THREE RIVERS COMMUNITY COLLEGE
COURSE OUTLINE

Course Number/Title: PHY 115 Heat, Sound, Light

Lecture 3 hrs   Laboratory 2 hrs   Credit 4 hrs   Contact 5 hrs

Course Description: This course covers three broad areas of physics including thermal equilibrium, heat transfer, harmonic motion and wave properties of sound and light. Three hour lecture, one two-hour lab.

Method: Lecture/Demonstration/Problem Solving/Laboratory Experiment & Analysis by students

Text: College Physics, ed. 6; Wilson and Buffa; Prentice-Hall
Departmental Lab Manual for HSL

Prerequisites: HS Algebra or MATH 105   Co-Requisites: MATH 109

COURSE TOPICS/CONTENT

		HOURS
I.	HEAT Thermal Expansion Electrical equivalent of heat Mechanical equivalent of heat Specific Heat Calorimetry Latent heat Heat transfer	15
II.	ELASTICITY AND HOOKE'S LAW	5
III.	VIBRATIONS AND WAVES Simple harmonic motion Transverse and longitudinal waves Wave equation Superposition, interference, and reflection of waves	5
IV.	SOUND Speed in different media Doppler effect for sound Decibel Scale Forced vibrations and resonance	5
V.	ELECTROMAGNETIC WAVES Spectrum, frequency and wavelength Energy-frequency relationship Refraction and reflection Mirrors and lenses Optical instruments Wave optics	15
	TOTAL HOURS:	45

Date: *August 20, 2007*

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LAB EXPERIMENTS

1.	Linear Thermal Expansion	2
2.	Volumetric Thermal Expansion	2
3.	Specific heat and Calorimetry	2
4.	Latent Heat of Fusion	2
5.	Latent Heat of Vaporization	2
6.	Heat Equivalent of Electricity	2
7.	Simple Harmonic Motion (Hooke's Law or Pendulum)	2
8.	Waves on Strings	2
9.	Speed of Sound in Air	2
10.	Refraction	2
11.	Lenses	2
12.	Young's Two-Slit Experiment	2
13.	Diffraction Grating	2
14.	Polarization	2
15.	Optical Instruments - Two Lens Systems	2

Additional Lab Experiments: Reflection from Two Mirrors
Interference in Thin Films
Speed of Light

TOTAL HOURS: 30

Measurable Objectives

The student will be able to do the following:

1. Calculate the coefficient of linear and volume expansion for various materials.
2. Solve calorimetry problems using specific heats of various solids and liquids.
3. Solve calorimetry problems using the Heat of Fusion and the Heat of Vaporization
4. Explain and contrast methods of heat transfer
5. Calculate heat transfer by conduction, convection and radiation
6. Solve general calorimetry problems involving heat transfer processes.
7. Calculate the spring constant ‘‘k’’ for various mass spring systems; and calculate elastic potential energy.
8. Explain the relationships between displacement, velocity and acceleration in simple harmonic motion.
9. Explain interference and superposition of waves.
10. Calculate the speed of sound in different solids, liquids, and gases.
11. Calculate the Doppler frequency shift for moving sound sources and observers.
12. Perform calculations with the decibel scale of sound intensity and explain the need for ear protection.
13. Give examples (preferably from technology applications) of resonance and damping.
14. Describe the electromagnetic spectrum in terms of both frequency and wavelength.
15. Solve problems using the laws of reflection and refraction.
16. Explain critical angle and the principle of optical fibers.
17. Calculate the position and describe the character of images in systems involving convex and concave mirrors and converging and diverging lenses.
18. Predict the fringe patterns (max./min. locations) for two-slit and diffraction grating problems.
19. Define diffraction, and use to explain the ‘‘limits of seeing’’.
20. Explain the construction and operation of optical instruments including the camera, telescope, microscope and human eye.

Continuation of PHY 115 Heat, Light, Sound

Students will be able to:

1. Read and follow written instruction

2. Assemble and use lab equipment peculiar to thermodynamics, acoustics and optics including (but not limited to) gas burners, steam generators, calorimeters, stroboscopes, dB meters, lasers, optical benches and their accessories.

3. Collect data in an organized fashion, noting precision of measurement and unit labels.

4. Analyze data by creating graphs (by hand and by computer, with slope and intercept, if needed) and by correctly inserting data into equations.

5. State results to the correct accuracy.

6. Calculate % error, where applicable.

7. Explain sources of error in an experiment based on the limitation of the equipment used.

8. Draw conclusions by relating their results to the appropriate physics principles.