### **JEE Main Physics Syllabus**

Students can take a look at the physics syllabus of JEE Main here.

| **Unit Number** | **Chapter** | **Topics** |
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| Unit 1 | Physics And Measurement | Units of measurements, System of Units, S I Units, Errors in measurements, Dimensions of Physics quantities, least count, significant figures, fundamental and derived units, dimensional analysis, and its applications |
| Unit 2 | Kinematics | Scalars and Vectors, Resolution of a Vector. Relative Velocity, Motion in a plane, Projectile Motion, The frame of reference, motion in a straight line, Uniform and non-uniform motion, average speed and instantaneous velocity, Position- time graph, Unit Vector, Uniform Circular Motion, speed and velocity; uniformly accelerated motion, Vector. Addition and subtraction, scalar and vector products, velocity-time, position-time graph, relations for uniformly accelerated motion, |
| Unit 3 | Laws Of Motion | Static and Kinetic friction, laws of friction, rolling friction  Newton’s First law of motion; Newton’s Second Law of motion, Newton’s Third Law of motion. Force and inertia, Momentum, Impulses; Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces  Dynamics of uniform circular motion: centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road. |
| Unit 4 | Work, Energy, And Power | Work done by a constant force and a variable force; work-energy theorem, kinetic and potential energies, power  Conservative and nonconservative forces, The potential energy of spring conservation of mechanical energy, motion in a vertical circle: Elastic and inelastic collisions in one and two dimensions |
| Unit 5 | Rotational Motion | Centre of the mass of a two-particle system, ; Basic concepts of rotational motion; moment of a force; torque, angular momentum, conservation of angular momentum and its applications, Centre of the mass of a rigid body  The moment of inertia, values of moments of inertia for simple geometrical objects, the radius of gyration, Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions, parallel and perpendicular axes theorems, and their applications. |
| Unit 6 | Gravitation | Escape velocity, Motion of a satellite, Acceleration due to gravity and its variation with altitude and depth. Gravitational potential energy Kepler’s law of planetary motion. orbital velocity, time period, and energy of satellite, gravitational potential, The universal law of gravitation. |
| Unit 7 | Properties Of Solids And Liquids | Effect of gravity on fluid pressure, Elastic behaviour, Pascal's law and its applications, Young's modulus, bulk modulus, and modulus of rigidity. Pressure due to a fluid column; Stress-strain relationship, Hooke's Law.  Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension - drops, bubbles, and capillary rise. Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer conduction, convection, and radiation  Viscosity, Bernoulli's principle and its applications, Stokes' law. streamline, and turbulent flow.critical velocity, terminal velocity |
| Unit 8 | Thermodynamics | Heat, work, and internal energy. Thermal equilibrium, zeroth law of thermodynamics, The first law of thermodynamics, isothermal and adiabatic processes. the concept of temperature  The second law of thermodynamics: reversible and irreversible processes. |
| Unit 9 | Kinetic Theory Of Gases | Equation of state of a perfect gas, Law of equipartition of energy and applications to specific heat capacities of gases, work done on compressing a gas, Kinetic theory of gases - assumptions, the concept of pressure.; Mean free path.  Avogadro's number  Kinetic interpretation of temperature: RMS speed of gas molecules: Degrees of freedom. |
| Unit 10 | Oscillations And Waves | Wave motion. Standing waves in strings and organ pipes, fundamental mode, and harmonics. Longitudinal and transverse waves, speed of the travelling wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves. Beats.  Simple pendulum - derivation of expression for its time period, Simple harmonic motion (S.H.M.) and its equation, Oscillations and periodic motion – time period, frequency, displacement as a function of time. Periodic functions. phase: oscillations of a spring -restoring force and force constant: energy in S.H.M. - Kinetic and potential energies; |
| Unit 11 | Electrostatics | Conductors and insulators. Energy stored in a capacitor, Dielectrics and electric polarisation, capacitors and capacitances, the combination of capacitors in series and parallel, and capacitance of a parallel plate capacitor with and without dielectric medium between the plates.  Electric charges: Conservation of charge. Coulomb's law forces between two point charges, forces between multiple charges: superposition principle and continuous charge distribution  Electric flux. Electric potential and its calculation for a point charge, electric dipole and system of charges; potential difference, Equipotential surfaces, Electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire uniformly charged infinite plane sheet, and uniformly charged thin spherical shell.  Electric field: , Electric field lines. Electric dipole, Electric field due to a dipole. Torque on a dipole in a uniform electric field, Electric field due to a point charge |
| Unit 12 | Current Electricity | Electric current. Drift velocity, mobility, and their relation with electric current. Ohm's law. Electrical resistance. Electrical energy and power. Series and parallel combinations of resistors; Temperature dependence of resistance, V-l characteristics of Ohmic and non-ohmic conductors. Electrical resistivity and conductivity.  Wheatstone bridge. Metre Bridge, Kirchhoff’s laws and their applications., Internal resistance, potential difference, and emf of a cell, a combination of cells in series and parallel. |
| Unit 13 | Magnetic Effects Of Current And Magnetism | Biot - Savart law and its application to the current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields.  Para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole in a uniform magnetic field, Bar magnet as an equivalent solenoid, magnetic field lines;  Torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its sensitivity, and conversion to ammeter and voltmeter, Force on a current-carrying conductor in a uniform magnetic field. The force between two parallel currents carrying conductors-definition of ampere. |
| Unit 14 | Electromagnetic Induction And Alternating Currents | Lenz’s Law, Self and mutual inductance. Alternating currents, peak and RMS value of alternating current/ voltage: reactance and impedance: LCR series circuit, resonance: power in AC circuits, wattless current. AC generator and transformer, Eddy currents, Electromagnetic induction: Faraday's law. Induced emf and current: . |
| Unit 15 | Electromagnetic Waves | Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet. X-rays. Gamma rays), Displacement current. Transverse nature of electromagnetic waves, Applications of e.m. waves, Electromagnetic waves and their characteristics, |
| Unit 16 | Optics | Reflection of light, Refraction of light through a prism. Microscope and Astronomical Telescope (reflecting and refracting ) and their magnifying powers, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula, and lens maker formula. Magnification. Power of a Lens. Combination of thin lenses in contact. Total internal reflection and its applications.  Wave optics: wavefront and Huygens' principle. Polarisation, plane-polarised light: Brewster's law, uses of plane polarised light and Polaroid, Interference, Young's double-slit experiment, and expression for fringe width, coherent sources, and sustained interference of light. Diffraction due to a single slit, width of central maximum, Laws of reflection and refraction using Huygens principle. |
| Unit 17 | Dual Nature Of Matter And Radiation | Dual nature of radiation. Einstein's photoelectric equation: particle nature of light. Hertz and Lenard's observations; Matter waves-wave nature of particle, de Broglie relation, Photoelectric effect. |
| Unit 18 | Atoms And Nuclei | Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission, and fusion, Alpha-particle scattering experiment; energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, Rutherford's model of atom; Bohr model |
| Unit 19 | Electronic Devices | Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED. the photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Logic gates (OR. AND. NOT. NAND and NOR) |
| Unit 20 | Experimental Skills |  |