# JEE ADVANCED PHYSICS SYLLABUS

Complete Chapter-Wise & Unit Breakdown | 2027 Syllabus

**Syllabus 2027**

## 1. General Physics & Experimental Skills

Heavily integrated into practical and experimental applications, combining error propagation with specific laboratory tools.

- **Core Topics:** Units and dimensions, dimensional analysis; Least count, significant figures; Methods of error analysis and propagation of errors in experimental measurements.
- **Experiments:** Vernier calipers, Screw gauge, Simple pendulum (determination of $g$), Hooke's law (Young's modulus), Surface tension of water by capillary rise, Focal length of mirrors and lenses using the $u$-$v$ method, Speed of sound using a resonance column, Verification of Ohm's law, Meter bridge and Potentiometer, Specific heat capacity of a liquid using a calorimeter.

## 2. Mechanics (~30% – 36% Weightage)

- **Kinematics:** Motion in one and two dimensions (projectiles); Uniform circular motion; Relative velocity.
- **Laws of Motion & Friction:** Newton's laws of motion; Inertial and non-inertial frames of reference; Static and kinetic friction.
- **Work, Energy, & Power:** Kinetic and potential energy; Work-energy theorem; Conservative and non-conservative forces; Potential energy diagrams; Collision of point masses (elastic and inelastic).
- **System of Particles & Rigid Body Dynamics:** Centre of mass of discrete and continuous systems; Momentum conservation; Torque, angular momentum, and their conservation; Moment of inertia, parallel and perpendicular axes theorems; Rotation of a rigid body about a fixed axis; Rolling without slipping.
- **Gravitation:** Law of gravitation; Gravitational field and potential; Kepler's laws of planetary motion; Motion of satellites and escape velocity.

## 3. Properties of Matter & Fluid Mechanics

- **Solids & Fluids:** Elastic properties, Young's, bulk, and rigidity moduli. Fluid pressure, Pascal's law, buoyancy (Archimedes' principle), surface tension/energy, contact angle, capillary action, viscosity (Stoke's law, terminal velocity), streamline flow, continuity equation, and Bernoulli's theorem.

## 4. Waves & Oscillations

- **Oscillations & Waves:** Linear and angular Simple Harmonic Motion (SHM), energy in SHM, pendulum variants. Longitudinal/transverse waves, superposition, stationary and progressive waves, string/air-column vibrations, resonance, beats, speed of sound, and Doppler effect.

## 5. Thermal Physics

- **Thermodynamics & Heat Transfer:** Thermal expansion, calorimetry, latent heat, ideal gas laws, Kinetic Theory of Gases (KTG) with molar specific heats ($C_v$, $C_p$). Thermodynamic processes (isothermal, adiabatic, isobaric, isochoric), 1st and 2nd laws, Carnot engines, heat transfer mechanisms (conduction, convection, radiation, Newton's law of cooling, blackbody laws).

## 6. Electricity & Magnetism

- **Electrostatics:** Coulomb's law, Gauss's law, electric potential, capacitors & dielectrics.
- **Current Electricity:** Ohm's law, Kirchhoff's laws, heating effects of current.
- **Magnetic Effects & EMI/AC:** Biot-Savart law, Ampere's law, magnetic forces, galvanometers; Faraday-Lenz laws, self/mutual inductance, LCR circuits, and resonance.

## 7. Electromagnetic Waves & Optics

- **Optics & EM Waves:** EM waves/spectrum; Geometrical optics (reflection, refraction, prisms, thin lenses, mirror/lens combinations); Wave optics (Huygens' principle, interference, Young's double-slit experiment, diffraction, polarization).

## 8. Modern Physics

- **Quantum, Atomic & Nuclear Physics:** De Broglie wavelength, photoelectric effect, Bohr's hydrogen model, X-rays, Moseley's law, radioactivity, mass defect, binding energy, nuclear fission and fusion.