PHYS 41 Course Outline as of Summer 2013

CATALOG INFORMATION

Dept and Nbr: PHYS 41 Title: WAVES, OPTICS, THERMO
Full Title: Waves, Optics and Thermodynamics for Scientists & Engineers
Last Reviewed: 1/23/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	4.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	6.00		Contact Total	105.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 210.00

Title 5 Category: AA Degree Applicable
Grading: Grade Only
Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:
Formerly: PHYS 4B

Catalog Description:
This is a course intended for science and engineering students and will include oscillations, waves, sound, heat, kinetic theory, thermodynamics, geometrical optics, interference, diffraction and polarization of light.

Prerequisites/Corequisites:
Course Completion of PHYS 40

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: This is a course intended for science and engineering students and will include oscillations, waves, sound, heat, kinetic theory, thermodynamics, geometrical optics, interference, diffraction and polarization of light. (Grade Only)
Prerequisites/Corequisites: Course Completion of PHYS 40
Recommended:
Limits on Enrollment:

Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Spring 1983	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Spring 1983	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Spring 1983	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Spring 1983	Inactive:
UC Transfer:	Transferable	Effective:	Spring 1983	Inactive:

CID:
CID Descriptor: PHYS 200S Calculus-Based Physics for Scientists and Engineers: ABC
SRJC Equivalent Course(s): PHYS40 AND PHYS41 AND PHYS42 AND PHYS43

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Outcomes and Objectives:
1. Describe waves and solve problems relating to their properties and propagation in various media.
2. Be able to convert to and from various temperature scales, solve problems related to coefficient of expansion, thermal equilibrium and heat transfer.
3. Use the three laws of thermodynamics and the kinetic theory of gasses to solve problems related to ideal gasses and various heat engines.
4. Explain propagation of light in media including reflection, refraction and dispersion.
5. Explain image formation and draw the ray diagrams for various optical devices including lenses, mirrors, microscopes and telescopes.
6. Explain the formation of interference patterns of light from single slit, double slit, diffraction grating, and thin films.
7. Describe polarization with filters and by reflection.

Lab Objectives:
1. Develop and conduct experiments that apply the scientific method and error analysis to explore principles in waves, sound, thermodynamics and optics.
2. Use manual and computerized data collection techniques to measure and analyze parameters related to waves, sound, thermodynamics and optics.
3. Plot, curve fit, and interpret data using a spreadsheet or other analysis tools.

Topics and Scope:

1. Oscillatory motion

   a. simple harmonic motion
   b. wave equations
   c. damped/forced oscillations
2. Wave motion
   a. travelling wave model/equation
   b. reflection and transmission
3. Sound waves
   a. Speed, frequency, power level and intensity
   b. Doppler effect
4. Superposition and standing waves
   a. equations
   b. interference and standing waves
   c. beats
   d. Fourier transformation of non-sinusoidal waves
5. Temperature and Zeroth law of thermodynamics
   a. temperature scales
   b. thermal expansion
   c. ideal gas
6. First law of thermodynamics
   a. heat and thermal energy
   b. specific heat and latent heat
   c. work-heat relationship
   d. thermal conduction methods
7. The kinetic theory of gases
   a. molecular and statistical models
   b. molar specific heat of gas
   c. adiabatic process
   d. equipartition theory
8. Second law of thermodynamics
   a. heat engines
   b. entropy
9. Light and optics
   a. nature of light
   b. ray, diagram, reflection and refraction of light
   c. total internal reflection
10. Image formation
   a. mirrors and lenses
   b. aberrations
   c. eye, camera, microscope and telescopes
11. Interference of light waves
   a. single and double slits
   b. thin film interference
   c. interferometers
12. Diffraction
   a. narrow single slit, double slits and diffraction gratings
   b. X-ray diffraction
   c. polarization of light

Assignment:

1. Homework problem sets (10-30)
2. Quizzes (5-15)

3. Laboratory experiments (12-16)
4. Mid-term exams (2-4)
5. Final exam
6. Written lab reports (12-16)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written lab reports	Writing 5 - 10%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, lab experiments	Problem solving 10 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Objective examinations (multiple choice, etc.) that include essay questions, Quizzes, Mid-terms, Final exam	Exams 50 - 70%

Other: Includes any assessment tools that do not logically fit into the above categories.

Participation and attendance	Other Category 5 - 10%

Representative Textbooks and Materials:
PHYSICS FOR SCIENTISTS AND ENGINEERS by Serway and Jewett, 8th edition, Thomson, 2010