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Course Description (from Undergraduate Bulletin, 2009-2010): PHY 113, 4 Credits
This is the second part of a three-semester sequence described in PHY112. The subject matter includes the study of fluids, heat, mechanical waves, and optics. Prerequisites: PHY 112 and M 144 [Calculus I]. Laboratory fee.


Laboratory Experiments: There will be eleven laboratory experiments performed during the course. Full lab reports will be collected and graded. The laboratory constitutes 25% of the course grade.

• Archimedes’ Principle (buoyancy and volume displacement)
• Absolute Zero (temperature scales and ideal gases)
• Specific Heat and Heat of Fusion (calorimetry and phase change)
• Work and Heat (Joule equivalent)
• Pendulum and Spring (oscillating systems and periodic motion)
• Vibrating String (standing waves and resonance)
• Resonance Tube (resonance in three dimensions)
• Kundt’s Tube (speed of sound resonance)
• Reflection and Refraction (geometric optics)
• Prism Spectrometer (spectra and the nature of light)
• Lenses (thin lenses equation and images)

Topics: Chapters 14 through 20, and 33 through 36 of the Text

Chapter 14  All sections 1 - 10
Density and pressure
Pascal’s Principle, Archimedes’ Principle
Ideal fluids and the equation of continuity
Bernoulli’s Equation

Chapter 15  All Sections 1 -9
Hooke’s Law and springs
Simple Harmonic Motion: position, velocity, and acceleration; energy in SHM
Angular oscillators and SHM; pendula and SHM
Damped and forced oscillations; resonance

Chapter 16  All sections 1 - 13
Waves: longitudinal, transverse and torsional
Wavelength, period, wave number, frequency and angular frequency, amplitude
Travelling waves and speed; speed on a stretched string
Energy and power of a wave
The wave equation, superposition, interference
Resonance and standing waves

Chapter 17  All sections 1 - 10
Sound waves, travelling waves and the speed of sound
Intensity and sound level
Superposition, interference, and beats
The Doppler Effect, supersonic speeds, and shock waves

Chapter 18  All sections 1 - 12
Temperature and heat, 0th Law, temperature scales, absolute temperature
Thermal expansion and contraction

continued on reverse side
Heat and work, the 1st Law, special cases of the 1st Law
Heat transfer mechanisms

Chapter 19
Sections 1 - 11
Ideal gases and kinetic theory
Pressure, temperature and RMS speed
Mean free path, distribution of molecular speeds
Molar specific heat and degrees of freedom
Adiabatic expansion of ideal gases

Chapter 20
All sections 1 - 8
Entropy and reversible processes
Change in entropy and the 2nd Law
Heat engines, refrigerators and thermal efficiency
Statistics and thermodynamics

Chapter 33
All sections 1 - 10; omit 5 and 6
Electromagnetic waves, EM spectrum
Polarization
Reflection and refraction
Total internal reflection and polarization by reflection

Chapter 34
Sections 1 - 9
Images, characterizing an image
Plane mirrors, spherical mirrors, images from mirrors
Images from spherical refracting surfaces; thin lenses
Optical instruments based on geometric optics

Chapter 35
Sections 1 - 8
Wave properties of light, coherence
Interference and diffraction; diffraction patterns
Young’s Experiment, single slit diffraction
Thin films and interference
Michelson’s Interferometer; measurements with interference

Chapter 36
Sections 1 - 10
Diffraction in light
Detailed look at single- and double-slit diffraction
Diffraction from circular opening, limits of resolution
Diffraction gratings
X-ray diffraction; measurements with diffraction