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JEE ADVANCED

COMPLETE SYLLABUS — 2027

Physics · Chemistry · Mathematics

For Candidates Preparing for Admission to the IITs

Prepared & Curated by the Faculty of Meer Sir Academy

Based on the officially notified JEE Advanced syllabus framework (unchanged since 2023),
pending release of the formal 2027 information brochure by the conducting IIT.

1. About This Syllabus

This document presents the complete subject-wise syllabus for JEE (Joint Entrance Examination) Advanced 2027, covering Physics, Chemistry, and Mathematics, prepared for students of Meer Sir Academy preparing for admission to the Indian Institutes of Technology (IITs) and other centrally funded technical institutions.

Important Notice: The official JEE Advanced 2027 information brochure and syllabus have not yet been released by the conducting IIT (expected to be announced after JEE Main 2027 results, in late 2026 or early 2027). The syllabus structure has remained unchanged since the 2023 revision and is not expected to see major changes for 2027. Candidates should begin preparation using this syllabus and cross-verify with the official brochure at jeeadv.ac.in once published.

2. Examination Overview

Conducting Body	One of the seven zonal IITs (rotational basis); organising institute for 2027 to be announced by the Joint Admission Board (JAB)
Exam Mode	Computer-Based Test (CBT), online
Number of Papers	Two compulsory papers — Paper 1 and Paper 2 (both mandatory for merit list)
Duration	3 hours per paper (both held on the same day, in two shifts)
Subjects	Physics, Chemistry, Mathematics — in every paper
Question Types	Single Correct MCQs, Multiple Correct MCQs (MSQs), Numerical Answer Type (NAT) questions
Medium	English and Hindi
Eligibility	Candidates must qualify JEE Main 2027 and rank within the top eligible candidates as notified by NTA
Official Website	jeeadv.ac.in

3. Marking Scheme (Indicative)

The exact marks per question and negative marking structure are announced afresh each year in the official information brochure. Based on recent years' pattern:

- Single Correct MCQ: +3 for correct answer, –1 for incorrect answer
- Multiple Correct MCQ (MSQ): full marks for all correct options chosen; partial marking for partially correct responses; negative marking for any incorrect option marked
- Numerical Answer Type (NAT): +3 or +4 for correct numerical value entered; generally no negative marking

Note: Question-wise marks and the exact partial-marking scheme for MSQs vary year to year and will be confirmed in the JEE Advanced 2027 official brochure.

4. Physics Syllabus

Physics tests conceptual clarity, application of formulae to unfamiliar situations, and the ability to integrate multiple topics within a single problem. Questions are frequently numerical and application-based rather than purely descriptive.

A. General Physics

- Units and dimensions, dimensional analysis
- Least count, significant figures
- Methods of measurement and error analysis for physical quantities pertaining to mechanics, heat, optics, and electricity using common laboratory apparatus (vernier callipers, screw gauge, simple pendulum, metre scale)

B. Mechanics

- Kinematics in one and two dimensions (Cartesian and polar coordinates); projectile motion; uniform circular motion
- Newton's laws of motion; inertial and uniformly accelerated frames of reference; static and dynamic friction
- Systems of particles; centre of mass and its motion; impulse; elastic and inelastic collisions
- Work-energy theorem; power; conservation of linear momentum and mechanical energy
- Gravitation: Newton's law of gravitation, gravitational potential and field, acceleration due to gravity, Kepler's laws, motion of planets and satellites in circular orbits, escape velocity
- Rigid body dynamics: moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies (rings, discs, thin rods, spheres, cylinders); torque, angular momentum and conservation, dynamics of rigid bodies with fixed axis of rotation, rolling without slipping, equilibrium of rigid bodies
- Elasticity: Hooke's law, Young's modulus, shear and bulk moduli, Poisson's ratio, elastic energy
- Fluid mechanics: pressure in a fluid, Pascal's law, buoyancy, surface energy and surface tension (capillary rise, drops, bubbles), viscosity (Poiseuille's equation, Stokes' law, terminal velocity), streamline flow, equation of continuity, Bernoulli's theorem and applications
- Oscillations: simple harmonic motion (linear and angular), oscillations of a spring, simple and compound pendulum, damped and forced oscillations, resonance
- Waves: wave motion (plane waves only), longitudinal and transverse waves, superposition of waves, progressive and stationary waves, vibration of strings and air columns, resonance, beats, speed of sound in gases, Doppler effect (in sound)

C. Thermal Physics

- Thermal expansion of solids, liquids, and gases; calorimetry; latent heat
- Heat conduction in one dimension; elementary ideas of convection and radiation; Newton's law of cooling; ideal gas laws; specific heats (C_v and C_p for monatomic and diatomic gases)
- Isothermal and adiabatic processes; bulk modulus of gases
- Equivalence of heat and work; first law of thermodynamics and its applications; second law of thermodynamics, reversible and irreversible processes, entropy (qualitative)
- Blackbody radiation: absorptive and emissive powers; Kirchhoff's law; Wien's displacement law; Stefan's law

D. Electricity and Magnetism

- Coulomb's law; electric field and potential; electrical potential energy of point charges and dipoles in a uniform electrostatic field; electric field lines
- Gauss's law and its application to field calculations for symmetric charge distributions
- Capacitance; parallel plate and spherical capacitors; capacitors in series and parallel; energy stored in a capacitor; dielectrics
- Electric current, Ohm's law, series and parallel arrangements of resistances and cells, Kirchhoff's laws and their application, thermal energy from current, potentiometer and Wheatstone bridge
- Magnetic field due to a current-carrying wire (straight wire, circular loop, solenoid); force on a moving charge and on a current-carrying wire in a uniform magnetic field; force between two parallel current-carrying wires; magnetic moment of a current loop; torque on a current loop in a magnetic field
- Electromagnetic induction: Faraday's law, Lenz's law, self- and mutual inductance; RC, LR, LC, and RLC circuits with DC and AC sources; alternating currents (root-mean-square value, reactance, impedance, LCR series circuit, resonance); transformer and AC generator

E. Electromagnetic Waves

- Elementary concepts of displacement current; electromagnetic waves and their characteristics (qualitative only); electromagnetic spectrum (radio waves through gamma rays), importance of wavelength ranges for various applications

F. Optics

- Rectilinear propagation of light; reflection and refraction at plane and spherical surfaces; total internal reflection; deviation and dispersion of light by a prism
- Thin lenses; combinations of mirrors and thin lenses; magnification
- Wave nature of light: Huygens' principle; interference (Young's double-slit experiment); diffraction due to a single slit; polarisation (elementary concepts)

G. Modern Physics

- Atomic nucleus: alpha, beta, gamma radiation; laws of radioactive decay; decay constant; half-life and mean life; binding energy and its calculation; fission and fusion processes
- Photoelectric effect; Bohr's model of the hydrogen atom; characteristic and continuous X-rays, Moseley's law; de Broglie wavelength of matter waves

5. Chemistry Syllabus

Chemistry is divided into Physical, Organic, and Inorganic Chemistry, each carrying roughly equal weightage. Strong NCERT foundations combined with numerical and reaction-mechanism practice are essential.

A. Physical Chemistry

General Topics

Concept of atoms and molecules; Dalton's atomic theory; mole concept; chemical formulae; balanced chemical equations; calculations based on mole concept, stoichiometry, and volumetric analysis.

Gaseous and Liquid States

Absolute scale of temperature; ideal gas equation; deviations from ideal behaviour; van der Waals equation; kinetic theory of gases; average, root-mean-square, and most probable velocities; law of partial pressures; vapour pressure; diffusion of gases.

Atomic Structure and Chemical Bonding

Bohr model of the hydrogen atom; wave-particle duality; de Broglie hypothesis; Heisenberg's uncertainty principle; quantum numbers; shapes of orbitals; electronic configuration of elements (up to atomic number 36); aufbau principle, Pauli's exclusion principle, Hund's rule. Ionic, covalent, and coordinate bonds; VSEPR theory and shapes of molecules; hybridisation of carbon, nitrogen, oxygen, and sulfur; molecular orbital theory for homonuclear diatomic species; hydrogen bonding; polarity in molecules and dipole moment; ionic solids (lattice energy, Born-Haber cycle).

Energetics

First law of thermodynamics; internal energy, enthalpy, and Hess's law; heats of reaction (formation, combustion, neutralisation); second law of thermodynamics; entropy and free energy; criteria for spontaneity.

Chemical Equilibrium

Law of mass action; equilibrium constants (K_p , K_c) and their relation to free energy change; Le Chatelier's principle (both physical and chemical equilibria); ionic equilibrium in solution, solubility product, common-ion effect, hydrolysis of salts, pH and buffer solutions.

Electrochemistry

Electrochemical cells and electrode potentials; Nernst equation; standard electrode potentials; electrochemical series; EMF of galvanic cells; Faraday's laws of electrolysis; conductance in electrolytic solutions, molar conductivity; Kohlrausch's law; electrolytic cells and cell constants; storage cells and fuel cells; corrosion (qualitative treatment).

Chemical Kinetics

Rates of chemical reactions; order and molecularity; rate constants and rate laws; integrated rate expressions for zero- and first-order reactions; temperature dependence of rate constants (Arrhenius equation); activation energy; catalysis (basic concepts).

Solid State and Solutions

Classification of solids, lattices, unit cells; packing in crystals, packing efficiency, void space, calculation of density; imperfections in crystals (qualitative). Raoult's law; molecular weight determination from lowering of vapour pressure, elevation of boiling point, and depression of freezing point; van't Hoff factor and colligative properties; concentration units and Henry's law.

Surface Chemistry

Elementary concepts of adsorption; colloids (types, preparation, and properties); Tyndall effect; emulsions and their types.

Nuclear Chemistry

Radioactivity: isotopes and isobars; properties of alpha, beta, and gamma rays; kinetics of radioactive decay (decay constant, half-life, and mean life); binding energy and mass defect; nuclear fission and fusion reactions.

B. Inorganic Chemistry

Isolation and Extraction of Metals

General principles of metallurgy — ore concentration, reduction (chemical and electrolytic), and refining, with reference to Al, Cu, Zn, and Fe.

Periodic Properties

Modern periodic law and long-form periodic table; periodic trends in physical and chemical properties (atomic radius, ionic radius, ionisation energy, electron affinity, valence, oxidation states); trends in acidic and basic nature of oxides.

Chemistry of Non-Metals and Representative Elements

Preparation, properties, and reactions of hydrogen, alkali and alkaline-earth metals, boron, carbon, silicon, nitrogen, phosphorus, oxygen, sulfur, and halogens; noble gases; general trends in chemistry of groups 1, 2, 13–18; important compounds such as NaOH, Na₂CO₃, NaHCO₃, CaO, Ca(OH)₂, CaCO₃, boric acid, borax, silicates, ammonia, nitric acid, phosphine, sulfuric acid, hydrogen peroxide, halogen oxoacids.

Transition Elements (3d series)

Definition; general characteristics of d-block elements — electronic configuration, oxidation states, colour, magnetic and catalytic properties; preparation and properties of K₂Cr₂O₇ and KMnO₄.

Coordination Compounds

Nomenclature; structure and stereoisomerism; magnetic properties; role in biological systems, qualitative analysis, and extractive metallurgy (basic concepts of valence bond and crystal field theory as applicable).

Qualitative Analysis

Chemistry of common qualitative-analysis reactions — precipitation and complex formation reactions in aqueous solution; test for common anions and cations; preparation and properties of common inorganic compounds.

C. Organic Chemistry

Basic Concepts and Nomenclature

IUPAC nomenclature of simple organic compounds; electronic effects (inductive, resonance, hyperconjugation) and their applications; hybridisation of carbon; shapes of molecules; structural and geometrical isomerism; optical isomerism of compounds containing up to two asymmetric centres, R,S and E,Z nomenclature (basic ideas).

Reaction Mechanisms and Reactive Intermediates

Nucleophiles and electrophiles; types of organic reactions — substitution, addition, elimination, and rearrangement; carbocations, carbanions, and free radicals (formation, generation, and stability).

Hydrocarbons

Preparation, properties, and reactions of alkanes, alkenes, alkynes, and aromatic hydrocarbons (benzene chemistry); electrophilic aromatic substitution reactions; directive influence of substituent groups; effect of O₂, O₃, X₂, HX, and H₂O₂ addition to alkenes and alkynes.

Haloalkanes and Haloarenes

Preparation and properties; nucleophilic substitution reactions (S_N1, S_N2); elimination reactions.

Alcohols, Phenols, and Ethers

Preparation, properties, and important reactions (esterification, dehydration, oxidation); acidity of phenols; Williamson synthesis.

Aldehydes and Ketones

Preparation and properties; nucleophilic addition reactions (with HCN, NH_3 and its derivatives, alcohols); acidity of α -hydrogen; aldol condensation; Cannizzaro reaction; haloform reaction; chemistry of carboxylic acids.

Carboxylic Acids and Derivatives

Preparation, acidity, and reactions of carboxylic acids; esters, amides, and acid chlorides — preparation and interconversion.

Amines

Preparation and properties of aliphatic and aromatic amines; basicity; diazonium salts and their synthetic applications.

Biomolecules and Polymers

Carbohydrates — classification and general properties of monosaccharides and disaccharides; amino acids and peptides (structure and general properties); properties and important reactions of proteins; DNA structure (basic concepts); vitamins (classification and functions, basic concepts); important polymers (natural and synthetic — polythene, nylon, polyesters, rubber, and related monomers).

Practical Organic Chemistry

Detection of elements (N, S, halogens); detection and identification of common functional groups — hydroxyl (alcoholic and phenolic), carbonyl, carboxyl, amino, and nitro groups; chemistry involved in the preparation of common organic compounds (acetanilide, dibenzalacetone, p-nitroacetanilide, aniline yellow, iodoform) and simple qualitative-analysis reactions.

6. Mathematics Syllabus

Mathematics tests analytical ability, speed, and accuracy in problem-solving. Calculus and Algebra together carry the highest weightage.

A. Algebra

- Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and argument, triangle inequality, cube roots of unity, geometric interpretations
- Quadratic equations with real coefficients: relations between roots and coefficients, formation of quadratic equations with given roots, symmetric functions of roots
- Arithmetic, geometric, and harmonic progressions; arithmetic, geometric, and harmonic means; sums of finite arithmetic and geometric progressions and their products with an arithmetic-geometric progression; sum of squares and cubes of the first n natural numbers
- Logarithms and their properties
- Permutations and combinations; binomial theorem for a positive integral index; properties of binomial coefficients
- Matrices: as a rectangular array of real numbers, equality, addition, multiplication by a scalar, product of two matrices, transpose of a matrix, determinant of a square matrix of order up to three, inverse of a square matrix of order up to three, properties of these matrix operations, diagonal, symmetric and skew-symmetric matrices, solutions of simultaneous linear equations in two or three variables
- Sets, relations, and functions; mathematical induction
- Sum of finite series; elementary probability theory: addition and multiplication rules, conditional probability, Bayes' theorem, independence of events, computation of probability of events using permutations and combinations

B. Trigonometry

- Trigonometric functions, their periodicity and graphs; addition and subtraction formulae; formulae involving multiple and sub-multiple angles; general solution of trigonometric equations
- Relations between sides and angles of a triangle; sine rule, cosine rule, half-angle formula, and area of a triangle; inverse trigonometric functions (basic properties)

C. Analytical Geometry

- Two-dimensional geometry: distance formula, section formula, area of a triangle, condition for collinearity of three points in a plane; translation of axes; slope of a line; parallel and perpendicular lines; equations of a straight line in various forms; angle between two lines; distance of a point from a line; equations of internal and external bisectors of angles between two lines; equation of a family of lines through the intersection of two lines; equations of a circle in standard and general form; conditions for a line to be tangent to a circle; equation of the tangent
- Equations of conic sections (parabola, ellipse, and hyperbola) in standard form, including foci, directrices, eccentricity, and parametric equations; equations of tangents and normals
- Locus problems
- Three-dimensional geometry: direction cosines and direction ratios; equation of a straight line in space and its distance from a point; skew lines, shortest distance between two lines; equation of a plane; distance of a point from a plane; angle between two lines, two planes, and a line and a plane; equation of a sphere

D. Differential Calculus

- Real-valued functions of a real variable: domain and range; even and odd functions; periodic functions; inverse functions; graphs of simple functions; sums, differences, products, and quotients of two functions; composite functions
- Limit and continuity of a function; limit and continuity of the sum, difference, product, and quotient of two functions; L'Hôpital's rule of evaluation of limits of the form $0/0$ and ∞/∞
- Concepts of derivative; derivatives of sum, difference, product, and quotient of two functions; derivative of a function with respect to another function; derivative of implicit functions; derivatives of order up to two
- Geometric interpretation of a derivative, tangents and normals; increasing and decreasing functions; Rolle's theorem and Lagrange's mean value theorem; relation between the sign of the derivative and the monotonicity of a function; maxima and minima of functions; Leibniz rule for differentiating a product of two functions

E. Integral Calculus

- Integration as the inverse process of differentiation; indefinite integrals of standard functions; integration by substitution, by partial fractions, and by parts
- Integration of trigonometric, algebraic, exponential, and logarithmic functions
- Properties of definite integrals; evaluation of definite integrals; determining areas of regions bounded by simple curves
- Formation of ordinary differential equations; solutions of homogeneous differential equations, separation of variables, and linear first-order differential equations

F. Vectors

- Addition of vectors; scalar (dot) and vector (cross) products; scalar triple products and their geometrical interpretations

7. Indicative Chapter-Wise Weightage

The distribution below reflects historical trends across recent JEE Advanced papers and is meant only as a broad planning guide. It is not a guarantee of the exact 2027 question distribution, which depends on the paper set each year.

Physics

Topic	Approx. Weightage	Priority
Mechanics	25–30%	Very High
Electricity & Magnetism	20–25%	Very High
Modern Physics	10–12%	High
Optics	8–10%	High
Thermal Physics	8–10%	Medium
Waves & Oscillations	8–10%	Medium
General Physics & EM Waves	5–7%	Medium

Chemistry

Topic	Approx. Weightage	Priority
Physical Chemistry	33–35%	Very High
Organic Chemistry	33–35%	Very High
Inorganic Chemistry	30–33%	Very High

Mathematics

Topic	Approx. Weightage	Priority
Calculus (Differential + Integral)	30–35%	Very High
Algebra	20–25%	Very High
Coordinate Geometry	15–18%	High
Vectors & 3D Geometry	10–12%	Medium
Trigonometry	8–10%	Medium
Probability	5–7%	Medium

8. Meer Sir Academy — Preparation Guidelines

- Build every topic on NCERT Class 11 and 12 foundations before moving to advanced problem sets.
- Give Mechanics, Calculus, and Physical Chemistry priority — they anchor most cross-topic questions in JEE Advanced.
- Practise previous 10 years' JEE Advanced papers (Paper 1 and Paper 2) under timed conditions.
- Revise Inorganic Chemistry regularly through short, repeated cycles rather than one-time reading.
- Attempt regular full-length mock tests conducted at Meer Sir Academy to build speed, accuracy, and paper-specific temperament (MCQ, MSQ, and NAT formats).
- Keep a formula and reaction-mechanism notebook for quick revision in the final weeks before the exam.

Important Notice: This syllabus will be updated by Meer Sir Academy as soon as the official JEE Advanced 2027 information brochure is released by the conducting IIT at jeeadv.ac.in. Students are advised to attend the academy's syllabus-update sessions for any confirmed changes.