

Markdown physics tree



Create a Markdown dependency tree for physics

Here's a compact, study-oriented dependency tree for (most of) physics. It's arranged roughly in the order you'd learn topics; arrows imply "prerequisite for."

Legend

- → means "is a prerequisite for"
- Brackets show key math/tools each topic leans on

text

MATH & TOOLS

- Algebra & Trig → Calculus I–III [limits, derivatives, integrals, series, vectors]
 - ↳ Linear Algebra [vectors, matrices, eigenstuff]
- Differential Equations (ODEs → PDEs)
- Vector Calculus [grad, div, curl; line/surface integrals]
- Probability & Statistics
- Complex Analysis [contour integrals, residues]
- Numerical Methods & Programming [Python/Julia/Matlab; ODE/PDE solvers]
- Measurement & Error Analysis → Experimental Methods & Instrumentation

CORE UNDERGRAD PHYSICS

- Intro/Foundations
 - ↳ Classical Mechanics I [Newtonian; energy; momentum]
 - ↳ Waves & Oscillations [SHM; coupled modes; Fourier]
 - ↳ Electricity & Magnetism I [Electrostatics; circuits]
- Classical Mechanics II
 - ↳ prerequisites: Calculus III, DEs
 - ↳ Lagrangian & Hamiltonian formalisms
 - ↳ Central forces; rigid bodies; small oscillations
 - ↳ Celestial Mechanics / Nonlinear Dynamics (Chaos)
- Electricity & Magnetism II
 - ↳ prerequisites: Vector Calc, DEs
 - ↳ Maxwell's equations; EM waves; radiation
 - ↳ Optics (Geometric & Physical)
- Thermal Physics
 - ↳ Thermodynamics [laws; cycles; entropy]
 - ↳ Statistical Mechanics I [ensembles; partition function]
- Modern Physics
 - ↳ Special Relativity [Lorentz transforms; 4-vectors]
 - ↳ Quantum Mechanics I [postulates; 1D problems; spin]

UPPER-DIV & GRAD CORE

- Quantum Mechanics II
 - ↳ prerequisites: QM I, Linear Algebra, DEs
 - ↳ Angular momentum; 3D; approximation methods (perturbation, WKB, variational)
 - ↳ Scattering theory; identical particles
- Statistical Mechanics II
 - ↳ prerequisites: Stat Mech I, Probability
 - ↳ Classical/quantum gases; phase transitions; critical phenomena
 - ↳ Non-equilibrium & Stochastic processes
- Classical Field Theory
 - ↳ prerequisites: CM II, SR, Calculus of Variations

- ↳ Relativistic fields; Noether's theorem; gauge symmetry
- Electrodynamics (Advanced)
 - ↳ prerequisites: E&M II, Complex Analysis, PDEs
 - ↳ Boundary-value problems; radiation; waveguides
 - ↳ Plasma physics / Photonics / Microwave engineering
- MAJOR BRANCHES & APPLICATIONS
- Optics & Photonics
 - ↳ prerequisites: E&M II, Waves
 - ↳ Interference, diffraction, Fourier optics
 - ↳ Lasers; nonlinear & quantum optics
- Condensed Matter Physics
 - ↳ prerequisites: QM II, Stat Mech II, Solid-state basics
 - ↳ Crystals; band theory; phonons; semiconductors
 - ↳ Superconductivity; magnetism; topological phases
- Atomic, Molecular & Optical (AMO)
 - ↳ prerequisites: QM II, E&M II
 - ↳ Atomic structure; selection rules; laser cooling & trapping
 - ↳ Precision metrology; quantum information platforms
- Nuclear Physics
 - ↳ prerequisites: QM II, Stat Mech, SR
 - ↳ Nuclear structure; decays; reactions
 - ↳ Reactor physics; nuclear astrophysics
- Particle / High-Energy Physics
 - ↳ prerequisites: SR, Field Theory, Group Theory (Lie groups)
 - ↳ The Standard Model; scattering/accelerators; detectors
 - ↳ Beyond-SM, cosmology connections
- General Relativity & Gravitation
 - ↳ prerequisites: SR, Differential Geometry (tensors, manifolds)
 - ↳ Einstein equations; black holes; gravitational waves
 - ↳ Numerical relativity; cosmology
- Astrophysics & Cosmology
 - ↳ prerequisites: CM II, E&M II, Stat Mech, SR/GR (for cosmology)
 - ↳ Stellar structure; radiative processes; galaxies
 - ↳ Early-universe cosmology; structure formation
- Plasma Physics
 - ↳ prerequisites: E&M II, Fluid dynamics, Stat Mech
 - ↳ Single-particle & MHD; waves & instabilities
 - ↳ Space plasmas; fusion (magnetic/inertial confinement)
- Biophysics / Soft Matter
 - ↳ prerequisites: Stat Mech, Diffusion & Stochastic processes
 - ↳ Polymers; membranes; active matter
- Computational Physics (cross-cuts many)
 - ↳ Numerical linear algebra; Monte Carlo; molecular dynamics
 - ↳ PDEs (finite difference/element/volume), HPC, ML for physics
- CROSS-CUTTING SKILLS
- Data Analysis & Uncertainty Quantification
- Scientific Computing & Visualization
- Group Theory & Symmetry Methods
- Differential Geometry (for GR & gauge theory)
- Experiment Design, Vacuum/cryogenics, Electronics, Detectors

Recommended “starter path” (minimal viable prerequisites)

1. Algebra/Trig → Calculus I-III → Linear Algebra & DEs
2. Classical Mechanics I → Waves/Oscillations → E&M I
3. Thermodynamics → Statistical Mechanics I

4. Special Relativity → Quantum Mechanics I

Then branch into: E&M II, CM II, QM II, Optics, Condensed Matter, AMO, GR, or Particle, depending on interests.

If you want this tailored to a specific level (high school, undergrad, self-study in 6–12 months, etc.), tell me your background and goal and I'll reshape the tree accordingly.