.

Wave motion: Longitudinal and transverse waves, speed of the travelling wave, displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, beats.

Unit XI: Experimental Skills

Familiarity with the basic approach and observations of the experiments and activities:

1. Vernier Callipers - its use to measure the internal and external diameter and depth of a vessel.
2. Screw gauge - its use to determine thickness / diameter of thin sheet / wire.
3. Simple Pendulum – length of second's pendulum by plotting a graph of the square of time period vs length of the pendulum.
4. Surface tension of water by capillary rise method.
5. Co-efficient of Viscosity of a given viscous liquid by measuring terminal velocity of a spherical body.
6. Speed of sound in air at room temperature by using a resonance tube,
7. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.

Reference Books:

1. A Text book of Physics Part-1 for class XI (Latest revised edition of NCERT text book)
2. A Text book of Physics Part-2 for class XI (Latest revised edition of NCERT text book)
3. Laboratory Manual in Physics for class XI (Latest revised edition of NCERT text book)

CLASS XII (THEORY)

(Total Periods: 160)

Unit I: Electrostatics (Periods: 32)

Electric charges and their basic properties: Coulomb's law – force between two point-charges, forces between multiple charges; superposition principle.

Electric field: electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole; torque on a dipole in a uniform electric field.

Electric flux, continuous charge distribution, Gauss's law and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Electric potential and potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of charges and of electric dipole in an electric field.

Conductors and insulators, electrostatics of conductors. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation).

Unit II: Current Electricity (Periods: 20)

Electric current: drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, I-V characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and its simple applications. Wheatstone bridge.

Unit III: Magnetic Effects of Current and Magnetism (Periods: 26)

Concept of magnetic field, Oersted's experiment. Biot-Savart's law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors–definition of ampere. Torque experienced by a current loop in a uniform magnetic field; moving coil galvanometer–its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment.

Bar magnet as an equivalent solenoid (only expression), magnetic field lines; torque on a dipole in a uniform magnetic field, Gauss's law in magnetism, magnetization and magnetic intensity.
Dia-, para- and ferromagnetic substances with examples.

Unit IV: Electromagnetic Induction and Alternating Currents (Periods: 20)

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, motional emf. Self and mutual inductance. AC generator.

Alternating currents, peak and rms value of alternating current/voltage; AC applied to a resistor, an inductor and a capacitor, reactance and impedance; LCR series circuit, resonance; power in AC circuits, wattless current. Transformer.

Unit V: Electromagnetic Waves (Periods: 4)

Displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays), applications of electromagnetic waves.

Unit VI: Optics (Periods: 26)

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Wave optics: Wavefront and Huygens' principle, proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double hole experiment, coherent sources and sustained interference of light. Diffraction due to a single slit, Polarisation: plane polarized light, uses of polaroids.

Unit VII: Dual Nature of Matter and Radiation (Periods: 8)

Electron emission and types, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation – particle nature of light.

Matter waves – wave nature of particles, de Broglie relation.

Unit VIII: Atoms and Nuclei (Periods: 12)

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum, de Broglie explanation of Bohr's second postulate.

Composition and size of nucleus, atomic masses, isotopes, isobars, isotones, nuclear forces.

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number. Radioactivity (only types of radioactive decay). Nuclear fission and fusion.

Unit IX: Electronic Devices (Periods: 12)

Energy bands in solids (qualitative ideas only), conductors, insulators and semiconductors; semiconductor: intrinsic and extrinsic semiconductors, semiconductor diode, I-V characteristics in forward and reverse bias, diode as a rectifier.

Unit X: Experimental Skills

Familiarity with the basic approach and observations of the experiments and activities:

1. The resistivity of the material of a given wire using Ohm's law.
2. The resistance per unit length of a given wire using Ohm's law.
3. Resistance and figure of merit of a galvanometer by half deflection method.
4. The focal length of (i) Convex mirror, (ii) Concave mirror and (iii) Convex lens using the parallax method.
6. The plot of the angle of deviation vs angle of incidence for a triangular prism.
7. Refractive index of a glass slab using a travelling microscope.
8. Characteristic curves of a p-n junction diode in forward and reverse bias.

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