GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: PHYS 4C DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Spring 2018 CURRICULUM APPROVAL DATE: 10/23/2017

SHORT TITLE: PHYS FOR SCI & ENG III

LONG TITLE: Physics for Scientists and Engineers-Heat/Optics/Modern Physics

Units	Number of Weeks		Contact Hours/Week		Total Contact Hours
4	18	Lecture:	3	Lecture:	54
		Lab:	3	Lab:	54
		Other:	0	Other:	0
		Total:	6	Total:	108

COURSE DESCRIPTION:

An introduction to the principles of physics using calculus. Topics include light, optics, interference, diffraction, thermal energy, the Laws of Thermodynamics, the kinetic theory of gases, and an introduction to relativity and modern physics. (C-ID: PHYS 215) (C-ID: PHYS 200S: Phys 4A + Phys 4B + Phys 4C) PREREQUISITE: Completion of MATH 1C with a grade of 'C' or better, AND completion of PHYS 4A with a grade of 'C' or better, AND completion of PHYS 4B with a grade of 'C' or better. COREQUISITE: MATH 2 and MATH 2C.

PREREQUISITES:

Completion of PHYS 4A, as UG, with a grade of C or better.
AND Completion of PHYS 4B, as UG, with a grade of C or better.
AND Completion of MATH 1C, as UG, with a grade of C or better.
AND Completion of MATH 2, as UG, with a grade of C or better., Concurrent OK
AND Completion of MATH 2C, as UG, with a grade of C or better., Concurrent OK

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion

03 - Lecture/Laboratory
04 - Laboratory/Studio/Activity

STUDENT LEARNING OUTCOMES:

1. Identify, describe, compare and contrast the thermodynamic state variables.
Measure of assessment: Exam, Lab
2. Apply conservation of energy to solve thermodynamics problems.
Measure of assessment: Exam, Lab
Year assessed, or planned year of assessment: 2018
Semester: Fall
3. Describe, compare and contrast the zeroth, first, and second laws of thermodynamics.
Measure of assessment: Exam, Lab
Year assessed, or planned year of assessment: 2018
4. Identify, describe, compare and contrast reflection, refraction, polarization, interference and diffraction.
Measure of assessment: Exam, Lab
Year assessed, or planned year of assessment: 2018
5. Describe the formation of images geometrically.
Measure of assessment: Exam, Lab
6. Identify, describe, compare and contrast real and virtual images, magnification, plane and spherical mirrors, and plane and spherical lenses.
Measure of assessment: Exam, Lab
Year assessed, or planned year of assessment: 2018
7. Describe the theory of relativity and identify, compare and contrast the application of relativistic and non-relativistic analyses.
Measure of assessment: Exam, Lab
8. Describe, compare and contrast the particle and wave properties of light.
Measure of assessment: Exam, Lab
Year assessed, or planned year of assessment: 2018
9. Describe the structure of the atom.
Measure of assessment: Exam, Lab
10. Describe, compare and contrast nuclear fusion and fission.
Measure of assessment: Exam, Lab

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 10/23/2017
LECTURE CONTENT:
HOURS
10 Lec
CONTENT
Temperature, heat, and the 1st law of thermodynamics
OUT-OF-CLASS ASSIGNMENTS
Reading and homework from text.
STUDENT PERFORMANCE OBJECTIVES
Use the first law of thermodynamics to calculate work and heat for ideal gas processes.
HOURS
10 Lec
CONTENT
Kinetic Theory of Gases

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Demonstrate how molecular motions and collisions are responsible for macroscopic phenomenon such as pressure and heat transfer.

HOURS

11 Lec/3 Lab

CONTENT

Entropy, heat engines, and the 2nd law of thermodynamics

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Use the second law of thermodynamics to assess how interacting systems come to thermal equilibrium. Characterize the performance of a heat engine in terms of its thermal efficiency and that of a refrigerator in terms of its coefficient of performance.

LAB: Heat engine

HOURS

6 Lec

CONTENT

Electromagnetic waves

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Recognize the properties of sinusoidal traveling waves and use the wave model to solve problems of wave motion.

HOURS

6 Lec/3 Lab

CONTENT

Geometric optics

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Employ the wave model of light to calculate angles of reflection and refraction. Analyze basic physical situations involving reflection and refraction, and use this analysis to predict the path of a light ray.

LAB: Geometric optics

HOURS

6 Lec/3 Lab

CONTENT

Wave optics/Physical optics

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Analyze how constructive and destructive interference occurs and calculate the allowed frequencies and wavelengths of standing waves.

Lab: Polarization

HOURS

6 Lec/3 Lab

CONTENT

Mirrors, lenses, and optical instruments

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Analyze combinations of lenses to compare and contrast cameras, microscopes, and telescopes.

LAB: Reflection and refraction

HOURS

6 Lec/3 Lab

CONTENT

Interference and diffraction

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Examine the wave model of light and calculate the interference pattern of double slits and diffraction gratings. Analyze situations involving interference and diffraction of light waves, and apply these to situations involving double slits, diffraction gratings, and wide slits.

LAB: Diffraction and Interference

HOURS

6 Lec/3 Lab

CONTENT

Special theory of relativity

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Use the principle of relativity to solve problems involving time dilation and length contraction. Apply concepts from special relativity to analyze physical situations, including time dilation, length contraction, and the Lorentz transformation. Solve basic problems involving relativistic momentum and energy.

LAB: Michelson Interferometer

HOURS

3 Lec/3 Lab

CONTENT

Blackbody radiation, photoelectric effect, and Compton scattering

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Understand the intensity versus wavelength distribution of a blackbody radiator and be able to calculate the total power output and maximum intensity wavelength of a blackbody radiator. Understand the physics involving the photoelectric effect and Compton effect and be able to perform calculations involving those effects.

LAB: Photoelectric effect

HOURS

3 Lec

CONTENT

DeBroglie waves and the Heisenberg uncertainty principle

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Analyze how DeBroglie's matter waves lead to the quantization of energy. Evaluate the connections between the particle and wave descriptions of matter to develop a model of the wave function.

HOURS

3 Lec

CONTENT

Schrodinger's equation

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Apply basic concepts of quantum mechanics to analyze basic physical setups, including a particle in a box and simple atomic models.

HOURS

3 Lec

CONTENT

Potential wells and barrier tunneling

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Understand how the wave nature of matter leads to quantized electron energies in the atomic hydrogen atom.

HOURS

6 Lec/3 Lab

CONTENT

Atomic physics

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Be able to calculate the emission wavelengths of excited hydrogen atoms and the x-ray emission wavelengths of heavy elements.

LAB: Atomic spectra

2 Hours

Final Exam

LAB CONTENT

METHODS OF INSTRUCTION:

Lecture, discussion. Laboratory exercises. Group projects.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 96

Assignment Description: 1. Regularly assigned homework that requires students to analyze and study pertinent text material, solved examples and lecture notes.

2. Regularly assigned homework that requires students to apply the principles and skills covered in class by solving related problems.

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 20.00 %

Lab Reports.

Problem-solving assignments

Percent of total grade: 20.00 %

Homework, quizzes, projects.

Objective examinations

Percent of total grade: 60.00 %

REPRESENTATIVE TEXTBOOKS:
Required Representative Textbooks
Halliday, Resnick, Walker. Fundamentals of Physics. Wiley,2013.
ISBN: ISBN-10: 1118230728
Reading Level of Text, Grade: 12 Verified by: Jennifer Nari

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:
- GAV B1, effective 201270
- GAV B3, effective 201270

CSU GE:
- CSU B1, effective 201270
- CSU B3, effective 201270

IGETC:
- IGETC 5A, effective 201270
- IGETC 5C, effective 201270

CSU TRANSFER:
- Transferable CSU, effective 201270

UC TRANSFER:
- Transferable UC, effective 201270

SUPPLEMENTAL DATA:
Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN: XXXXXX
CAN Sequence: PHYS SEQ B
CSU Crosswalk Course Department: PHYS
CSU Crosswalk Course Number: 4C
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000110763
Sports/Physical Education Course: N
Taxonomy of Program: 190200