Course Syllabus
Physics for Scientists and Engineers I

Course Description

A calculus based physics course designed to give science and engineering students a thorough understanding of mechanics. Topics include work and energy, vectors, kinematics, forces, Newton's three laws of motion, momentum, circular motion and rotations, angular momentum, Newtonian gravity. All topics are covered in one, two, and three spatial dimensions. Applications include mechanical oscillations, and wave motion. Three lectures and two recitations weekly. Those wishing to take this course as a lecture-laboratory course should register concurrently for PHYS 2215.

Course Components

Discussion & Lecture.

Credit Hours: 4.0.

Pre-requisites and Co-requisites: 'C-' or better in (PHYS 1500 AND (MATH 1060 OR MATH 1080 OR AP Calc AB score of 3+)) OR (MATH 1210 OR MATH 1215 OR MATH 1250 OR MATH 1310 OR MATH 1311 OR AP Calc BC score of 3+ OR AP Calc AB score of 4+).

Satisfies a General Elective: Yes.

Course Outcomes and Objectives

The course Physics for Scientists and Engineers I prepares students to understand, analyze, and solve problems in classical mechanics. The course is organized into five units: kinematics, dynamics, energy conservation, rigid body dynamics, and waves and oscillations. By the end of the course, students will be able to

- Understand and apply kinematic equations, Newton's three laws, and conversation laws to solve physics problems in multiple dimensions
- Solve basic problems relating to rigid body motion, oscillations, and waves

Students will progress in the following ABET accreditation outcomes by developing

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Course Requirements

The course includes lectures each class period with an accompanying pre-lecture reading assignment worth 2% of the total grade. Attendance at lectures is required and makes up 2% of the total grade. After the conclusion of each lecture, a recitation (discussion session) which reviews the lecture content begins; the associated discussion question is worth 8% of the total grade. Homework assignments relating to the course material total 8% of the grade. After the completion of each unit, a quiz will be offered during the recitation hour, making up an additional 10% of the grade. Lastly, two midterms and a comprehensive final make up 40% and 30% of the final grade, respectively.

Component	Contribution to Grade
Attendance	2 %
Pre-Lecture Reading	2 %
Discussion Questions	8 %
Homework	8 %
Quizzes	10 %
Midterms	40 %
Final	30 %
Total	100 %

Table 1: Final grade composition.

Required and Recommended Readings

Students will be required readings from the text "Fundamentals of Physics, 7th edition," by Halliday, Resnick, and Walker, available freely through the Marriott library.

Grading Scale and Policies

The final grade will be rounded to the nearest tenth of a percent and assigned a letter grade as follows:

Grade	Percentage
A	93.0 –100.0 %
A-	90.0 – 92.9 %
B+	87.0 – 89.9 %
B	83.0 – 86.9 %
B-	80.0 – 82.9 %
C+	77.0 – 79.9 %
C	73.0 – 76.9 %
C-	70.0 – 72.9 %
E	00.0 – 69.9 %

Table 2: Final letter grade relationship.

Late work will be accepted but with a cumulative 10% deduction per day until a 50% deduction at five days late. Any late work completed after five days late will receive a standard 50% deduction.

Preliminary Course Schedule

Date	Topic	Key Assignments
Week 1	Kinematics: Introduction and Constant Acceleration, 2D Vectors, Projectile Motion, Relative and Circular Motion	Quiz 1
Week 2	Dynamics: Newton's Three Laws	Quiz 2
Week 3	Dynamics: Circular Motion; Conservation Laws: Kinetic and Potential Energy and Work	Midterm 1
Week 4	Conservation Laws: Momentum and Collisions; Rigid Body Motion: Center of Mass and Torque	Quiz 3+4
Week 5	Rigid Body Motion: Moment of Inertia and Angular Momentum	Midterm 2
Week 6	Waves: Oscillations, the Wave Equation and Acoustics	Quiz 5+6
Week 7	Final	

Table 3: Preliminary Course Schedule.

List of Lectures:

Lecture	Unit	Topic
1	1.1	Kinematics: Introduction
2	1.2	Kinematics: Constant Acceleration
3	1.3	Kinematics: 2D Motion and Vectors
4	1.4	Kinematics: Projectile Motion
5	1.5	Kinematics: Relative and Circular Motion
6	2.1	Dynamics: Introduction
7	2.2	Dynamics: Newton's Second Law: Tension and Friction
8	2.3	Dynamics: Newton's Third Law
9	2.4	Dynamics: 2D Dynamics and Circular Motion
10	3.1	Conservation Laws: Kinetic Energy and Work
11	3.2	Conservation Laws: Potential Energy
12	3.3	Conservation Laws: Springs and the Work Energy Theorem
13	3.4	Conservation Laws: Energy Diagrams
14	3.5	Conservation Laws: Linear Momentum
15	3.6	Conservation Laws: Collisions
16	4.1	Rigid Body Motion: Center of Mass and Torque
17	4.2	Rigid Body Motion: Moment of Inertia and Angular Dynamics
18	4.3	Rigid Body Motion: Equilibrium and Elasticity
19	4.4	Rigid Body Motion: Conservation of Angular Momentum
20	4.5	Rigid Body Motion: Rotational Kinetic Energy
21	5.1	Waves: Simple Harmonic Motion
22	5.2	Waves: Phasors and Damped Harmonic Oscillators
23	5.3	Waves: The Wave Equation
24	5.4	Waves: Acoustics

Table 4: Lecture List.

This syllabus is subject to change at the discretion of the instructor.

University Policies

Americans With Disabilities Act (ADA): The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access (CDA). CDA will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations.

In compliance with ADA requirements, some students may need to record course content. Any recordings of course content are for personal use only, should not be shared, and should never be made publicly available. In addition, recordings must be destroyed at the conclusion of the course.

If you will need accommodations in this class, or for more information about what support they provide, contact:

Center for Disability & Access 801-581-5020 disability.utah.edu

Third Floor, Room 350 Student Services Building 201 S 1460 E Salt Lake City, UT 84112

Safety at the U: The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message. For more safety information and to view available training resources, including helpful videos, visit safeu.utah.edu.

To report suspicious activity or to request a courtesy escort, contact:

Campus Police & Department of Public Safety 801-585-COPS (801-585-2677) dps.utah.edu 1735 E. S. Campus Dr. Salt Lake City, UT 84112

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information.

If you or someone you know has been harassed or assaulted, you are encouraged to report it to university officials:

Title IX Coordinator & Office of Equal Opportunity and Affirmative Action 801-581-8365 oeo.utah.edu 135 Park Building 201 Presidents' Cir. Salt Lake City, UT 84112

Office of the Dean of Students 801-581-7066 deanofstudents.utah.edu 270 Union Building 200 S. Central Campus Dr. Salt Lake City, UT 84112

To file a police report, contact:

Campus Police & Department of Public Safety 801-585-COPS (801-585-2677) dps.utah.edu 1735 E. S. Campus Dr. Salt Lake City, UT 84112

If you do not feel comfortable reporting to authorities, the U's Victim-Survivor Advocates provide free, confidential, and trauma-informed support services to students, faculty, and staff who have experienced interpersonal violence.

To privately explore options and resources available to you with an advocate, contact:

Center for Campus Wellness 801-581-7776 wellness.utah.edu 350 Student Services Building 201 S. 1460 E. Salt Lake City, UT 84112

Academic Misconduct: It is expected that students comply with University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: Policy 6-410: Student Academic Performance, Academic Conduct, and Professional and Ethical Conduct.

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code:

"...Includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information... It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct."

For details on plagiarism and other important course conduct issues, see the U's Code of Student Rights and Responsibilities.