CAREERS 360

PREPARATION Series

JEE Main 2025

Physics Syllabus

(As Per the Latest NTA Syllabus)

Powered by: AMITY UNIVERSITY – NOIDA (DELHI NCR) –

Contents

A Note to students

Dear JEE Main Aspirants,

It is a known fact that JEE Main is the best entrance examination for admission to top engineering institutes in India. All the aspirants who aim to qualify for JEE Main have to make a perfect exam strategy to stand out of the crowd and ace the exam. With this comes lots of queries and confusion regarding the preparation strategy regarding what to study, where to study from, and much more. It is very important for the aspirants to fully understand the exam pattern and syllabus of JEE Main Chemistry to clear all their queries.This eBook contains an analysis of the new topics that have been added and the topics that have been removed in the revised JEE Main Chemistry syllabus in comparison to the previous year's syllabus.

There are two parts, including the theoretical aspect and the practical aspect. The latest JEE Main Physics syllabus is provided for each chapter in Physics, including details about newly added topics and removed topics. While some topics have been removed from the previous year's syllabus, it's recommended to review them, especially if they are interconnected with other mentioned topics. Notably, the entire communication system chapter has been removed. Also, some experiments are reduced from the previous year's syllabus.

Good luck, and may your hard work and determination pave the way for your success in the JEE Main

Warm Regards
Team Careers360

JEE Mains Physics Syllabus

PHYSICS

UNIT 1: Units and Measurements

Units of measurements, System of units, SI Units, fundamental and derived units, least count, significant figures, Errors in measurements. Dimensions of Physics quantities, dimensional analysis, and its applications.

UNIT 2: Kinematics

The frame of reference, motion in a straight line, speed and velocity, uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, relative velocity. Motion in a plane, projectile motion, uniform circular motion.

UNIT 3: Laws of Motion

Force and inertia, Newton's first law of motion, momentum, 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. Static and Kinetic friction, laws of friction, rolling friction. 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, kinetic and potential energies, work-energy theorem, power. The potential energy of a spring, conservation of mechanical energy, conservative and non- conservative forces, motion in a vertical circle. Elastic and inelastic collisions in one and two dimensions.

UNIT 5: Rotational Motion

Centre of mass of a two-particle system, centre of mass of a rigid body. Basic concepts of rotational motion, moment of a force, torque, angular momentum, conservation of angular momentum and its applications.

The moment of inertia, the radius of gyration, values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

UNIT 6: Gravitation

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy, gravitational potential. Escape velocity, motion of a satellite, orbital velocity, time period and energy of satellite.

UNIT 7: Properties of Solids and Liquids

Elastic behaviour, stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus and modulus of rigidity.Pressure due to a fluid column, Pascal's law and its applications, effect of gravity on fluid pressure, viscosity, Stoke's law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's principle and its applications. 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.

UNIT 8: Thermodynamics

Thermal equilibrium and the concept of temperature, zeroth law of thermodynamics, heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes. The second law of thermodynamics: reversible and irreversible processes.

UNIT 9: Kinetic Theory of Gases

Equation of state of a perfect gas, work done on compressing a gas, kinetic theory of gases: assumptions, the concept of pressure, kinetic interpretation of temperature, RMS speed of gas molecules, degrees of freedom, law of equipartition of energy and applications to specific heat capacities of gases, mean free path, Avogadro's number.

UNIT 10: Oscillations and Waves

Oscillations and periodic motion: time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M.) and its equation, phase, oscillations of a spring: restoring force and force constant, energy in S.H.M.: 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 11: Electrostatics

Electric charges: conservation of charge, Coulomb's law forces between two point charges, forces between multiple charges, superposition principle and continuous charge distribution.

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, 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 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.

Conductors and insulators, dielectrics and electric polarization, capacitors and capacitance, the combination of capacitors in series and parallel and capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

UNIT 12: Current Electricity

Electric current: drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, I-V characteristics of Ohmic and non-ohmic conductors, electrical energy and power, electrical resistivity and conductivity, series and parallel combinations of resistors, temperature dependence of resistance.
Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel. Kirchhoff's laws and their applications, Wheatstone bridge, Metre Bridge.

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, force on a current-carrying conductor in a uniform magnetic field, the force between two parallel currents carrying conductors-definition of ampere, torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its sensitivity and conversion to ammeter and voltmeter.
Current loop as a magnetic dipole and its magnetic dipole moment, bar magnet as an equivalent solenoid, magnetic field lines, 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, para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties.

UNIT 14: Electromagnetic Induction and Alternating Currents

Electromagnetic induction: Faraday's law, induced emf and current, Lenz's law, eddy currents, 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.

UNIT 15: Electromagnetic Waves

Displacement current, electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, Gamma rays), applications of electromagnetic waves.

UNIT 16: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula, total internal reflection and its applications, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism, microscope and astronomical telescope (reflecting and refracting) and their magnifying powers.
Wave optics: wavefront and Huygens 'Principle, laws of reflection and refraction using Huygens principle. 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.
Polarization: plane-polarized light, Brewster's law, uses of plane- polarized light and Polaroid.

UNIT 17: Dual Nature of Matter and Radiation

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light. Matter waves: wave nature of particle, de- Broglie relation.

UNIT 18: Atoms and Nuclei

Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

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, Zener diode, Zener diode as a voltage regulator. Logic gates (OR. AND. NOT. NAND and NOR).

UNIT 20: Experimental Skills

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

1. Vernier calipers -its use to measure the internal and external diameter and depth of a vessel.
2. Screw gauge-its use to determine the thickness/ diameter of thin sheet/wire.
3. Simple pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.
4. Metre scale - the mass of a given object by the principle of moments.
5. Young's modulus of elasticity of the material of a metallic wire.
6. Surface tension of water by capillary rise and effect of detergents,
7. Co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
8. Speed of sound in air at room temperature using a resonance tube,
9. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
10. The resistivity of the material of a given wire using a metre bridge.
11. The resistance of a given wire using Ohm's law.
12. Resistance and figure of merit of a galvanometer by half deflection method.
13. The focal length of
    (i) Convex mirror
    (ii) Concave mirror and
    (iii)Convex lens, using the parallax method.
14. The plot of the angle of deviation vs angle of incidence for a triangular prism.
15. The refractive index of a glass slab using a travelling microscope.
16. Characteristic curves of a p-n junction diode in forward and reverse bias.
17. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
18. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items.

How to Prepare For JEE Main Physics

To excel in JEE Main Physics, candidates need a combination of conceptual clarity, analytical skills, and consistent practice. Here is a focused strategy for efficient Physics preparation:

- **Detailed Understanding of Syllabus and Exam Pattern:** Start by thoroughly reviewing the JEE Main Physics syllabus and understanding the exam pattern. Prioritize topics based on weightage, with particular attention to mechanics, electromagnetism, and modern physics.
- **NCERT Textbooks as a Foundation:** Begin with NCERT textbooks for Grades 11 and 12, as these provide a solid foundation and cover fundamental concepts crucial for JEE Main Physics.
- **Conceptual Clarity with Practical Application:** Aim to build a deep understanding of physical concepts rather than rote learning. Topics like kinematics, rotational dynamics, and optics require a clear grasp of theory and its application in various problem types.
- **Emphasis on Important Formulas and Laws:** Regularly revise key formulas, derivations, and laws, as they form the basis of problem-solving in Physics. Create a formula sheet for quick reference and revision.
- **Structured Practice in Numerical Problem-Solving:** Physics for JEE Main involves extensive numerical calculations. Consistently practice a variety of problems, from basic to complex, to strengthen your analytical skills and improve accuracy.
- **Mock Tests and Previous Years' Papers:** Frequently practice mock tests and solve previous years' papers under timed conditions. This enhances speed, accuracy, and familiarity with the question patterns.
- **Error Analysis and Adaptive Strategy:** After each practice session or test, analyze mistakes and focus on understanding where and why errors occurred. Refine your strategy based on these insights to improve performance in weak areas.

Other Useful Resources

Are you preparing for the JEE Main exam, a crucial stepping stone towards your dream engineering college? Success in this competitive exam requires dedication, hard work, and access to high-quality study materials. To help you excel in the JEE Main exam, we have provided below some essential eBooks. Let's explore those ebooks.

JEE Main Exam's High Scoring Chapters and Topics (Just Study 40% Syllabus and Score up to 100%)

This eBook provides a comprehensive list of JEE Main important chapters and topics to study in just 40% of the syllabus and score up to 100% marks in the examination. We encourage you to focus on key chapters and topics to study smart and score high through this amazing eBook.

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This ebook contains a comprehensive chapter-wise collection of all fundamental formulas, equations, and laws of JEE Main Physics that are essential for the quick revision of concepts of 11th-class and 12th-class Physics chapters.

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Thank You