

CATALOG INFORMATION

Dept and Nbr: PHYS 1

Title: INTRO PBLM SOLVING

Full Title: Introduction to Physics Problem Solving

Last Reviewed: 2/25/2019

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

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

**Catalog Description:**  
An introduction to basic concepts in physics with an emphasis on the development of problem solving skills. This course helps prepare students for success in Physics 20 or Physics 40.

**Prerequisites/Corequisites:**  
Course Completion of MATH 154 OR MATH 155 OR MATH 156 OR higher (MATH) OR appropriate placement based on AB705 mandates

**Recommended Preparation:**

**Limits on Enrollment:**

**Schedule of Classes Information:**  
Description: An introduction to basic concepts in physics with an emphasis on the development of problem solving skills. This course helps prepare students for success in Physics 20 or Physics 40. (Grade or P/NP)  
Prerequisites/Corequisites: Course Completion of MATH 154 OR MATH 155 OR MATH 156 OR higher (MATH) OR appropriate placement based on AB705 mandates  
Recommended:

Limits on Enrollment:

Transfer Credit: CSU;UC.

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

|                      |                      |                                       |                   |                  |
|----------------------|----------------------|---------------------------------------|-------------------|------------------|
| <b>AS Degree:</b>    | <b>Area</b>          |                                       | <b>Effective:</b> | <b>Inactive:</b> |
|                      | B                    | Communication and Analytical Thinking | Fall 1994         |                  |
|                      | MC                   | Math Competency                       | Fall 1981         | Fall 2009        |
| <b>CSU GE:</b>       | <b>Transfer Area</b> |                                       | <b>Effective:</b> | <b>Inactive:</b> |
|                      | B1                   | Physical Science                      | Fall 1996         |                  |
| <b>IGETC:</b>        | <b>Transfer Area</b> |                                       | <b>Effective:</b> | <b>Inactive:</b> |
| <b>CSU Transfer:</b> | Transferable         | <b>Effective:</b>                     | Fall 1994         | <b>Inactive:</b> |
| <b>UC Transfer:</b>  | Transferable         | <b>Effective:</b>                     | Fall 1994         | <b>Inactive:</b> |

### **CID:**

### **Certificate/Major Applicable:**

Major Applicable Course

## **COURSE CONTENT**

### **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Define and identify basic physical laws, theories, and principles applicable to mechanics.
2. Interpret and generate the appropriate graphs and diagrams that represent the evolution of physical systems and events in mechanics.
3. Organize and interpret word problem information and apply the related laws and equations to generate and explain solutions to one- and two- dimensional problems in mechanics.
4. Work in groups to analyze, solve, and present solutions to problems in mechanics.

### **Objectives:**

Students will be able to:

1. Define the physics quantities used in mechanics including: displacement, velocity, acceleration, force, energy, work, power, momentum, and impulse.
2. Identify the major unit systems and convert between them.
3. Organize and interpret written problem statements.
4. Describe basic concepts in mechanics and selected additional physics topics.
5. Generate and/or interpret graphs of physics quantities related to mechanics.
6. Generate free body diagrams and use them in the correct application of Newton's Laws.
7. Apply the equations of mechanics to the solution of selected simple physics problems.
8. Apply interpersonal skills to work in teams to solve physics problems.

### **Topics and Scope:**

#### **I. Problem Solving Tools, Strategies, and Algorithms**

- A. Interpretation of written problem statements
- B. Written description or analysis of applicable physics concepts

- C. Choice of appropriate mathematical models and equations
- D. Organization of information and assignment of variables
- E. Interpretation and generation of diagrams and graphs
- II. Units and Dimensional Analysis
  - A. The international system (SI)
  - B. The centimeter, gram, second system (CGS)
  - C. The British engineering system (BE)
  - D. Common metric prefixes
  - E. Conversion of units
  - F. Unit consistency in equations
- III. One-Dimensional Kinematics
  - A. Concepts, definitions, and units of displacement, velocity and acceleration
  - B. Graphs of displacement, velocity and acceleration versus time
  - C. Slopes of displacement and velocity versus time graphs and areas under velocity and acceleration versus time graphs
  - D. Equations for uniformly accelerated motion in one dimension
  - E. Freefall body problem analysis
- IV. Vectors and Trigonometry
  - A. Scalar and vector quantities
  - B. Components of vectors and right triangle trigonometry
  - C. Sums of vectors
- V. Two-Dimensional Kinematics
  - A. Separation of coordinate directions
  - B. Equations of two-dimensional kinematics
  - C. Projectile motion
- VI. Forces and Newton's Laws of Motion
  - A. Concepts, definitions, and units of mass, force and weight
  - B. Newton's third law and force interactions between objects
  - C. Newton's first law and the construction of free body diagrams
  - D. One- and two-dimensional statics
  - E. Newton's second law and free body diagrams with acceleration
  - F. One- and two-dimensional linear dynamics
- VII. Work, Energy, and Power
  - A. Concepts, definitions, and units of work, energy, and power
  - B. Calculation of work done using force and displacement data and graphs
  - C. Kinetic and potential energy
  - D. Conservative and non-conservative forces
  - E. Conservation of energy
  - F. Computation of power

#### Optional Physics Topics:

Faculty should choose 2-6 additional topics of interest to broaden exposure and encourage further investigations, such as:

- I. Impulse and momentum
- II. Newton's universal law of gravity
- III. Rotational kinematics and dynamics
- IV. Simple harmonic motion
- V. Fluids, statics and dynamics
- VI. Temperature, heat, thermodynamics
- VII. Waves and sound
- VIII. Electricity and magnetism
- IX. Optics

- X. Superconductivity
- XI. Radioactivity
- XII. Fusion and Fission
- XIII. Special relativity
- XIV. Subatomic particles

### Assignment:

1. Homework problem sets (12-20)
2. Exams (2-4)
3. Quizzes (0-10)
4. Worksheets (to be completed in groups, in-class) (0-15)
5. Final exam

### 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.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.

Writing  
0 - 0%

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

Homework problem sets

Problem solving  
15 - 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.

Exams, quizzes, final exam

Exams  
60 - 80%

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

Class participation, worksheets

Other Category  
0 - 10%

### Representative Textbooks and Materials:

Physics. 11th ed. Cutnell, John and Johnson, Kenneth. Wiley. 2018  
 Essentials of College Physics. Serway, Raymond and Vuille, Chris. Cengage Learning. 2007 (Classic)  
 Instructor prepared materials

