TESSELLATE 2026

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STEMS 2026

Physics Syllabus

Category A

– dimensional analysis, limiting cases, series expansions, differentials, iterative solutions.
– Basics probability, error analysis, data analysis, estimation.
– 1D motion, projectile motion, optimal launching, Newton's law
– Force and torque balance, extended bodies, pressure and surface tension.
– Momentum, energy and center-of-mass energy, collisions
– Basic Oscillations, pendulams and others
– rotation, Angular kinematics, angular impulse, physical pendulums
– gravity. Kepler's laws, basic rocket science, non-inertial frames
– fluids. Buoyancy, Bernoulli's principle, viscosity and surface tension.
– ideal gases, basic statistical mechanic, kinetic theory
– laws of thermodynamics, radiation, conduction.
– surface tension, phase transitions.
– electrostatics. Coulomb's law, Gauss's law, potentials, conductors.
– capacitors, conduction, resistors, DC circuits.
– Biot–Savart law, Ampere's law, dipoles and solenoids.
– Dynamic charges, permanent magnets
– Faraday's law, inductors
–RLC circuits, diodes.
– wave equation, standing waves
– sound waves, water waves, polarization, geometrical optics
– basic nuclear, particle, and atomic physics.
– basic astrophysics, and cosmology.

Category B

– dimensional analysis, limiting cases, series expansions, differentials, iterative solutions.
– probability, error analysis, data analysis, estimation.
– Newton's Laws, projectile motion, optimal launching
– Force and torque balance, extended bodies, pressure and surface tension.
– Momentum, energy and center-of-mass energy, collisions.
– Damped/driven oscillators, normal modes, small oscillations, adiabaticity.
– Angular kinematics, angular impulse, physical pendulums.
– Kepler's laws, rocket science, non-inertial frames, tides.
– Buoyancy, Bernoulli's principle, viscosity and surface tension.
– 3D rotation, precession
– ideal gases, kinetic theory, the atmosphere, basic statistical mechanics,
– laws of thermodynamics, radiation, conduction, basic quantum statistical mechanics.
– surface tension, real fluids, phase transitions, compressible flow
– electrostatics, Coulomb's law, Gauss's law, potentials, conductors.
– Method of Images, capacitors, conduction, DC circuits.
– Biot–Savart law, Ampere's law, dipoles and solenoids.
– Lorentz force, Dynamic charges, permanent magnets, solid state physics.
– induction, Faraday's law, inductors, dynamos, superconductors.
– RLC circuits, filters, normal modes, diodes
– electrodynamics, displacement current, radiation, field energy-momentum.
– Electromagnetic fields in matter
– Relativistic kinematics. Lorentz transformations, Doppler effect, acceleration, classic paradoxes and resolutions.
– Relativistic dynamics, Momentum, energy, four-vectors, forces.
– fields under relativity. Electromagnetic field transformations, the equivalence principle
– wave equation, standing waves, music, interferometry.

– interference and diffraction, crystallography, real world examples
– sound waves, water waves, polarization, geometrical optics.
– semiclassical quantum mechanics, bosons and fermions
– nuclear, particle, and atomic physics
– condensed matter, astrophysics, and cosmology