

# Physics 1410 Elementary Physics

## Instructor

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Office Hours: MW 1:00 – 2:00 pm, TT 8:00 – 9:00 am, F 7:30 – 11:30 am  
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## Course Description

### Content

Conceptual level survey of topics in physics intended to acquaint liberal arts and other non-science majors with the basic laws and vocabulary of physics. A minimum level of mathematics is used.

### Prerequisites

None

### Textbook

No textbook is required. The following online resources may be helpful:

Openstax College Physics, <https://openstax.org/details/books/college-physics>  
Free Online Physics textbooks by Ben Crowell, <http://www.lightandmatter.com/books.html>  
Fascination of Physics, <https://web.phys.ksu.edu/fascination/Contents.htm>  
Learn Conceptual Physics, <http://www.learnconceptualphysics.com/index.html>  
The Physics Hypertextbook, <https://physics.info/>  
HyperPhysics, <http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html>

### Course Overview

This course offers a broad survey of the fundamental definitions, laws, and principles of physics. We will be taking a first look at what comprises our universe, from the smallest subatomic particles to the largest galaxies, as well as the interactions that can occur between those things. We want to learn to view the world around us through the eyes of physics, seeing how physics principles literally touch our lives moment by moment.

### Approach

The course will emphasize construction of physics knowledge using a student-centered active learning environment. Class sessions will require students to be responsive, to think, and to perform hands-on tasks. Key concepts of new material will be discussed in short lectures. Lab time will be interspersed with classroom discussion. If you devote a sufficient amount of time each day to studying physics, you will develop a greater appreciation of the world around you and how it functions, based on a clear understanding of the fundamental physical principles that govern the universe.

### Collaborative Work

This course encourages collaborative teamwork, a skill that is valued by most employers. As you study together, help your partners to get over confusions, ask each other questions, and critique each other's homework write-ups. Teach each other! You can learn a great deal by teaching. But remember that you are responsible for understanding all details of a problem solution.

### Study requirements

Studying science can be a time intensive activity. You have probably heard the recommendation to study two hours outside of class for every hour of time in class. In physics, this is a reasonable way to estimate the needed study time. So, in addition to your time in class each week, you can expect to spend about 8 hours studying outside of class.

It is important to keep up with the class. New concepts introduced in this course build on earlier ones, so mastering key concepts is critical. If you get behind, seek help right away!

### Attendance policy

Attendance and effort are vital to success in this course. Class attendance keeps you well connected to the course, so that you know at all times what's going on, what are the most important points, etc., and gives you opportunities to ask questions and clear up confusions. Therefore, students are expected to be in attendance for every class session. However, everybody gets sick, has some emergency, needs to care for a friend or family member or similar stuff now and then. Therefore, all students will be allowed two excused absences, no documentation required. The third and fourth absences will be unexcused and after a fifth absence you will be dropped from the class. If you stop attending class and wish to avoid an "F" you must obtain an official drop form, have it signed, and take the completed form to the registrar's office before your fifth absence. See the current class schedule for the last day you can drop a class.

## Assignments

### Homework

Weekly homework assignments will be due at the beginning of the first class meeting each week.

### Readings

Reading selections from internet-based sources will be assigned. These readings will form the basis of class discussions so *it is essential to read the selections BEFORE coming to class*. Your time in class will be largely ineffective if you have not studied the assigned reading selection prior to coming to class.

### Getting help

You should ask lots of questions in class to clear up any initial confusion you might have about a topic. I also encourage you to avail yourself of my help during office hours. You do not have to wait for my official office hours to get help; anytime I am in my office you are always welcome to come get help. I will do what I can to help you complete the course satisfactorily.

## Tests

### Tests

Three tests will be given as shown on the course calendar. The tests will consist of 50 multiple choice questions and the score on the test will be  $50 + \text{"number of correct answers"}$  (i.e., if you get 35 of the 50 questions correct, your score would be  $50 + 35 = 85$ ). There will be no make-up tests – if you miss a test due to an excused absence, your final exam will count twice (once as the final exam and once in place of the missed test). Tests missed due to an unexcused absence will receive a grade of zero and cannot be replaced by the final exam.

### Final exam

A comprehensive final exam will cover all of the course material. The final exam will be given during the scheduled final exam time as shown in the schedule of classes and on the course calendar. The format and grading of the final exam will be the same as the tests. If you score higher on the final exam than your lowest test grade, your final exam will count twice (once as the final exam and once in place of the lowest test).

## Grade calculation

Your final grade will be assigned based on your overall, weighted class average using the weighting scheme shown below:

Weighting Scheme	
Task	Weight
Daily Work	20%
Tests	60%
Final	20%

The letter grades will be based on a fixed scale as follows:

A: 89.5 – 100    B: 79.5 – 89.5    C: 69.5 – 79.5    D: 59.5 – 69.5    F: below 59.5

If everyone in the class does well, grades are not curved downward. Everyone can get an A. There usually is a "gray area" between two letter grades for borderline cases (grades within 0.5 points of the break point). Earning the higher grade in these cases depends on your interactions in class and whether your test and homework performance shows improvement during the course of the semester.

## Miscellaneous information

In this class, the teacher will establish and support an environment that values and nurtures individual and group differences and encourages engagement and interaction. Understanding and respecting multiple experiences and perspectives will serve to challenge and stimulate all of us to learn about others, about the larger world and about ourselves. By promoting diversity and intellectual exchange, we will not only mirror society as it is, but also model society as it should and can be.

Students with disabilities, including but not limited to physical, psychiatric, or learning disabilities, who wish to request accommodations in this class should notify the Disability Services Office early in the semester so that the appropriate arrangements may be made. In accordance with federal law, a student requesting accommodations must provide acceptable documentation of his/her disability to the Disability Services Office. For more information, call or visit the Disability Services Office at Levelland (Student Health & Wellness Office) 806-716-2577, Reese Center (Building 8) 806-716-4675, or Plainview Center (Main Office) 806-716-4302 or 806-296-9611.

South Plains College does not discriminate on the basis of race, color, national origin, sex, disability or age in its programs and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies: Vice President for Student Affairs, South Plains College, 1401 College Avenue, Box 5, Levelland, TX 79336. Phone number 806-716-2360.

If you are pregnant, or have given birth within six months, Under Title IX you have a right to reasonable accommodations to help continue your education. To activate accommodations you must submit a Title IX pregnancy accommodations request, along with specific medical documentation, to the Director of Health and Wellness. Once approved, notification will be sent to the student and instructors. It is the student's responsibility to work with the instructor to arrange accommodations. Contact Crystal Gilster, Director of Health and Wellness at 806-716-2362 or email at [cgilster@southplainscollege.edu](mailto:cgilster@southplainscollege.edu).

### **Core Objectives Addressed in this course:**

As a part of the Texas Core Curriculum established by the Texas Higher Education Coordinating Board (THECB), the following core objectives will be addressed in this class:

**Communication Skills** – effective development, interpretation and expression of ideas through written, oral, and visual communication

**Critical Thinking Skills** - creative thinking, innovation, inquiry, analysis, evaluation and synthesis of information

**Empirical and Quantitative Skills** - manipulation and analysis of numerical data or observable facts resulting in informed conclusions

**Teamwork** - ability to consider different points of view and to work effectively with others to support a shared purpose or goal

### **Course Learning Objectives:**

#### Mechanics:

I can distinguish between displacement, velocity, and acceleration.

I can solve simple problems involving uniform motion, uniformly accelerated motion, or uniform circular motion.

I can state Newton's Laws of Motion, explain the meaning of each, and identify applications of each.

I can apply Newton's laws of motion to relate forces to motion.

I can define momentum and solve problems involving conservation of momentum.

I can identify types of energy in a system and solve problems involving conservation of energy.

#### Properties of Matter and Thermal Physics

I can describe the different phases of matter from an atomic perspective.

I can calculate the pressure at different depths in a fluid and can relate it to force.

I can define density and relate it to the buoyant force, applying Archimedes' Principle to solve problems.

I can discuss the first law of thermodynamics, distinguishing between energy contained within the system and energy in the process of being transferred into or out of the system.

I can describe various means of heat transfer.

I can make simple calculations involving changes in temperature as well as phase changes when systems at different temperatures interact.

#### Oscillations and Waves

I can describe and calculate basic properties of waves such as frequency, wavelength, etc.

I can discuss wave interference and the conditions for constructive and destructive interference.

#### Electricity and Magnetism

I can discuss electric charge and the role it plays in atomic structure.

I can calculate electrical forces using Coulomb's law.

I can describe electric field and discuss electrical interactions in terms of electric field.

I can discuss simple electrical circuits and make calculations using Ohm's law applied to series and parallel circuits.

I can describe magnetic field and discuss interactions of magnetic fields with moving charges.

I can relate changing magnetic fields to induced electric fields.

I can discuss the spectrum of electromagnetic waves from radio waves to x-rays.

## Optics

I can discuss reflection and refraction of light.

I can work qualitatively with image formation using mirrors and lenses.

I can calculate the image position and magnification produced by a simple thin lens.

I can discuss qualitatively dispersion and the formation of rainbows, as well as other atmospheric optical effects.

I can discuss diffraction and interference and how they arise based on superposition and Huygens' principle.

## Atomic, Nuclear, and Particle Physics

I can discuss and make simple calculations related to the photoelectric effect, the Bohr model of the hydrogen atom, and the Pauli Exclusion Principle and its implications for atomic structure.

I can describe the basic structure of a nucleus and explain the meaning of different "isotopes".

I can recall the three basic types of radioactivity and describe some properties of each.

I can use radioactive half-life in simple calculations.

I can describe the basic principles of radioactive dating.

# Calendar

Phys 1410.002

Spring 2019

Week	Tuesday		Thursday	
	Date	Topics	Date	Topics
1	01/15	Course Introduction	01/17	What is Science? The Scientific Attitude – Thinking Like a Scientist
2	01/22	Simple Math and Scientific Notation	01/24	Our Place in the Cosmos – A Case Study of How Science is Done
3	01/29	Atomic Nature of Matter	01/31	How Things Move – Describing Motion: Velocity
4	02/05	How Things Move – Describing Motion: Acceleration	02/07	<b>Test 1</b>
5	02/12	Why Things Move – Force	02/14	Forces are Interactions
6	02/19	Conservation Laws – Energy and Momentum	02/21	Conservation Laws – Energy and Momentum
7	02/26	Degradation of Energy – Directionality of Energy Flows	02/28	Energy-Related Issues – Energy for Transportation, Power Generation
8	03/05	Electromagnetism – The Dominate Interaction in Our Daily Lives	03/07	<b>Test 2</b>
9	03/12	Spring Break	03/14	Spring Break
10	03/19	Electromagnetic Fields	03/21	Light – Electromagnetic Waves
11	03/26	Special Relativity – Unifying Space and Time	03/28	Special Relativity – Mass is Energy and Energy is Mass
12	04/02	General Relativity – Mass/Energy Warps Spacetime and this is Gravity	04/04	Cosmology – Large Scale Structure of the Universe
13	04/09	The Quantum Revolution – Light has Particle Properties	04/11	<b>Test 3</b>
14	04/16	The Quantum Revolution – Matter has Wave Properties	04/18	Quantum Weirdness – The Uncertainty Principle, Quantum Entanglement
15	04/23	The Quantum Atom	04/25	The Final Two Fundamental Forces – Strong Force and Weak Force
16	04/30	Fusion and Fission – Energy from the Strong Force	05/02	Quantum Fields – The Basic Ingredients of Nature
17	05/07	<b>Final Exam – 1:00 to 3:00 pm</b>	05/09	