Course Outline

2026-2027 Catalog

PHYS 41 - Physics for Scientists and Engineers I

Catalog Description

Transfer Status: CSU/UC

Prerequisite: MATH C2210 or MATH C2210E

Unit(s): 4.00

Lecture: 25.50 Contact hours/51.00 Out of class hours/76.50 Total hours/1.50 Unit(s)
Activity: 51.00 Contact hours/25.50 Out of class hours/76.50 Total hours/1.50 Unit(s)
Lab: 51.00 Contact hours/0.00 Out of class hours/51.00 Total hours/1.00 Unit(s)
Total: 127.50 Contact hours/76.50 Out of class hours/204.00 Total hours/4.00 Unit(s)

Course 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. Graded only. (C-ID PHYS 205/PHYS 100S).

Objectives

Upon successful completion 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.
4. Analyze real-world experimental data, including appropriate use of error propagation, units and significant figures.
5. Relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.
6. 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.

Course Content

Topic Titles / Suggested Time Topic

Lecture/Activity

Topics	Lec Hrs	Act Hrs
Vectors and Scalars	1.50	3.00
Newton’s Laws	1.50	3.00
Statics and Dynamics	3.00	6.00
Translational Kinematics	2.00	4.00
Rotational Kinematics	1.00	2.00
Rotational Dynamics	3.00	6.00
Work and Energy	3.00	6.00
Momentum	1.50	3.00
Gravitation	2.50	5.00
Fluids	1.50	3.00
Special Relativity	2.50	5.00
Simple Harmonic Motion	2.50	5.00
Total Hours:	**25.50**	**51.00**

Lab

Topics	Lab Hrs
Error Analysis	3.00
Period of a Pendulum	3.00
Random Distributions & Error Propagation	3.00
Freely Falling Bodies	3.00
Projectile Motion	3.00
Newton's Laws of Motion	3.00
Centripetal Forces	3.00
Dissipative Forces	3.00
Energy Conservation	3.00
Elastic & Inelastic Collisions	3.00

Topics	Lab Hrs
Impulsive Forces	3.00
Center of Mass Motion	3.00
Moments of Inertia	3.00
Equilibrium of a Rigid Body	3.00
Kepler's Laws of Planetary Motion	3.00
Oscillatory Systems	3.00
Static & Dynamic Fluids	3.00
Total Hours:	**51.00**

Methods of Instruction

A. Class Activities
B. Demonstrations
C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
D. Instructor Demonstrations
E. Laboratory Experiments
F. Lecture

Methods of Evaluation

A. Exams/Tests
B. Quizzes
C. Homework
D. Lab Projects
E. Final Examination
F. Written Assignments

Examples of Assignments

Reading Assignments

1. Read example problem and solution of the beam leaning against a frictionless wall with given friction at the base. Prepare to solve a similar problem on a quiz.
2. Read the first chapter of special relativity text. Be prepared to participate in a discussion regarding the differences between Galilean and Lorentz velocity transformations.

Writing Assignments

1. Produce a written lab report on the experiment involving moments of inertia. Include a one page summary, error propagation, calculations and properly annotated data sheet.
2. Produce a clearly written solution of the bowling ball problem including critical assessment of numerical results.

Out-of-Class Assignments

1. Look up the range of static friction coefficients for commercially available tires and contrast these values with NASCAR tires.
2. Watch the clip of 2001 A Space Odyssey when the shuttle docks with the space station. Estimate the rate of rotation and the physical dimensions of the station and determine, within estimation error, if the centripetal force at the outer rim of the station is equal to 9.8m/s^2.

Recommended Materials of Instruction

Halliday, D., Resnick, R., Walker, J. (2021). Fundamentals of Physics Extended. *Wiley, 12th.* 978-1-119-77351-1.
William Moebs, Samuel J. Ling, Jeff Sanny. (2022). University Physics Vol 1. *OpenStax.* 978-1-938168-27-7.

Other Learning Materials

Eggert S. and Trento J., Physics 41 Lab manual , purchased at the bookstore
Panunto, M., Physics 41 Supplemental Notes & Exercises, purchased at the bookstore
Graph paper will be required for laboratory reports
Scientific calculator

Minimum Qualifications

Physics/Astronomy (Masters Required)

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