

ADVANCED PLACEMENT TEST MODULES' DESCRIPTION

Recommended Text

University Physics. (13th edition) by Young and Freedman.

PC1141 - Physics I

This module presents the fundamental principles of classical mechanics. It covers topics such as kinematics, Galilean transformation, Newton's laws of motion, dynamics of a particle with generalization to many particle systems, conservation laws, collisions, angular momentum and torque, motion of a rigid body, gravitation and planetary motion, static equilibrium, oscillatory motion and vibrational modes, waves, Doppler's effect and fluid mechanics. The module is targeted at science students who wish to acquire a working knowledge of mechanics, and is an essential for physics majors.

Syllabus

Chapter 1: Units, Physical Quantities, and Vectors

Chapter 2: Motion Along a Straight Line

Chapter 3: Motion in Two or Three Dimensions

Chapter 4: Newton's Laws of Motion

Chapter 5: Applying Newton's Laws

Chapter 6: Work and kinetic Energy

Chapter 7: Potential Energy and Energy Conservation

Chapter 8: Momentum, Impulse, and Collisions

Chapter 9: Rotation of Rigid Bodies

Chapter 10: Dynamics of Rotational Motion

Chapter 11: Equilibrium and Elasticity

Chapter 12: Fluid Mechanics

Chapter 13: Gravitation

Chapter 14: Periodic Motion

Chapter 15: Mechanical Waves

Chapter 16: Sound and Hearing

PC1142 - Physics II

This module covers the fundamentals of two branches of physics: **Thermodynamics** and **Optics**. Its aim is to prepare students for a host of more advanced modules in these and related areas. Topics included in **Thermodynamics** are: thermal processes and effects; the first and second laws; kinetic theory of gases; heat engines and entropy. **Topics included in Optics** are: geometric optics; systems of lenses; optical instruments; interference; diffraction; grating and polarization. The module is targeted at science students who wish to acquire a working knowledge of thermodynamics and optics, and is an essential for physics majors

Syllabus

Chapter 17: Temperature and Heat

Chapter 18: Thermal Properties of Matter

Chapter 19: The First Law of Thermodynamics

Chapter 20: The Second Law of Thermodynamics

Chapter 33: The Nature and Propagation of Light

Chapter 34: Geometric Optics

Chapter 35: Interference

Chapter 36: Diffraction

PC1143 - Physics III

This module covers the fundamentals of electricity and magnetism: electric fields; electric flux and Gauss's law; electric potential, capacitance, dielectrics, current and resistance; DC circuits; magnetic fields, magnetic effect of currents, Ampere's law, electromagnetic induction; AC circuits; magnetism in matter; electromagnetic waves. The module also is targeted at science students who wish to acquire a working knowledge in electricity and magnetism, and is an essential for physics majors.

Syllabus

Chapter 21: Electric Charge and Electric Field

Chapter 22: Gauss's Law

Chapter 23: Electric Potential

Chapter 24: Capacitance and Dielectrics

Chapter 25: Current, Resistance, and Electromotive Force

Chapter 26: Direct-Current Circuits

Chapter 27: Magnetic Field and Magnetic Forces

Chapter 28: Sources of Magnetic Field

Chapter 29: Electromagnetic Induction

Chapter 30: Inductance

Chapter 31: Alternating Current

Chapter 32: Electromagnetic Wave

PC1144 - Physics IV

This module introduces the ideas of modern physics to students, with an emphasis on conceptual understanding. Topics covered are:

- a) Einstein's theory of special relativity, including time dilation, length contraction, and his famous equation $E=mc^2$;
- b) Quantum physics, where the observed phenomena of black body radiation, the photoelectric effect and Compton scattering, leading to the quantization of angular momentum and energy, atomic transitions and atomic spectra;
- c) Introduction to quantum mechanics, introducing the Heisenberg uncertainty principle, wave-mechanics and wave particle duality, and the use of wavefunctions in predicting the behaviour of particles trapped in potential wells;
- d) Nuclear physics, introducing radioactivity and decay processes, nuclear interaction and binding energy, fission and fusion; and
- e) Sub-atomic elementary particles and their classification.

The module is targeted at science students who are interested in learning about the more recent developments in physics, and is an essential for physics majors.

Syllabus

Chapter 37: Relativity

Chapter 38: Photons: Light Waves Behaving as Particles

Chapter 39: Particles Behaving as Waves

Chapter 40: Quantum Mechanics

Chapter 41: Atomic Structure

Chapter 42: Molecules and Condensed Matter

Chapter 43: Nuclear Physics

Chapter 44: Particle Physics and Cosmology

PC1431 - Physics IE

The module is designed to provide a clear and logical introduction to the concepts and principles of mechanics and thermodynamics, with illustrations based on applications to the real world.

Topics covered include motion in one dimension; curvilinear motion; circular motion; relative motion; Newton's laws; friction; work and energy; conservative forces, conservation of energy; linear momentum and conservation, collisions; rotational kinematics; moment of inertia and torque; rotational dynamics; conservation of angular momentum; temperature and the zeroth law, temperature scales; thermal expansion of solids and liquids; heat and internal energy, specific heat capacities, enthalpy and latent heat, work for ideal gases, first law of thermodynamics; equipartition of energy, mean free path; entropy and the second law, heat engines; entropy changes for reversible and irreversible processes.

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