

Physics 42 Course Syllabus

Semester 1

Unit 1 — Linear Motion

Velocity, acceleration, Five Equations of Motion, falling bodies.

Unit 2 — Vectors

Vector Algebra, projectiles, “hanging mass” problems, inclined planes.

Unit 3 — Forces

Newton’s Laws of Motion, Weight vs. Mass, Motion Under Constant Force problems (e.g., friction, tension, weight), two body problems (atwood machines), pressure.

Unit 4 — Curved Motion, Gravity & Torque

Uniform circular motion, fictitious forces (centrifugal “force”, coriolis effect), universal gravitation, orbits.

Unit 5 — Energy

Work, KE, PE, power, Work-Energy Theorem, Conservation of Energy, Hooke’s Law.

Unit 6 — Momentum

Impulse = ΔP , Conservation of Momentum, 1D collisions, Conservation of Angular Momentum (qualitative). How do air bags make a collision safer?

Semester 2

Unit 7 — Electrostatics

Coulomb’s Law, Electric Fields, E.S. Potential.

Unit 8 — D.C. Circuits

Ohm’s Law, Series vs. Parallel Circuits, Capacitors, using multimeters.

Unit 9 — Magnets

Mag. field of straight and curled wire, force on moving charged particle, circular motion in B-field, EM induction, motivation for relativity. [We skipped this unit last year.]

Unit 10 — Vibrations

Transverse and longitudinal waves, standing waves, resonance, musical instruments, sound, doppler effect, simple harmonic motion, interference patterns produced by two point sources.

Unit 11 — Light

Reflection (plane and curved mirrors), Refraction (Snell’s Law and lenses), energy of photon.

Unit 12 — Relativity

Invariant speed of light in vacuum, relativity of simultaneity, time dilation, length contraction, mass increase.