

Syllabus for PHYS 1401

General Physics I

Class # 97275

10:30 – 1:20 Monday and Wednesday

HLC 2405/2116

Instructor: James (Jim) Heath

Office Hours: Highland Campus 2408 MW 1:30 – 4:00 PM
TTh 9:00 AM – 10:30 AM
TTh 3:00 – 4:00 PM
Fridays by appointment

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Class Website: <http://www.austincc.edu/jheath/GP1/>

YouTube Channel: <https://www.youtube.com/ACCPhysics>

Text: *Sears and Zemansky's College Physics*, 11th Edition, by Hugh D. Young (Pearson). This course just uses Volume 1.

Catalogue Description: Study of principles and applications of concepts in mechanics, energy, heat, wave motion, and sound. 3 Lecture Hours, 1 Lab Hour, 96 contact hours.

Course Overview:

This course is intended to give students an overview of the basic principles of physics. Physics is a branch of science that tries to explain things that happen around us in everyday life. Like all branches of science, physics depends on information gathered with the five senses, and on theories (explanations) that come out of finding patterns in that information. In this class we shall focus on the following topics:

- Kinematics – how and why things move
- Statics – how forces balance each other
- Pressure
- Heat

Part of this class will involve discovering the basic laws of physics in the laboratory, and part will involve using those laws to find things out using essential problem-solving techniques.

Course Rationale:

This course is designed for students who are pursuing degrees in scientific and technical majors other than physics and engineering. It is intended to provide an overview of basic physics to assist these students in their further studies in science and technology. Because many if not most students will be using this course for transfer credit, the course will be taught at the University level.

Course Prerequisites: Grade of C or better in MATH 2412 or MATH 1316.

Course-Level Student Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Demonstrate techniques to set up and perform experiments, collect data from those experiments, and formulate conclusions from an experiment.
- Record experimental work completely and accurately in laboratory notebooks, and communicate experimental results clearly in written reports.
- Determine the component of linear motion (displacement, velocity, and acceleration), and especially motion under conditions of constant acceleration.
- Apply Newton's laws to physical properties including gravity.
- Solve problems using principles of energy.
- Use principles of impulse and linear momentum to solve problems.
- Solve problems in rotational kinematics and dynamics, include the determination of the location of the center of mass and center of rotation for rigid bodies in motion
- Solve problems involving rotational and linear motion.
- Demonstrate an understanding of equilibrium, including the different types of equilibrium.
- Discuss simple harmonic motion and its application to quantitative problems or qualitative questions.
- Describe the component of a wave and relate those components to mechanical vibrations, sound, and decibel level.
- Solve problems using the principles of heat and thermodynamics.
- Solve basic fluid mechanics problems.

General Education Student Learning Outcomes:

Upon completion of this course, students will demonstrate competence in:

- **Communication Skills**
Develop, interpret, and express ideas and information through written, oral and visual communication that is adapted to purpose, structure, audience, and medium.
- **Critical Thinking Skills**
Gather, analyze, synthesize, evaluate and apply information for the purposes of innovation, inquiry, and creative thinking.
- **Empirical and Quantitative Skills**
Apply mathematical, logical and scientific principles and methods through the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
- **Teamwork**
Consider different points of view to work collaboratively and effectively in pursuit of a shared purpose or goal.

Goals and Objectives:

I realize that many if not most of you will not be pursuing careers in physics. Therefore, I have structured the class to help you develop important skills as you learn the basic principles of physics. While your employers and future employers will very likely not care much how many laws of physics you are familiar with, we know that they will value the following skills:

- The ability to communicate clearly
- The ability to solve problems (mathematical and otherwise)
- The ability to work together with a group

In this course we will use physics as a way to help you to develop these valuable and valued skills. To that end, the following objectives apply to this course:

- Students will understand the basic principles of physics.
- Students will be able to communicate these principles clearly.
- Students will be able to use algebra and the laws of physics to solve simple problems.
- Students will be able to work together in collaborative groups to perform experiments, gather data, reach conclusions, and solve problems.

Hopefully while honing these skills you will come to understand the world around you a little bit better.

Instructional Methodology:

A substantial portion of the course will consist of lectures by the instructor to convey the basic principles of physics. Students will also discover the basic laws of physics in the laboratory, using a combination of hands-on experiments and computer simulations. The course will also involve demonstrating to students how the basic laws of physics can be used to solve problems, with an emphasis on situations students will encounter in their everyday lives.

Grading System:

I. Exams (30% Regular + 20% Final)

There will be three exams in this class. Exams will take up the lecture and lab period for that day. Each one will be worth 10% of the grade, for 30% total. The exams will test and help you develop your communication abilities and problem-solving skills. Some of the questions on the exams will involve explaining physics theories discussed in class, and others will involve solving physics problems. In some cases, you will be asked on the test to explain in words how you solved some problems. All the problems on the exams will be similar to problems in the textbook and other materials handed out in class, and many will be similar to

homework problems. All useful numbers and equations will be given on the exams. The final exam (20%) will take up the last class period, and will involve ideas and problems from the entire semester.

II. Homework Assignments (15%)

Mathematics is an essential part of physics, and an important tool for solving problems. The homework problems in this class will involve using basic algebra and arithmetic, nothing beyond the first semester of high school algebra. Most problems will be taken from the book, but some will be made up by the instructor. Some problems will be submitted on paper, and others will be submitted via the Mastering Physics online homework system. To view a video about registering for Mastering Physics, go to YouTube and search for “mastering registration.”

The plan is to give 12 homework assignments, all of which will determine your homework grade. Homework solutions will be handed out and discussed in class, so late homeworks cannot be accepted. Assignments can be found on the class Website, along with due dates.

Your grade on the written portion of the homework will be based on how well you have worked the problem, how well you have shown your work, and how well you have justified the answer using the basic laws of physics. This is the way things work in the “real world”: people typically spend as much time (if not more) justifying answers as they do getting them! You answers must always be expressed in the proper units and with the proper number of significant figures. In addition, you must express every one of you answers *in a complete English sentence*, or get diminished credit. This is a real world situation you might as well get used to!

Many of the problems on the exams will be taken from these homework problems, although they may be slightly altered. This does *not* mean that you should try to memorize how to solve these problems. That amount of memorization is not only useless, it’s also nearly impossible, so please don’t even try. Physics is not about memorization; it’s about learning how to do things!

No time will be allotted in class for working homework problems. You must work on homework outside of class! I encourage you to start homeworks early, so that you can come in to my office hours and talk if need be. I also encourage you to work together on homework problems and studying for tests. However, copying of work will be punished!

III. Quizzes (10%)

The most important thing to do in a physics class is to keep working. To motivate students to keep working steadily, 7 quizzes will be given on the class day after a homework is due. The quizzes will be short, consisting of one problem, similar to a problem from the previous homework. Quizzes can be made up if the absence is excused.

IV. Laboratories (25%)

Physics theories are more than just... well, theoretical. They describe things that are happening in the real world all around us. Therefore, you will be given many opportunities to discover some of the basic laws of physics for yourself. Some of these labs will involve working with mechanical and electronic devices, others will involve thinking about and discussing real-world situations. You will be assigned laboratory partners. The plan is to have a total of 13 labs, all of which will be used to determine your lab grade. Also, part of your grade will be determined by how well you work together with the group.

An Important Note about Earning a Passing Grade in this Class! This is Official ACC Department of Physical Sciences Policy!

You must earn a grade of “C” or better in the laboratory portion of the course as well as a grade of “C” or better in the lecture portion of the course in order to earn a grade of “C” or better in the course. If you do not earn a grade of “C” or better in both the lecture and the laboratory sections of the course, then your grade for the course will be a “D” unless due to your overall course average you have earned an “F” for the course. In this course, the “laboratory component” is defined as the lab reports only. The “lecture component” is the rest of the course.

Summary of Grading System:

Tests (3 @ 10% apiece)	30%
Final Exam	20%
Homeworks	15%
Quizzes	10%
Laboratories	25%
Total	100%

Things you will need: Scientific calculator
Graph paper
A ruler
At least 12 hours per week to work outside class

Course Policies:

Attendance – A number of studies in science education have revealed that class attendance is a very important factor in determining the final grades of college science students. Attendance is even **more important** than the teacher, the textbook, the student’s GPA or even the student’s IQ! Yet these same studies reveal that some college

students enjoy exercising the “freedom to miss class” that college affords, and their grades suffer as a result.

Class time is when you can interact with your fellow students and with the instructor. More pragmatically, class time is when you find out what’s going to be on the test! In this class, there will be nothing required on the test that is not discussed in class. Conversely, with the exception of a few personal anecdotes and historical vignettes to add flavor to the class, everything said in class will be on the test in one form or another. There is no substitute for coming to class.

Because attendance is so important to your success in this class, we will have the following attendance policy:

After FOUR (4) unexcused absences, I reserve the right to withdraw you from the class without further notice.

Notice that this *doesn't* mean I will automatically withdraw you, merely that I *reserve the right* to do so. It is possible to get an absence excused, by one of two methods:

1. Producing a **documented** valid excuse. Valid excuses include, but are not limited to
 - a. Personal illness or other medical emergency
 - b. Illness or death of family member
 - c. Loss of transportation (*one time only*)
 - d. Work conflict (*one time only*)
 - e. Jury duty
 - f. National Guard duty

Valid excuses **must** come with written documentation (doctor’s note, mechanic’s receipt, etc.) to be counted. It is your responsibility to provide this documentation, and to notify me as quickly as possible of your absence, so that I won’t withdraw you!

2. An adequately detailed outline of the text reading for the missed class day. I will be the final arbiter of what constitutes an adequate amount of detail, and only one rewrite will be allowed per outline.

Attendance will be taken, either verbally, or by sign-in sheet, during class. **Anyone not in roll is class when roll is called will be counted absent, and must have a valid excuse (see above) for not being there.**

Make-up Policy – Homeworks are due at the end of the lecture session on the day they are due. No late homeworks will be accepted, unless a student has an excused absence for that day. Labs can be made up during the Open Lab periods on Fridays. Late lab

reports will be accepted until graded lab reports have been returned to the other students. Absolutely no late work will be accepted after the final exam is complete!

Withdrawal Policy – It is the responsibility of each student to ensure that his or her name is removed from the roll should he or she decide to withdraw from the class. The instructor does, however, reserve the right to drop a student should he or she feel it is necessary. If a student decides to withdraw, he or she should also verify that the withdrawal is submitted before the Final Withdrawal Date. The student is also strongly encouraged to retain their copy of the withdrawal form for their records.

Students who enroll for the third or subsequent time in a course taken since Fall 2002 may be charged a higher tuition rate for that course.

State law permits students to withdraw from no more than six courses during their entire undergraduate career at Texas public colleges or universities. With certain exceptions, all course withdrawals automatically count towards this limit. Details regarding this policy can be found in the ACC college catalog.

Incompletes -- An instructor may award a grade of “I” (Incomplete) if a student was unable to complete all of the objectives for the passing grade in a course. An incomplete grade cannot be carried beyond the established date in the following semester. The completion date is determined by the instructor but may not be later than the final deadline for withdrawal in the subsequent semester.

HOW TO GET A GOOD GRADE IN THIS CLASS

Physics is a difficult subject. Most physics majors and physics teachers will tell you that. Not even Einstein found physics to be easy. It’s just that most physicists would agree very strongly with what President Kennedy said when announcing the Apollo Program:

“We do these things not because they are easy, but because they are hard.”

And physics is hard, mainly because it requires you both to read and to do math, to be creative and logical, to solve problems and learn concepts. That’s the bad news, but there is some good news. First off, because physics is hard, the learning and work habits you develop in this class will help you succeed in your other classes, and “out in the real world.” In other words, if you “survive” this class, you should be able to handle anything that ACC, or even the “Big U,” can throw at you.

The second piece of good news is that your grade in this class will depend almost entirely on how hard you work. It doesn’t matter how “smart” you are; in fact, many people who have been called “smart” all their lives bomb in physics classes, because they think that they don’t have to work hard. Wrong! Physics is a great equalizer: people of all ages, races, genders, and walks of life can do well in physics, as long as they are willing to work hard. When you learned to drive a car, you practiced driving outside of driver’s ed class. Great basketball players don’t just practice during practice time. You will have to spend time outside of class to succeed in this course. That time will be spent

writing reports, working practice problems, and reading the book. You may need to get help from your classmates, come to my office hours, or go to the tutoring lab, but if you work hard, you will do well. Bearing that in mind, here are some truths about this class:

- **It is not unreasonable for me to expect you to come to class on time every day that you are physically able.**
- **It is not unreasonable for me to expect you to take notes in class.**
- **It is not unreasonable for me to expect you to do all the assignments.**
- **It is not unreasonable for me to expect you to do work outside of class.**
- **It is not unreasonable for me to expect you to read the book.**

All of the above are essential to your learning in this class, or any science class. You are all adult learners, and I will treat you like adults, responsible for your own learning. I provide the opportunities; you must provide the energy. If you think that any of the above are unreasonable, then you will have a difficult time in this class!

12 Basic Truths about This Class:

- **It is the right of the instructor to establish the standards for his or her class; it is the right of the student to have those standards described.**
- **It is the responsibility of the instructor to make the standards for his or her class evident; it is the responsibility of the student to meet those standards.**
- **Brilliant students require at least a dozen hours of work outside of class each week to succeed in physics. Less brilliant students require at least twelve.**
- **Physics doesn't care about your IQ, your GPA, your race, your gender, or how much money your family makes. Physics only cares about how hard you work.**
- **"But that's the way the tutor did it" is not a valid reason for anything.**
- **"But that's the way the book did it" is not a valid reason for anything.**
- **"But I got the answer in the back of the book" is not a valid reason for anything.**
- **There is a wide gulf between solving a problem correctly and getting the "right answer."**
- **Equations are not the most important thing. This is a physics class, not an algebra or geometry class.**
- **You will succeed in this class if your attitude is "How much can I learn?" rather than "How little can I get away with doing?"**
- **There is absolutely no way that the instructor, or anyone other than yourself, can motivate you. As an adult learner, you *must* motivate yourself.**
- **The only *really* stupid question is "Who cares?"**

The sooner you accept these basic truths, the sooner you can get about the business of succeeding in your studies.

Course Syllabus

Week	Day	Topic	Reading	Lab Exercise	What is Due
1 January 22	Wednesday	Introduction		Lab #1 Basic Measurements	
2 January 27, 29	Monday	Units and Vectors	Ch. 1 pp. 1-19	In-class pre- test	
	Wednesday	Forces in Balance	Ch. 5 pp. 120-126	Lab #2 Hooke's Law	Lab #1 Write-up
3 February 3, 5	Monday	Velocity and Acceleration	Ch. 2 pp. 27-47	Lab # 3	Homework #1
	Wednesday	Free Fall	Ch. 2 pp. 47-52	Velocity and Acceleration	Lab #2 Write-up Quiz #1
4 February 10, 12	Monday	Newton's Laws	Ch. 4 pp. 93-112	Lab # 3 Free Fall	Homework #2
	Wednesday	Newton's Second Law	Ch 5 pp. 120-129	Lab #4 Newton's Second Law	Lab #3 Write-up Quiz #2
5 February 17, 19	Monday	Applications of Newton's Laws	Ch. 5 pp. 130-140	Lab #4 Newton's Second Law	Homework #3
	Wednesday	Projectile Motion	Ch. 3 pp. 64-78	Lab #5 Projectile Motion	Quiz #3 Lab #4 Write-up

Week	Day	Topic	Reading	Lab Exercise	What is Due
6 February 24, 26	Monday	Pressure	Ch. 13 pp. 397-405	Lab #5 Projectile Motion	Homework #4
	Wednesday	TEST #1			
7 March 2, 4	Monday	Buoyancy	Ch. 13 pp. 406-419	Lab #6 Density	Homework #5
	Wednesday	Circular Motion	Ch. 3 pp. 78-81 Ch. 6 pp. 152-171		
8 March 9, 11	Monday	Rotational Motion	Ch. 9 pp. 258-268	Lab #7 Rotational Motion	Lab #5 Write-up Quiz # 4
	Wednesday	Torque	Ch. 10 pp. 285-294		Lab #6 Write-up
9 March 23, 25	Monday	Statics revisited	Ch. 10 pp. 305-309	Lab #8 Torque and Equilibrium	Homework #6
	Wednesday	Stress and Strain	Ch 11 pp. 325-333		Lab #7 Write-up Quiz #5
10 March 30, April 1	Monday	Work and Energy	Ch. 7 pp. 180-200	Catch-up	Homework #7
	Wednesday	TEST #2			

Week	Day	Topic	Reading	Lab Exercise	What is Due
11 April 6, 8	Monday	Conservation of Energy	Ch. 7 pp. 201-210	Lab #9 Energy	Lab #8 Write-up
	Wednesday	Rotational Energy	Ch 9 pp. 268-275		
12 April 13, 15	Monday	Linear Momentum	Ch 8 pp. 222-247	Lab #10 Momentum and Collisions	Homework #8
	Wednesday	Angular Momentum	Ch 10 pp. 297-303		Lab #9 Write-up Quiz #6
13 April 20, 22	Monday	Simple Harmonic Motion	Ch 7 pp.193-195, 198-200 Ch 11 pp. 333-348	Lab #11 Simple Harmonic Motion	Homework #9
	Wednesday	Waves and Sound	Ch 12 pp. 357-375		Lab #10 Write-up Quiz #7
14 April 27, 29	Monday	More on Sound	Ch 12 pp. 375-387	Lab #12 Sound	Homework #10 Lab #11 Write- up
	Wednesday	TEST #3			
15 May 4, 6	Monday	Temperature	Ch 14 pp. 429-438	Lab #13 Determining the Coefficient of Friction	Lab #12 Write-up
	Wednesday	Heat	Ch. 14 pp. 439-453 Ch 15 pp. 464-478		

Week	Day	Topic	Reading	Lab Exercise	What is Due
16 May 11, 13	Monday	Thermo- dynamics	Ch 15 pp. 479-491 Ch. 16 pp. 501-521	Take-home Final passed out	Homework #11 and #12 Lab #13 Write-up
	Wednesday	FINAL EXAM			