

Syllabus for Physics Bachelor's

Section 1: Subject Knowledge

Please Note: A Total of 26 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Bachelor's Candidate.

Unit I: Classical Mechanics

Newton's laws, motion in different frames, centrifugal and Coriolis forces, Central force motion, Kepler's laws, gravitational field, and force types, Rotational dynamics, conservation laws, variable mass systems, and collisions, Fluid dynamics.

Unit II: Mathematical Physics

Calculus, Taylor expansion, Fourier series, Vector algebra & Vector Calculus, Multiple Integrals, Divergence theorem, green's theorem, Stokes' theorem, First-order equations and linear second-order differential equations with constant coefficients, Matrices and determinants, Algebra of complex numbers.

Unit III: Electrostatics

Electrostatic, Conductors, capacitors, dielectrics, and electrostatic energy, Biot-Savart and Ampere's laws, EMI, inductance, and AC/DC circuits, Maxwell's equations, plane electromagnetic waves, Poynting's theorem, and wave reflection/refraction at dielectric interfaces, Lorentz Force.

Unit IV: Kinetic theory, Thermodynamics

Kinetic theory of gases, velocity distribution, and equipartition of energy, Ideal and van-der-Waals gases, Laws of thermodynamics, Maxwell's relations, and thermodynamic potentials, Phase transitions and Clausius-Clapeyron equation, Ensembles and distributions.

Unit V: Modern Physics

Inertial frames, Galilean invariance, special relativity, Lorentz transformations, and mass-energy equivalence, Blackbody radiation, photoelectric effect, wave-particle duality, and uncertainty principle, Schrödinger equation, Pauli Exclusion Principle, atomic nucleus structure, radioactivity, and decay laws.

Unit VI: Solid State and Electronics

Crystal structures, Bravais lattices, Miller indices, and X-ray diffraction, Semiconductor properties, Fermi level, p-n junctions, and diodes, BJT, amplifiers, oscillators, OP-AMP, and digital electronics (Boolean algebra, logic gates, De Morgan's theorem).

Unit VII: Oscillation and waves

Simple harmonic oscillators, Lissajous figures, damped and forced oscillators, and resonance, Wave equation, traveling and standing waves, group and phase velocity, and Doppler Effect, Sound waves, Fermat's principle, image formation, lenses, and interference, Diffraction, and polarization phenomena.

Section 2: Fundamental Skills

Please Note: A Total of 28 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Bachelor's Candidate.

Unit I: Data Analysis

Unit II: Math and Statistics

Unit III: Lab skills

Unit IV: Reading and Writing

Section 3: Specific Skill Proficiency

This section has more than 30 skills. You can select the ones you are proficient in from the enrollment form. You can choose a maximum of 2 skills. Each skill contains 10 questions.

