TESSELLATE 2025

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STEMS 2025

Physics Syllabus

Category A

- Mechanics
  - Distance and Displacement
  - Velocity
  - Uniform and Non-uniform Motion along a Straight Line
  - Acceleration
  - Distance-time and Velocity-time Graphs
  - Uniform Circular Motion
  - Newton's Laws of Motion
  - Momentum
  - Elementary Idea of Conservation of Momentum.
  - Kinetic and Potential Energy
  - Work and Power
  - Conservation of Energy
  - Pressure in Fluids, Pascal\'s Law
  - Wave Motion
  - Gravitation
  - Archimedes' Principle
  - Buoyancy
  - Elementary idea of Relative Density
  - Kinematics in 1 and 2 Dimensions
  - Newton\'s Laws of Motion
  - Friction (Static and Dynamic)
  - Kinetic and Potential Energy
  - Work and Power
  - Conservation of Energy
  - Conservation of Momentum
  - Elastic and Inelastic Collisions
  - Gravitation
  - Dynamics of Rigid Bodies
  - Linear and Angular Harmonic Motions
  - Pressure in Fluids, Pascal\'s Law
  - Surface Energy and Surface Tension
  - Streamline Flow
  - Equations of Continuity
  - Bernoulli\'s Theorems and its Applications
  - Wave Motion
  - Vibration of Strings and Air Columns
  - Doppler Effect (Sound)
- Thermal Physics
  - Thermal Expansion of Solids, Liquids, and Gases
  - Latent Heat
  - Conduction, Elementary Concepts of Convection and Radiation
  - Ideal Gas Laws
  - Specific Heats
  - Thermal Expansion of Solids, Liquids, and Gases
  - Latent Heat
  - Conduction in 1 Dimension, Elementary concepts of Convection and
  - Radiation

  - Newton\'s Law of Cooling
  - Ideal Gas Laws
  - Specific Heats
  - Isothermal and Adiabatic Processes
  - First Law of Thermodynamics
  - Black Body Radiation (Absorptive and Emissive Powers): Kirchoff\'s Law, Wein\'s Displacement Law, Stefan Law
- Optics
  - Rectilinear Propagation of Light
  - Ray Diagrams
  - Reflection and Refraction
  - Mirror Formula and Magnification
  - Lens Formula and Magnification
  - Photoelectric Effect
- Electrodynamics
  - Electric Circuits and Ohm's Law
  - Resistance of System of Resistors (Series and Parallel)
  - Heating Effects of Current
  - Electric Power
  - Magnetic Fields and Field Lines
  - Magnetic Field - Right-hand Thumb Rule
  - Field Lines

Category B

- Mechanics
  - Newtonian Mechanics, Lagrangian Mechanics, Hamiltonian Mechanics
  - Rigid Body Dynamics
  - Simple Harmonic Oscillator
  - Central Forces
  - Special Relativity (Time Dilation, Length Contraction, Lorentz
  - Transformation)
  - Noether\'s Theorem
  - Elementary Topics in Fluid Dynamics
- Electrodynamics
  - Gauss\'s Law, Coulomb\'s Law, Application of Gauss\'s Law in the Presence
  - of Symmetries
  - Currents and AC and DC Circuits
  - Solution of Laplace\'s Equations in Cartesian, Spherical, and Cylindrical
  - Coordinates
  - Multipole Expansion
  - Ampere\'s Law
  - Faraday\'s Law
  - Continuity Equation
  - Electromagnetic Waves and Poynting\'s Theorem
  - Coulomb\'s Law
  - Electric Fields and Electric Potential
  - Gauss\'s Law and its Application in Simple Cases
  - Capacitance
  - Electric Current, Ohm\'s Law, Series and Parallel Arrangements of
  - Resistors and Cells, Kirchoff\'s Laws (and Simple Applications)
  - Heating Effect of Current
  - Biot-Savart\'s Law and Ampere\'s Law
  - Lorentz Force
  - Magnetic Moment of a Current Loop
  - Electromagnetic Induction: Faraday\'s Law, Lenz\'s Law, RC, LC, and RL
  - Circuits
- Quantum Mechanics
  - Heisenberg\'s Formulation, Schrodinger\'s Formulation
  - Linear Algebra
  - Spin 1
  - 2 Systems

  - Angular Momentum Quantization and Addition
  - Perturbation Theory (Basics)
  - Fourier Transforms
  - Quantum Harmonic Oscillator
- Optics
  - Rectilinear Propagation of Light
  - Reflection and Refraction
  - Thin Lenses
  - Wave Nature of Light: Huygens Principle, Interference
  - Modern Physics
  - Law of Radioactive Decay, Decay Constant, Half-life and Mean Life,
  - Binding Energy and its Calculation, Fission and Fusion Processes
  - Photoelectric Effect
  - Bohr\'s Theory of Hydrogen-like Atoms
  - de Broglie Wavelength of Matter Waves
  - Wave Properties
  - Superposition, Diffraction
  - Geometric Optics
  - Polarization
  - Doppler Effect
- Thermal Physics
  - Thermodynamic Processes, Equations of State
  - Ideal Gases, Kinetic Theory
  - Ensembles
  - Statistical Concepts and Calculation of Thermodynamic Quantities
  - Heat Transfer
  - Thermal Expansion
- Modern Physics
  - Bohr\'s Model
  - Energy Quantization
  - Black Body Radiation
  - X-Rays
  - Atoms in Electric and Magnetic Fields