

Topics list for PHYS 1407, based on Hewitt

Required topics in **red**; instructors should cover *all* of these topics.
Suggested topics are in *italics*; instructors should cover the *majority* of these topics, depending on their focus for the course

Part Five: Electricity and Magnetism

22 Electrostatics

22.1 Electricity

22.2 Electric Charges

22.3 Conservation of Charge

22.4 Coulomb's Law

22.5 Conductors and Insulators

22.6 Charging

22.7 Charge Polarization

22.8 Electric Field

22.9 Electric Potential

23 Electric Current

23.1 Flow of Charge and Electric Current

23.2 Voltage Sources

23.3 Electrical Resistance

23.4 Ohm's Law

23.5 Direct Current and Alternating Current

23.6 Speed and Source of Electrons in a Circuit

23.7 Electric Power

23.8 *Lamps*

23.9 Electric Circuits

24 Magnetism

24.1 Magnetism

24.2 Magnetic Poles

24.3 Magnetic Fields

24.4 Magnetic Domains

24.5 Electric Currents and Magnetic Fields

24.6 Electromagnets

24.7 Magnetic Forces

24.8 Earth's Magnetic Field

24.9 *Biomagnetism*

25 Electromagnetic Induction

25.1 Electromagnetic Induction

25.2 Faraday's Law

25.3 Generators and Alternating Current

25.4 Power Production

25.5 Transformers

25.6 *Self-Induction*

25.7 Power Transmission

25.8 *Field Induction*

Part Six: Light

26 Properties of Light

26.1 Electromagnetic Waves

26.2 Electromagnetic Wave Velocity

26.3 The Electromagnetic Spectrum

26.4 Transparent Materials

26.5 Opaque Materials

26.6 *Seeing Light—The Eye*

27 Color

27.1 Color in Our World

27.2 Selective Reflection

27.3 Selective Transmission

27.4 Mixing Colored Lights

27.5 Mixing Colored Pigments

27.6 Why the Sky Is Blue

27.7 Why Sunsets Are Red

27.8 Why Clouds Are White

27.9 Why Water Is Greenish Blue

28 Reflection and Refraction

28.1 Reflection

28.2 Law of Reflection

28.3 Refraction

28.4 Cause of Refraction

28.5 Dispersion and Rainbows

28.6 Total Internal Reflection

28.7 Lenses

28.8 Lens Defects

29 Light Waves

29.1 Huygens' Principle

29.2 Diffraction

29.3 Superposition and Interference

29.4 Thin-Film Interference

29.5 Polarization

29.6 Holography

30 Light Emission

30.1 Light Emission

30.2 Excitation

30.3 Emission Spectra

30.4 Incandescence

30.5 Absorption Spectra

30.6 Fluorescence

30.7 Phosphorescence

30.8 Lamps

30.9 Lasers

31 Light Quanta

31.1 Birth of the Quantum Theory

31.2 Quantization and Planck's Constant

- 31.3 Photoelectric Effect
- 31.4 Wave–Particle Duality
- 31.5 Double-Slit Experiment
- 31.6 Particles as Waves: Electron Diffraction
- 31.7 Uncertainty Principle
- 31.8 Complementarity*

Part Seven: Atomic and Nuclear Physics

32 The Atom and the Quantum

- 32.1 Discovery of the Atomic Nucleus
- 32.2 Discovery of the Electron
- 32.3 Atomic Spectra: Clues to Atomic Structure
- 32.4 Bohr Model of the Atom
- 32.5 Explanation of Quantized Energy Levels: Electron Waves
- 32.6 Quantum Mechanics
- 32.7 Correspondence Principle*

33 The Atomic Nucleus and Radioactivity

- 33.1 X-rays and Radioactivity
- 33.2 Alpha, Beta, and Gamma Rays
- 33.3 Environmental Radiation
- 33.4 The Atomic Nucleus and the Strong Force
- 33.5 Radioactive Half-Life
- 33.6 Radiation Detectors*

33.7 Transmutation of Elements

33.8 Radiometric Dating

34 Nuclear Fission and Fusion

34.1 Nuclear Fission

34.2 Nuclear Fission Reactors

34.3 The Breeder Reactor

34.4 Fission Power

34.5 Mass–Energy Equivalence

34.6 Nuclear Fusion

34.7 Controlling Fusion

Part Eight: Relativity

35 Special Theory of Relativity

35.1 Motion Is Relative

35.2 Postulates of the Special Theory of Relativity

35.3 Simultaneity

35.4 Spacetime and Time Dilation

35.5 Addition of Velocities

35.6 Length Contraction

35.7 Relativistic Momentum

35.8 Mass, Energy, and $E = mc^2$

35.9 The Correspondence Principle

36 General Theory of Relativity

36.1 Principle of Equivalence

36.2 Bending of Light by Gravity

36.3 Gravity and Time: Gravitational Red Shift

36.4 Gravity and Space: Motion of Mercury

36.5 Gravity, Space, and a New Geometry

36.6 Gravitational Waves

36.7 Newtonian and Einsteinian Gravitation