

Course Outline

COURSE: PHYS 4A **DIVISION:** 10 **ALSO LISTED AS:**

TERM EFFECTIVE: Spring 2018 **CURRICULUM APPROVAL DATE:** 10/09/2017

SHORT TITLE: PHYS FOR SCI & ENG I

LONG TITLE: Physics for Scientists and Engineers - Mechanics

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 kinematics in one, two and three dimensions, vectors, equilibrium and non-equilibrium applications of Newton's Laws, work and energy, momentum, systems of particles, rotational kinematics and dynamics, simple harmonic motion, elasticity, and waves. (C-ID: PHYS 205) (C-ID: PHYS 200S: Phys 4A + Phys 4B + Phys 4C) **PREREQUISITE:** Completion of MATH 1A with a grade of 'C' or better, AND completion of PHYS 2A with a grade of 'C' or better OR High School Physics with a grade of 'B' or better. **COREQUISITE:** MATH 1B (Effective Fall 2018)

PREREQUISITES:

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

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 various units of numbers and their significance.

Measure of assessment: Exam, Lab

2. Describe vectors and their manipulation and use them as problem solving tools.

Measure of assessment: Exam, Lab

Year assessed, or planned year of assessment: 2018

Semester: Spring

3. Identify, describe, compare and contrast distance, displacement, speed, velocity and acceleration.

Measure of assessment: Exam, Lab

Year assessed, or planned year of assessment: 2018

Semester: Spring

4. Identify, describe, compare and contrast various forces, Newton's Laws, conservation of momentum, conservation of energy, power and work.

Measure of assessment: Exam, Lab

Year assessed, or planned year of assessment: 2018

Semester: Spring

5. Identify, describe, compare and contrast rotational kinematics and dynamics.

Measure of assessment: Exam, Lab

6. Identify and describe simple harmonic motion.

Measure of assessment: Exam, Lab

7. Identify, describe, compare and contrast longitudinal, transverse and sound waves.

Measure of assessment: Exam, Lab

8. Identify and describe the role of calculus as a tool to describe the physical world.

Measure of assessment: Exam, Lab

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

Curriculum Approval Date: 10/09/2017

HOURS

3 Lect/3 Lab

CONTENT

Introduction, numbers and units, math review.

OUT-OF-CLASS ASSIGNMENTS

Reading and homework problems from text.

STUDENT PERFORMANCE OBJECTIVES

Identify and discuss the significance of units of various quantities, convert between systems of units, solve equations with one or two variables, solve right triangles.

LAB: Math review.

HOURS

3 Lect/3 Lab

CONTENT

One-dimensional kinematics.

OUT-OF-CLASS ASSIGNMENTS

Reading and homework from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, compare and contrast distance, displacement, speed, velocity and acceleration. Identify, set-up and solve one dimensional kinematics problems.

LAB: Free-fall determination of g .

HOURS

3 Lect/3 lab

CONTENT

Vector analysis.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from the text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe and find the components of a vector and the sum, difference, and product of two or more vectors in one-, two-, and three dimensions.

LAB: Finding resultant vectors.

HOURS

3 Lect/3 Lab

CONTENT

Two- and three-dimensional kinematics.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, set-up, and solve two- and three-dimensional kinematics problems.

LAB: Projectile motion.

HOURS

6 Lect/6 Lab

CONTENT

Forces. Newton's Laws.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems for text.

STUDENT PERFORMANCE OBJECTIVES

Discuss, compare and contrast Newton's Laws and apply Newton's Second Law to accelerating and non-accelerating systems. Construct an accurate free-body diagram. Identify, set-up and solve problems involving Newton's Laws.

LAB: Acceleration of a system subjected to unbalanced forces.

HOURS

3 Lect/3 Lab

CONTENT

Uniform circular motion.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT PERFORMANCE OBJECTIVES

Identify and include centripetal forces in the set-up and solution of problems involving Newton's Laws.

LAB: Centripetal acceleration.

HOURS

3 Lect/3 Lab

CONTENT

Work and Energy.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from text.

STUDENT PERFORMANCE OBJECTIVES

Discuss and describe the principle of conservation of energy, compare and contrast potential and kinetic energy, discuss work done by conservative and non-conservative forces. Identify, set-up and solve energy problems using the work-energy theorem.

LAB: Conservation of energy.

HOURS

3 Lect/3 Lab

CONTENT

Momentum.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT

PERFORMANCE OBJECTIVES

Discuss the impulse-momentum theorem, the principle of conservation of momentum, and compare and contrast elastic and inelastic collisions. Identify, set-up, and solve problems using the impulse-momentum theorem.

LAB: Conservation of momentum.

HOURS

3 Lect/3 Lab

CONTENT

Rotational kinematics.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from the text.

STUDENT PERFORMANCE OBJECTIVES

Discuss, compare and contrast rotational kinematics with one-dimensional kinematics. Identify, set-up, and solve rotational kinematics problems.

LAB: Angular acceleration of rotating objects.

HOURS

3 Lect/3 Lab

CONTENT

Rotational dynamics.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT PERFORMANCE OUTCOMES

Discuss, compare and contrast torque and force, application of Newton's Laws to rotating systems, and conservation of energy and momentum for rotating systems. Identify, set-up, and solve problems using Newton's Laws and conservation of energy and momentum for rotating systems.

LAB: Equilibrium of a rigid bar subjected to torques.

HOURS

3 Lect/3 Lab

CONTENT

Spring forces and elasticity.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from text.

STUDENT PERFORMANCE OBJECTIVES

Students will identify and include forces due to springs in the set-up and solution of problems using Newton's Laws. Students will discuss, compare and contrast stress, strain, and the elastic moduli of materials. Students will identify, set-up and solve simple harmonic motion and elasticity problems.

LAB: Stress-strain behavior of solids.

HOURS

3 Lect/3 Lab

CONTENT

Fluids.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, discuss, compare and contrast solids, liquids and vapors, the properties of liquids and gases in terms of density, velocity and pressure. Identify, set-up and solve problems using Bernoulli's equation and Archimedes principle. Compare and contrast Archimedes principle and Newton's Second Law. Identify, set-up and solve fluids problems.

LAB: Stress-strain behavior of solids.

HOURS

3 Lect/3 Lab

CONTENT

Systems of particles.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast the configuration, Newton's Second Law, and conservation of momentum, for multi-particle and single particle systems.

Identify, set-up, and solve multi-particle system problems.

LAB: Conservation of momentum for multi-particle systems.

HOURS

3 Lect

CONTENT

Gravitation

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from the text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast Newton's Second Law and Newton's Universal Law of Gravitation. Describe Earth's gravitational field. Identify,

set-up, and solve Gravitation problems.

HOURS

3 Lect/3 Lab

CONTENT

Oscillations

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from the text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast simple harmonic motion, uniform circular motion, and pendulum motion. Identify and describe conservation of energy in oscillating systems. Identify, set-up, and solve oscillation problems.

LAB: Pendulum motion.

HOURS

4 Lect

CONTENT

Waves.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, discuss, compare and contrast transverse and longitudinal waves, sound waves, interference and superposition of waves, diffraction, and standing waves. Identify, set-up, and solve wave problems.

HOURS

2

Final Exam

3 Lect/3 Lab

CONTENT

Systems of particles.

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast the configuration, Newton's Second Law, and conservation of momentum, for multi-particle and single particle systems. Identify, set-up, and solve multi-particle system problems.

LAB: Conservation of momentum for multi-particle systems.

HOURS

3 Lect

CONTENT

Gravitation

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from the text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast Newton's Second Law and Newton's Universal Law of Gravitation. Describe Earth's gravitational field. Identify, set-up, and solve Gravitation problems.

HOURS

3 Lect/3 Lab

CONTENT

Oscillations

OUT-OF-CLASS ASSIGNMENTS

Problems and reading from the text.

STUDENT PERFORMANCE OBJECTIVES

Identify, describe, compare and contrast simple harmonic motion, uniform circular motion, and pendulum motion. Identify and describe conservation of energy in oscillating systems. Identify, set-up, and solve oscillation problems.

LAB: Pendulum motion.

HOURS

4 Lect

CONTENT

Waves.

OUT-OF-CLASS ASSIGNMENTS

Reading and problems from text.

STUDENT PERFORMANCE OBJECTIVES

Identify, discuss, compare and contrast transverse and longitudinal waves, sound waves, interference and superposition of waves, diffraction, and standing waves. Identify, set-up, and solve wave problems.

HOURS

2

Final Exam

Lab Content:

Lab activities are listed above.

METHODS OF INSTRUCTION:

Lecture/discussion. Laboratory exercises. Group projects.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 64

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

Required Outside Hours: 64

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

METHODS OF EVALUATION:

Objective examinations

Percent of total grade: 60.00 %

In-class written exams.

Writing assignments

Percent of total grade: 20.00 %

Lab reports.

Problem-solving assignments

Percent of total grade: 20.00 %

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: 4A
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: CCC000292018
Sports/Physical Education Course: N
Taxonomy of Program: 190200