Physics 1410 Elementary Physics

Instructor

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Office Hours: MW 1:00 – 2:00 pm, TT 1:30 – 3:00 pm, F 8:30 – 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

The textbook is *Inquiry into Physics, 8th edition* by V. Ostdiek and D. Bord (Cengage Learning, 2018).

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

WebAssign

Homework will be delivered and graded on WebAssign, a web-based homework system. WebAssign provides immediate feedback on the correctness of your answers and allows you to make additional attempts on problems you initially miss. WebAssign access codes come packaged with a new textbook if purchased from the SPC bookstore or can be purchased online.

Readings

A key component of the course is the textbook, in which you are asked to analyze phenomena in "Physics to Go" activities, to study worked examples, to answer "Learning Check" questions, etc. *Class discussion may not cover all of the assigned material; it is essential that you study the textbook carefully.*

Class sessions will be devoted to *discussion* of ideas, clarifying points of confusion, and activities of various kinds that allow you to practice using the concepts you have read about in the text. The text thus provides the *background* for these activities. *Therefore, it is essential to read the appropriate sections in the textbook BEFORE coming to class.* Your time in class will be largely ineffective if you have not studied the appropriate text sections 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. These tests will be closed-book, but students will be allowed a single 4 inch x 6 inch note card with hand-written notes front and back. The tests will consist of 50 multiple choice questions and the score on the test will be 50 + "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 exam). 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 closed-book, but students will be allowed a single 4 inch x 6 inch note card with hand-written notes front and back. 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) & Lubbock Center 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, 806-894-9611

Note to students with disabilities: If you have a disability-related need for reasonable academic adjustments in this course, provide the instructor with a letter of accommodation from the Disability Services Office. If you need immediate accommodations or physical access, please arrange to meet with the Disability Services Office before the next class meeting.

Core Objectives Addressed in this course:

Communication skills - to include effective written, oral, and visual communication

Critical Thinking skills - to include creative thinking, innovation, inquiry and analysis, evaluation and synthesis of information

Empirical and Quantitative skills - to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

Teamwork skills - to include the 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 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 apply the ideal gas law to solve simple 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 discuss the forces that give rise to oscillatory motion.
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.
I can discuss sound and its various properties such as pitch, loudness, and tone quality.

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.
I can describe the properties of blackbody radiation.

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.

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 functioning of a laser.
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.
I can use nuclear binding energy to discuss the sources of energy in nuclear fission and fusion.
I can list the four fundamental interactions and give examples of each.
I can explain the difference between fermions and bosons.
I can use the quark model to explain the structure of particles such as protons, neutrons, and pions.
I can explain the classification of particles as hadrons and leptons and the differences between them.
I can explain the differences between baryons and mesons in terms of the quark model.

Calendar

Phys 1410.001 Spring 2018

Week	Monday		Wednesday	
	Readings	Topics	Readings	Topics
1	01/15	Martin Luther King Day – No Class	01/17	Course Introduction
2	01/22 **P.1 – P.6**	What is Physics and Why Study It?	01/24 **1.1 – 1.2**	Quantifying Motion – Distance, Time, Speed, Velocity
3	01/29 **1.3 – 1.4**	Quantifying Motion – Acceleration; Examples of Simple Types of Motion	01/31 **2.1 – 2.4**	Forces and Changing Motion – Newton's 1st and 2nd Laws of Motion
4	02/05 **2.5 – 2.8**	Examples of Motion Resulting from Various Forces; Newton's 3rd Law of Motion; Newton's Universal Law of Gravitation	02/07 **3.1 – 3.4**	Momentum and Energy and Their Conservation
5	02/12 **3.5 – 3.8**	Applying Conservation of Energy; Power; Conservation of Angular Momentum	02/14 **4.1 – 4.3**	Phases of Matter; Pressure and Density
6	02/19	**Test 1 Chapters 1 – 3**	02/21 **4.4 – 4.7**	Pressure in Fluids; Buoyancy; Fluids in Motion
7	02/26 **5.1 – 5.4**	Temperature; Ideal Gas Law; 1st Law of Thermodynamics; Heat Transfer	02/28 **5.5 – 5.7**	Calorimetry; 2nd Law of Thermodynamics
8	03/05 **6.1 – 6.2**	Wave Motion	03/07 **6.3 – 6.6**	Sound
9	03/12	Spring Break	03/14	Spring Break
10	03/19 **7.1 – 7.3**	Electric Charge; Electric Force and Field; Current	03/21	**Test 2 Chapters 4 – 6**
11	03/26 **7.4 – 7.6**	Electric Circuits; Electric Energy and Power	03/28 **8.1 – 8.4**	Magnetic Field; Electromagnetic Induction
12	04/02	Easter Holiday – No Class	04/04 **8.5 – 8.7**	Electromagnetic Waves
13	04/09 **9.1 – 9.3**	Light: Reflection, Refraction, Diffraction, Interference, Polarization	04/11 **9.4 – 9.7**	Optical Instruments: Mirrors and Lenses; Optical Phenomena in Nature
14	04/16 **10.1 – 10.4**	Blackbody Radiation; Photoelectric Effect; Bohr Model of the Atom	04/18	**Test 3 Chapters 7 – 9**
15	04/23 **10.5 – 10.8**	De Broglie Hypothesis; Wave-Particle Duality; Pauli Exclusion Principle and the Periodic Table; Lasers	04/25 **11.1 – 11.4**	Radioactivity; Half-Life; Radioactive Dating; Nuclear Reactions
16	04/30 **11.5 – 11.7**	Nuclear Binding Energy; Nuclear Fission and Fusion	05/02 **12.1 – 12.6**	Fundamental Particles and the Standard Model
17	05/07	**Final Exam – 8:00 to 10:00 am**	05/09	