Syllabus for PHYS 1405
Conceptual Physics I
Section # 97294 10:30 – 1:20 Tuesday and Thursday 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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Text: Conceptual Physics, Twelfth Edition, by Paul G. Hewitt (Addison Wesley)
Conceptual Physics Practice Book, Twelfth Edition, by Paul G. Hewitt

Course Overview:

Description from the ACC Catalogue: Conceptual survey of topics in physics, including the fundamentals of motion, forces, energy and momentum. Intended for liberal arts and other non-science majors, but science majors with weak physics background may wish to use this as an introduction to physics principles.

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

This course is also intended to familiarize students with the scientific process, by discussing how scientists have discovered fundamental principles of physics in the classroom, and by studying phenomena for ourselves in the laboratory.

Course Prerequisites:

- Two years of high school algebra or equivalent OR grade of C or better in MATD 0370.
- One year of high school science recommended, but not required.

Course Rationale:

This course is designed for non-science majors. It is intended to provide an overview of basic physics and the scientific process. The course is also a laboratory course, providing many opportunities for hands-on investigation. Because many if not most students will be using this course for transfer credit, the course will be taught at the University level.

Student Learning Outcomes

Course-Level Student Learning Outcomes

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

- Demonstrate understanding of the nature of science and scientific methods and how science differs from other ways of understanding the world.
- Demonstrate knowledge of Newton's Laws of Motion, and conceptually apply those laws to simple physical systems.
- Demonstrate knowledge of physical conservation laws, and conceptually apply those laws to simple physical systems.
- Demonstrate knowledge of wave motion, oscillations, and sound and conceptually apply that knowledge to simple physical systems.
- Demonstrate knowledge of thermal physics and conceptually apply that knowledge to simple physical systems.
- Demonstrate knowledge of the nature of matter, *e.g.,* atomic structure, elasticity, and fluids.
- Demonstrate the ability to collect, analyze, and interpret data.
- Demonstrate the ability to communicate findings in terms of fundamental physical concepts.

General Education Student Learning Outcomes

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

- **Critical Thinking**
  Gathering, analyzing, synthesizing, evaluating and applying information.
- **Interpersonal Skills**

Interacting collaboratively to achieve common goals.

- **Quantitative and Empirical Reasoning**

Applying mathematical, logical and scientific principles and methods.

- **Technology Skills**

Using appropriate technology to retrieve, manage, analyze, and present information.

- **Written, Oral and Visual Communication**
  Communicating effectively, adapting to purpose, structure, audience, and medium.

Goals and Objectives:

The simplest and most obvious goal for this course is to convey to you the basic concepts of elementary physics. I realize that few if any of you would even consider a career in science, so this course is not necessarily "pitched" to future scientists. I hope to be able to give you enough of a background in the "facts" and theories of physics to be able to understand claims made by scientists in the popular media, and to be able to look at the world around you in a more informed way.

A deeper goal for this course is to give you practice in "thinking scientifically." In-class material, as well as most graded activities, are intended to help you improve your abilities to organize, reason, make conclusions based on evidence, and otherwise think logically. These are skills that employers are looking for, and skills a scientifically aware citizen should have. Everyone has these skills inside them, and part of my job is to help you sharpen these skills.

Of course, the most important goal in this class is to have fun. I hope some of my enthusiasm about science and physics will be infectious. However, you must realize that a lot of the responsibility for this rides on you: you can only have as much fun as you allow yourself to have. Be involved in the class! Be energetic!

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. Most of the questions will be essay in nature, testing your ability to explain physics theories and use them to describe real situations. A few questions may involve making predictions, interpreting graphs, and using and interpreting equations. The final exam (20%) will take up the last class period, and will involve ideas from the entire semester.

II. Homework Assignments (10%)

Homework assignments will be found on the Website, and will consist of questions and problems taken from the book. Homework assignments will be submitted along with the Learning Journals, in the same notebook. They will be graded for completeness, not

correctness. No time will be allotted in class for working homework problems. You *must* work on homework *outside* of class! I encourage you to start assignments 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, whether from other students, outside sources, or even the book, will be regarded as plagiarism! The homeworks may be reviewed on the day they are due, time permitting. Therefore, no late homeworks will be accepted.

III. 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 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. With projects involving apparatus, I would like for the work to be divided as follows:

- Equipment operator(s)
- Data recorder
- Supervisor (responsible for final report)

These duties will rotate from lab to lab. Also, part of your grade will be determined by an evaluation by your lab partners, and an evaluation by me of how involved you have been in discussion activities.

IV. Term Project (10%)

This is a special project designed to sum up your learning for the semester. It can take one of two forms:

1. You can write a paper detailing a specific physics concept that you have learned this semester that you will be able to use in your future career. You will be required to present a brief talk on this concept in class.

2. You can create a mini-lesson on one of the ideas in the course, suitable for teaching at the pre-college grade level of your choice. The report should include lecture notes, and details of any activity that is part of the lesson. You will present one of these activities briefly in class.

Your in-class presentation will be evaluated by the instructor and your peers.

V. Learning Journal (5%)

The final 5% of your grade will be determined by a "learning journal" that I would like you to keep. Please set aside an entire notebook for this purpose; you will be writing

homework in the same notebook. You will turn in your journal most Tuesdays, and I will return it the next Thursday. You will also turn it in on test days, and get it back the next period. The purpose of the journal is to write down your thoughts on what we have discussed during the previous week. You may write anything you wish in the journal, but I would like these questions answered at least:

1. What was the most interesting thing you learned this week? Why was it interesting?
2. What confused you the most this week? How could it be made more clear?
3. What could you have done this week to improve your learning?
4. What could the instructor have done this week to improve your learning?

Also in the journal, I would like you to suggest an essay-style question for the upcoming exam. Alternately, you could come up with a test question suitable for the grade level of your choice.

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 this 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 for the course. The grade in each portion, either lecture or laboratory, of the course will be determined by using the weights, as stated in the syllabus, for each individual component. In this course, the "laboratory component" is defined as the lab reports and term projects only. The "lecture component" is the rest of the course.

Summary of Grading System:

Tests (3 @ 10% apiece)	30%
Final Exam	20%
Homeworks	10%
Laboratories	25%
Term Project	10%
Learning Journal	5%
Total	100%

Grading Scale:
A = 90% to 100%
B = 80% to 89%
C = 68% to 79%
D = 50% to 67%
F = Less that 50%

Things you will need: 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 producing a ***documented*** valid excuse. Valid excuses include, but are not limited to

- Personal illness or other medical emergency
- Illness or death of family member
- Loss of transportation (*one time only*)
- Work conflict (*one time only*)
- Jury duty
- 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!

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.

A Note on Cheating: I expect and demand that everything you do in this class will be your own work. Studies have shown that increasing numbers of college students think that cheating is acceptable, and it simply is not. Claiming someone else's work as your own is plagiarism, and both the college and I have a very low tolerance for it. Please take pride in your work, and be honest. Note that this does not forbid students from working together. If you are doubtful about where the line is between collaboration and plagiarism, talk to me, and we'll work it out before you turn things in.

Academic Freedom – Students are free to disagree with instructors on matters of opinion or personal philosophy, and will incur no penalty from doing so. However, instructors will judge student work based upon its relation to the current state of mainstream scientific fact and theory.

A Note about Readings:
There is no substitute for reading the book. Research has shown that one of the keys to learning science is to have prior knowledge "hooks" that give you someplace to "hang" new knowledge. Your own life experiences will provide some of these hooks, and I hope you will share them in class discussions. Reading material in the book before class will provide you with more hooks, so that information discussed in class will not be entirely new. To best understand the things we will discuss, you will need as many angles as possible. The book provides you with one such angle.

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.

Research has shown that the leading obstacles to success in physics classes are unrealistic expectations on the part of students. Students treat physics classes like some of the other classes that they have taken.

Please don't be unreasonable in your studies!

- **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!

7 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.**
- **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 21, 23	Tuesday	Introduction		Lab #1 Basic Measurements	
	Thursday	The nature of science	Ch 1 pp. 1-17	In-class Pre-test	
2 January 28, 30	Tuesday	Forces in Balance	Ch 2 pp. 19-34	Lab #2 Hooke's Law	
	Thursday	Velocity and Acceleration	Ch 3 pp. 39-46	Lab #3 Velocity and Acceleration	Lab #1 Write-up
3 February 4, 6	Tuesday	Free Fall	Ch 3 pp. 46-52	Lab #3 Velocity and Acceleration	Homework #1
	Thursday	Forces	Ch 4 pp. 57-63		Lab #2 Write-up
4 February 11, 13	Tuesday	Newton's Second Law	Ch 4 pp. 63-67	Lab #4 Newton's Second Law	Homework #2
	Thursday	Newton's Third Law	Ch 5 pp. 74-85		Lab #3 Write-up
5 February 18, 20	Tuesday	Momentum	Ch 6 pp. 90-103	Lab #5: Collisions	Homework #3
	Thursday	Gravity	Ch 9 pp. 160-176		Lab #4 Write-up

Week	Day	Topic	Reading	Lab Exercise	What is Due
6 February 25, 27	Tuesday	Projectile Motion	Ch 10 pp. 182-200	Lab #6 Projectile Motion	Homework #4
	Thursday	TEST #1 Weeks 1-5			
7 March 3, 5	Tuesday	Centripetal Force	Ch 8 pp. 145-149	Lab #6 Projectile Motion	
	Thursday	Rotational Motion	Ch 8 pp 132-145, 151- 152	Lab #7: Torque and Equilibrium	Lab #5 Write-up
8 March 10, 12	Tuesday	Matter	Ch 11 pp. 208-222	Lab #7: Torque and Equilibrium	Homework #5
	Thursday	Density and Elasticity	Ch 12 pp. 226-239	Lab #8 Density and Buoyancy	Lab #6 Write-up
9 March 24, 26	Tuesday	Pressure and Buoyancy	Ch 13 pp. 244-258	Lab #8 Density and Buoyancy	Homework #6
	Thursday	Gases and Other Fluids	Ch 14 pp. 264-277		Lab #7 Write-up
10 March 31 April 2	Tuesday	Work and Power	Ch 7 pp. 109-117	Lab #9 Energy	Homework #7
	Thursday	TEST #2 Weeks 6-10			
11 April 7, 9	Tuesday	Energy	Ch 7 pp. 117-120	Lab #9 Energy	
	Thursday	Conservation of Energy	Ch 7 pp. 120-125		Lab #8 Write-up

Week	Day	Topic	Reading	Lab Exercise	What is Due
12 April 14, 16	Tuesday	Simple Harmonic Motion	Ch 19 pp. 356-359	Lab #10 Simple Harmonic Motion	Homework #8
	Thursday	Waves	Ch 19 pp. 360-368		Lab #9 Write-up
13 April 21, 23	Tuesday	Sound	Ch 20 pp. 375-387 Ch 21 pp. 391-400	Lab #11 Sound	Homework #9
	Thursday	Temperature	Ch 15 pp. 284-296		Lab #10 Report
14 April 28, 30	Tuesday	Heat	Ch 16 pp. 302-315	Catch-up	Homework #10
	Thursday	Thermodynamics	Ch 17 pp. 320-332 Ch 18 pp. 336-350	In-class Presentations	Lab #11 Report
15 May 5, 7	Tuesday	In-class Presentations			Homework #11
	Thursday	TEST #3 Weeks 11-14			
16 May 12, 14	Tuesday	In-class Presentations			
	Thursday	FINAL EXAM			