C-ID Descriptor
Calculus-Based Physics for Scientists and Engineers: A

Descriptor Details

- **Descriptor Title**: Calculus-Based Physics for Scientists and Engineers: A
- **C-ID Number**: 205
- **Units**: 4.0
- **Hours**: 0000
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General Description

This course, intended for students majoring in physical sciences and engineering, is part of a three-semester course whose contents may be offered in other sequences or combinations. Core topics include an introduction to kinematics, dynamics, work and energy, momentum, gravitation and simple harmonic motion.

Prerequisites

N/A

Corequisites

1 semester college-level calculus (C-ID MATH 210 OR MATH 211) (co-requisite)

Advisories

A year of high school physics or a physics prep course is recommended. Completion of 1 semester of calculus and concurrent enrollment in second semester calculus is highly recommended.

Content

- Vectors and Scalars
- Newton’s Laws
- Statics and Dynamics
- Translational Kinematics
- Rotational Kinematics
- Rotational Dynamics
- Work and Energy
- Momentum
- Gravitation
- "Floating Topics" which may be included in this semester
    - Fluids
    - Simple Harmonic Motion
    - Mechanical Waves
    - Sound
    - Laws of Thermodynamics
    - Heat Engines
    - Kinetic Theory of Gases
    - Entropy

Lab Activities

Laboratory activities should cover the range of topics designated for lecture. The majority of labs should be hands-on activities with “real-world” data collection as opposed to computer simulation, although simulations may be appropriate for some topics in modern physics.

Objectives

Lecture Course Objectives*: *At the conclusion of the lecture component of this course, the student should be able to:*

1. Predict the future trajectory of an object moving in two dimensions with uniform acceleration.
2. Analyze a physical situation with multiple constant forces acting on a point mass using Newtonian mechanics.
3. Analyze a physical situation with multiple forces acting on a point mass or extended object using concepts of work and energy.

Laboratory Course Objectives*: *At the conclusion of the laboratory component of this course, the student should be able to:*

1. Analyze real-world experimental data, including appropriate use of error propagation, units and significant figures.
2. Relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.

*Note that course objectives are not limited to be the ones listed here.

Evaluation Methods

Examinations which include problem solving exercises, final examinations, projects, homework problems, laboratory reports.

*Note that not all of the methods listed are required.

Textbooks

Typical Textbooks:

Giancoli, Douglas C. *Physics for Scientists and Engineers*

Halliday, David; Resnick, Robert; Walker, Jearl. *Fundamentals of Physics*

Knight, Randall D. *Physics for Scientists and Engineers: A Strategic Approach*

Serway, Raymond A.; Jewett, John W. *Physics for Scientists and Engineers*

Moebs, Willian; Ling,, Samuel J; Sanny, Jeff. *University Physics, Volume 1*

Typical Lab Manuals:

Edmonds, Jr., Dean S. *Cioffari's Experiments in College Physics*

Laws, Priscilla. *Workshop Physics Activity Guide, Modules 1 and 2*

Loyd, David. *Physics Lab Manual*

Sokoloff, David, *Real Time Physics: Active Learning Laboratories, Module 1*

Laboratory manuals developed on-site