

MODULE SPECIFICATION

Module Title	Applied Physics
Module Code	PHYS 103
Credits	4
Pre-requisites (<i>including Year 1</i>)	College Algebra or Precalculus

Description

Course Overview
This introductory physics course is designed for students pursuing general education or creative/technical disciplines that require applied scientific literacy. The course explores foundational principles of mechanics, material behavior, fluids, thermodynamics, waves, sound, optics, electricity, and magnetism. Emphasis is placed on real-world applications, quantitative reasoning, experimental demonstrations, and interdisciplinary connections—especially in built environments and sustainable design contexts.
Method of Teaching and Learning
This module will be taught using a combination of lectures, tutorials and consultation hours. Learning will also be reinforced by appropriate readings from the course text.
Syllabus
<p>Modules</p> <p>Module 1: Measurement, Vectors, and Kinematics</p> <ul style="list-style-type: none"> • Dimensional analysis and unit conversions • Mass vs. weight • Temperature scales • Distance vs. displacement • Speed vs. velocity • Acceleration and motion in one and two dimensions • Scalars and vectors • Vector components and trigonometric applications • Types of friction (static and kinetic)

Applied Problem Solving: Vector resolution and force balancing.

Module 2: Newtonian Mechanics and Energy Systems

- Newton's Three Laws of Motion
- Inertia and force systems
- Free-fall motion
- Momentum and impulse
- Conservation of momentum
- Mechanical energy and energy transformation
- Renewable vs. non-renewable energy systems
- Conservation of energy principles

Applied Analysis: Multi-force systems and energy conversion scenarios.

Module 3: Static Equilibrium and Rotational Mechanics

- Conditions for static equilibrium
- Concurrent force systems
- Torque (moment of force)
- Clockwise vs. counterclockwise rotation
- Simple beam analysis
- Center of mass
- Moment of inertia
- Gravitational acceleration
- Satellite and orbital motion

Quantitative Focus: Solving equilibrium systems and rotational balance problems.

Module 4: Oscillatory Motion and Simple Harmonic Systems

- Periodic motion fundamentals
- Pendulum motion

- Spring-mass systems
- Period and frequency relationships
- Mathematical modeling of harmonic motion

Experimental Emphasis: Measuring periods and evaluating oscillatory behavior.

Module 5: Mechanical Properties of Materials

- Stress and strain definitions
- Elasticity and plastic deformation
- Stress-strain curve regions and critical points
- Young's modulus
- Comparative behavior of metals, alloys, polymers, and composite materials
- Material testing principles

Application Context: Structural material performance evaluation.

Module 6: Fluids and Gas Behavior

- Density and mass density
- Archimedes' Principle
- Buoyant force applications (balloons, submarines, floating systems)
- Ideal Gas Law
- Boyle's Law and Charles's Law (derived forms)
- Pascal's Principle
- Bernoulli's Principle

Applied Demonstrations: Fluid flow and pressure differentials.

Module 7: Heat, Temperature, and Thermodynamic Transfer

- Thermal expansion and contraction
- Specific heat capacity

- Thermal conductivity
- Conduction, convection, and radiation
- Thermal resistance concepts
- Phase transitions and latent heat
- Relative humidity and human thermal comfort

Quantitative Work: Heat transfer calculations and material comparisons.

Module 8: Waves and Sound Physics

- Wave characteristics (amplitude, wavelength, frequency, speed)
- Mechanical vs. electromagnetic waves
- Longitudinal vs. transverse waves
- Speed of sound in various media
- Mach number and supersonic motion
- Doppler effect
- Sound intensity, power, absorption
- Decibel scale
- Resonance
- Acoustic absorbers and diffusers

Applied Context: Acoustic behavior in built environments.

Module 9: Light, Radiation, and Optical Systems

- Electromagnetic spectrum
- Solar spectrum
- Dispersion and scattering
- Doppler shift (optical context)
- Reflection and refraction
- Snell's Law
- Diffraction and interference

- Spectrometry and spectral analysis
- Primary vs. secondary color systems (light vs. pigments)
- Wien's Law
- Bragg's Law
- Beer's Law
- Optical properties: incidence, reflectance, absorbance, transmittance
- Applications: LEDs, solar cells, infrared thermal imaging, night vision

Quantitative Focus: Optical law calculations and light intensity analysis.

Module 10: Electricity and Circuit Analysis

- Electric charge
- Electric current
- Voltage (potential difference)
- Resistance
- Ohm's Law
- Electrical power and energy
- Series circuits
- Parallel circuits
- Measurement of voltage and current
- Thermoelectric effects

Applied Laboratory Work: Constructing and analyzing LED circuits.

Module 11: Magnetism and Electromagnetic Induction

- Magnetic fields vs. electric fields
- Permanent magnets
- Electromagnets
- Faraday's Law of Induction

- Lenz's Law
- Magnetic induction principles
- Generators vs. electric motors
- Electromagnetic energy conversion

Demonstrations: Magnetic levitation and induced current experiments.

Module 12: Physics Applications in Sustainable and Structural Systems

- Corrosion mechanisms
- Climate-responsive design
- Passive heating and cooling systems
- Green and recycled materials
- Floating structures
- Renewable energy generation:
 - Solar
 - Wind
 - Ocean wave systems
 - Fuel cells

Integrated Analysis: Physics-driven sustainability strategies.

Final Exam

Assessment

Assessment Type	% of Final Mark
Applied Physics Projects	25%
Discovery Activities	15%
Midterm 1	15%
Midterm 2	15%
Final Exam	20%
Homework & Quizzes	5%
Course Participation	5%

<i>Range</i>	<i>Letter Grade</i>
90% - 100%	A
80% – 89%	B
70% - 79%	C
60% - 69%	D
< 60%	U

Textbooks

Mandatory Textbooks

Title	Editor/Author	ISBN/Publisher
<i>Baker, K. Barron's Visual Learning Physics, 1st Edition. Kaplan Inc.</i>		978-1506267623

Optional Textbooks

Title	Author	ISBN/Publisher
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Reference Textbooks

Title	Author	ISBN/Publisher
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