South Plains College
Common Course Syllabus: PHYS 2425
Revised 06/26/2025

Department: Science

Discipline: Physics

Course Number: PHYS 2425

Course Title: Principles of Physics I

Available Formats: conventional

Campuses: Levelland

Instructor:
David Hobbs
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Office Hours: MW 1:00 – 2:00 pm, TT 8:30 – 10:30 am, and F 1:00 – 3:00 pm
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Course Description: Fundamental principles of physics, using calculus, for science, computer science, and engineering majors; the principles and applications of classical mechanics, including harmonic motion, physical systems and thermodynamics; and emphasis on problem solving. Basic laboratory experiments supporting theoretical principles and applications of classical mechanics, including harmonic motion and physical systems; experimental design, data collection and analysis, and preparation of laboratory reports.

Prerequisite: MATH 2413 Calculus I

Credit: 4 **Lecture:** 3 **Lab:** 3

Textbook: *Physics for Scientists and Engineers, 5th edition* by Randall D. Knight (Pearson, 2022). Either a physical copy or e-text is fine, just be sure it's the 5th edition. If using an e-text, you *do not* need any of the add-on study aides such as are offered in Pearson+.

Required Supplies: (1) good scientific calculator (NOT capable of accessing the internet so a calculator app on your smart phone is *not* acceptable, a graphing calculator is fine but not required), and (2) a **purple or green pen** (get several!). You will also likely find a ruler, a 3-ring binder with plenty of paper (work on paper torn from a spiral notebook will not be accepted), and a stapler handy.

This course partially satisfies a Core Curriculum Requirement:
Life and Physical Sciences Foundational Component Area (030)

Core Curriculum Objectives addressed:
- **Communications 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 competency skills**—to manipulate and analyze numerical data or observable facts resulting in informed conclusions
- **Teamwork**—to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

Student Learning Outcomes:

Lecture Learning Outcomes - Upon successful completion of this course, students will:

1. Determine the components of linear motion (displacement, velocity, and acceleration), and especially motion under conditions of constant acceleration.
2. Solve problems involving forces and work.
3. Apply Newton's laws to physical problems.
4. Identify the different types of energy.
5. Solve problems using principles of conservation of energy.
6. Define the principles of impulse, momentum, and collisions.
7. Use principles of impulse and momentum to solve problems.
8. Determine the location of the center of mass and center of rotation for rigid bodies in motion.
9. Discuss rotational kinematics and dynamics and the relationship between linear and rotational motion.
10. Solve problems involving rotational and linear motion.
11. Define equilibrium, including the different types of equilibrium.
12. Discuss simple harmonic motion and its application to real-world problems.

Lab Learning Outcomes - Upon successful completion of this course, students will:

1. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner.
2. Conduct basic laboratory experiments involving classical mechanics.
3. Relate physical observations and measurements involving classical mechanics to theoretical principles.
4. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements.
5. Design fundamental experiments involving principles of classical mechanics.
6. Identify appropriate sources of information for conducting laboratory experiments involving classical mechanics.

Student Learning Outcomes Assessment: Selected questions on tests will assess how well students have met targeted student learning outcomes.

General Class Structure: Physics education research has robustly shown that practice-oriented activities are *much* more effective than lectures at teaching both the concepts of physics and physics reasoning skills. We will therefore spend most of class time doing *activities* that give you practice (with instant feedback) using the concepts discussed in the reading. *All* activities will assume that you have read the assigned reading BEFORE coming to class: this is *crucial* for you to learn effectively!

You will practice using some specific skills: (1) how to model a physical situation by making suitable approximations; (2) how to make useful physics sketches and diagrams; (3) how to use mathematical tools, including drawing and interpreting graphs, keeping track of units, doing algebra using symbols, and using single-variable calculus applied to vectors; (4) how to present a problem solution clearly in writing.

The focus on the model-building process (in addition to merely learning concepts) is one of the things that distinguishes a good college-level course from a high-school course, so the skills you will need to succeed in this course are thus somewhat different.

A Metaphor: Physics is more like learning to play a sport or a musical instrument than merely memorizing information: there are actual skills to learn that can only be mastered through practice. This course is therefore designed to give you guided practice with feedback. You should consider class sessions and homework to be *practice*, formal exams to be like *games or recitals*, and the instructor as a *coach*. You will receive credit in this class for both practice and performance.

Course Evaluation: Student grades will be based on in-class work, homework, one practice test, two in-class tests, and a comprehensive final exam. Final grades will be assigned based on the percentages shown below:

Task	Weight
In-class work	15%
Homework	20%
Practice Test	10%
In-class Tests	25%
Final Exam	30%

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

Borderline cases (within 0.5 of the break) will be decided based on class participation. Please note that no matter what your final calculated grade is, **you will fail the course if you score below 50 on the in-class tests and the final exam**.

Late Work: Late work will not be accepted.

Extra Credit: This course will not include any extra credit opportunities.

Attendance Policy: Attendance and effort are vital to success in this course. Class attendance keeps you well connected to the course and gives you opportunities to ask questions and clear up confusions. Therefore, students are expected to be in attendance for every class session. Students with excessive absences (more than 5) will be administratively dropped from the class. It is the student's responsibility to know how many absences they have accumulated.

Dropping a Course: Students may drop courses through Texan Connect, the Admissions and Records Office, or Advising and Testing Center through the late registration period.

After late registration has closed, a student must complete the online Student Initiated Drop Request to drop a course.

Students may also drop courses in person at any campus location by completing a Student Initiated Drop Form. Complete a Student Initiated Drop Form and return the signed form to the Levelland Admissions and Records Office, the Student Support Center at the Lubbock Downtown Center, the Lubbock Career and Technical Center, or Plainview Center. You must have a picture ID to complete the drop.

A mark of "W" will be given for student-initiated drops that occur prior to and through the last day to drop as indicated in the online Academic Calendar found here: https://www.southplainscollege.edu/academiccalendar/index.php.

In-class Work: In-class work consists of short quizzes over reading assignments and in-class worksheets (exercises, problem solving with feedback, and lab work).

The first ten minutes of each class will be used for a 3-question quiz over the reading assignment for that class. The intent is to get you to read the assignment *before* class and to encourage on-time class attendance. You should be able to answer these very simple questions correctly with little effort *if you have read the chapter beforehand*. I will grade your quiz on a 3-point scale:

3 = at least 2 of 3 correct
2 = good effort but only 1 correct
1 = poor effort with all 3 incorrect
0 = not present to take quiz

While participating in class activities, you will fill out a worksheet. Be sure to correct any mistakes as we talk about them in class, but work can be very sketchy compared to homework. If we don't have enough time to go over the entire worksheet, I will announce what I expect you to have completed in class. Please place your finished worksheet in the tray at the back of the class as you leave. I will grade your worksheet on a 2-point scale:

2 = complete and correct
1 = partial
0 = absent

Your worksheet score will be added to your reading quiz score, and the worksheet and quiz will be returned to your folder in the file box next to the tray before the next class.

I will automatically drop your *three* (3) lowest reading quiz/worksheet scores before computing your final in-class work grade (points earned/points possible). This is meant to give you flexibility to deal with normal illnesses, unexpected life events, school-related trips, flat tires, and so on, so I shouldn't need to hear excuses from you unless an emergency or significant illness keeps you out more than two class days in a row.

Homework: Much of your real learning takes place when you try to do substantial assigned problems AND learn from your mistakes. Making errors, and learning from those errors, is part of the process. Homework is primarily practice with feedback that allows for improvement. Before class each Monday, you should submit (as a ***pdf file*** in Blackboard) a scan of all pages of your solutions to that week's assigned homework problems (usually about seven problems per week). Keep your actual written homework: you will need it for the next step. The scans provide a record of your initial effort.

After 6 pm each Monday, you can view in Blackboard, solutions to the problems due that day. Carefully compare each of your solutions with the posted solution. Use your green or purple pen to mark/adjust your solution as needed to make it correct (this will make it easy for me to differentiate your corrections from your original effort). If you think your solution was initially correct, mark it as such by writing the word "correct" with your green or purple pen next to the problem number. Submit these corrected problem solutions (on actual paper!) on Wednesday, putting them in the tray as you enter the classroom. See the last page for details about how I will grade your homework.

Note that you may need to extensively correct any given problem, so as you write up your initial efforts, **please leave plenty of space** on the same page for corrections as well. Your corrections should (if at all possible) go on the same physical page as your initial effort: this makes grading much easier.

Note also that you must submit a corrected homework set (even if you don't actually correct anything) to earn credit. Late submissions will not be accepted.

I will automatically drop your *seven* (7) lowest individual homework problem scores before computing your final homework grade (points earned/points possible). As noted previously, this is meant to give you flexibility to deal with normal illnesses, unexpected life events, school-related trips, flat tires, and so on, so I shouldn't need to hear excuses from you unless an emergency or significant illness keeps you out more than two class days in a row.

In addition to the required homework problems, you are strongly encouraged to attempt all the Conceptual Questions and as many of the odd-numbered Exercises as possible at the end of each chapter. The answers to the conceptual questions will be made available in Blackboard and the answers to the odd-numbered exercises are given at the end of the text.

Practice Test: A practice test (taken outside of class) will be given early in the semester (end of the 4th week). The practice test will be identical in style to the in-class tests. You will take the test during a two-hour period outside of class using only a calculator and an 8½ × 11 inch note sheet (one side only), as if it were an actual in-class test. You will then submit a scan of your work as a pdf file in Blackboard by 6:00 pm on Sunday 09/21 in the same manner as for homework. Solutions will become available at 7:00 pm that day; use them to correct your test as you would a homework assignment and submit the corrected test (on paper) when you arrive for class on Monday, placing it in the tray as you enter the classroom. Your score on this practice test will be (1/3) × (pre-correction score) + (2/3) × (post-correction score) to make the stakes relatively low.

In-Class Tests: Two in-class tests will be given during the semester as shown on the course calendar. The lower of the two in-class tests will be dropped. You can use a calculator and an 8½ × 11 inch note sheet (one side only) on these in-class tests, but no other aids.

Make-up tests will be given only in extreme circumstances. The first missed test will be the test dropped. A second missed test can be made up only if both missed tests were due to serious unavoidable medical issues that were both properly documented – see below.

Missing a test should only be for serious unavoidable medical issues and should not be for trivial reasons. You should notify the instructor **before** the missed test, if at all possible. In any case, you must notify the instructor of the reason for missing the test within 24 hours of the test date.

Failure to make this notification means making up the test will not be allowed under any circumstances. Proper documentation must be provided before a make-up test will be scheduled.

Final Exam: The final exam will be a comprehensive exam. It will be given during the scheduled final exam time as shown on the course calendar. As with the tests, you can use a calculator and an 8½ × 11 inch note sheet (one side only), but no other aids.

Tips for Doing Well

- Read "Preface to the Student" in the textbook. It's written for you!
- Students who have never had a high school physics course must be extra diligent in keeping up with the material. Lots of new concepts are introduced in each chapter. Keep up with the homework and readings to avoid getting overwhelmed.
- Attend classes and ask questions. If you have a question from a previous class, send me a quick email ahead of the next class and I will endeavor to respond, as time permits.
- Read ahead each day. Frame questions from your readings.

- Do the homework. Homework helps you internalize what you are learning and gives practice. Don't skimp! Students who try to get by without serious effort on the homework often fail the course.
- Time commitment. Learning physics is a time intensive process. Be sure to set aside enough time for both studying the textbook thoroughly and working homework. How much time you need will depend on your prior preparation. It's probably fair to say that most students underestimate the time commitment needed to excel.
- Study together. Explaining your thought process to others is a great way to clarify your thinking. You are encouraged to discuss homework problems with your peers. However, homework solutions should be your own. You will learn almost nothing by just copying what everyone else is doing.
- Meet individually with me. Don't hesitate to ask me for help. That's my job! To facilitate the most effective help, bring a list of questions you have and any attempted work with you when meeting with me.
- Online resources. There is a plethora of free online physics resources. Hyperphysics (http://hyperphysics.phy-astr.gsu.edu/) summarizes many course topics. Video tutorials can be viewed at Khan Academy (https://www.khanacademy.org/science/physics).

Student Code of Conduct Policy: Any successful learning experience requires mutual respect on the part of the student and the instructor. Neither instructor nor student should be subject to others' behavior that is rude, disruptive, intimidating, aggressive, or demeaning**.** Student conduct that disrupts the learning process or is deemed disrespectful or threatening shall not be tolerated and may lead to disciplinary action and/or removal from class.

Syllabus Statements: For information about Artificial Intelligence, Disabilities, Non-Discrimination, Intellectual Exchange, Title IX Pregnancy Accommodations, CARE (Campus Assessment, Response, and Evaluation) Team, Campus Concealed Carry, and COVID-19, please use this link: https://www.southplainscollege.edu/syllabusstatements/.

Note: The instructor reserves the right to modify the course syllabus and policies, as well as notify students of any changes, at any point during the semester.

Homework Grading Information

I will use the following rubric to evaluate your work on each homework problem solution:

I	C	
☐	☐	Problem-Solving Approach (MVSR/Clear/Coherent) (1½)
☐	☐	Physics Reasoning (Correct Principles/Correct Applications)
☐	☐	Good Notation (Symbolic Algebra/Units & Vectors)
☐	☐	Valid Math (Sufficient/Correct)
☐		Plausible (Correct Units/Magnitude/Sign)

x __ __ Fraction = TOTAL ☐

"I" column – marks for **I**nitial Effort
"C" column – marks for **C**orrected Effort

Each box is worth 1 point with the exception of the "Problem-Solving Approach" line, where each box is worth 1½ points. The "Fraction" on the last line represents the fraction of the problem you completed during each phase (no marks here means that the problem was complete both initially and after correction). Points for each column are multiplied by the fraction for that column, then column results are added and rounded to the nearest half-point for the total. Maximum score is 10 points.

Each box is marked as follows:

☐ = full credit
◪ = ½ point off
☒ = 1 point off
◯ = 1½ points off

1st Line – Problem-Solving Approach: Were the MVSR steps properly performed? This category is primarily about the presentation of your problem solution. You earn full credit in this category if your solution uses the MVSR steps to provide a sufficient, adequately clear, and coherent presentation of your reasoning. This is done using descriptive English, lists, labeled diagrams, sketches, and other appropriate elements of the MVSR process as illustrated by examples in the textbook as well as examples worked out in lecture. Please also note that only work that is both legible and reasonably easy to follow qualifies as "adequately clear." "Coherent" solutions flow logically and without self-contradiction.

2nd Line – Physics Reasoning: You will earn full credit in this category if your solution uses the correct physical principles and also applies those principles correctly (which includes making appropriate and clearly stated approximations when necessary). This category is about correctness, not necessarily clarity, but if your MVSR approach is so unclear that it's impossible to even guess what your physics reasoning is, you will lose points in both the Problem-Solving Approach and Physics Reasoning categories.

3rd Line – Good Notation: This category is to math what good grammar is to writing. Your solution will earn full credit in this category if (1) you do all your algebra with symbols (no algebra with numbers), (2) you include units with every numerical quantity that has them (in lists of "known values" and in your post-algebra calculations), and (3) you use correct vector notation.

Doing all your algebra symbolically is crucial for making your work clear and easy to follow (for both you and the grader). You may use simple unitless numbers (particularly integers and simple fractions, such as ½ in the expression for kinetic energy for example) in addition to symbols: what you should avoid is doing algebra with any quantities having units and/or unitless quantities that involve more than two or three digits. Hint: You are "doing algebra with numbers" if a symbol appears on the same side of an equation with such a number.

Unit tracking is very useful and highly recommended but including units with every numerical quantity having units is required. Correct vector notation is important: in particular, never (1) set a vector equal to a number, (2) divide by a vector, or (3) put the vector arrow symbol over a variable that is not actually representing a vector.

4th Line – Valid Math: You will earn full credit here if (1) you adequately display all of your steps, and (2) your math is correct.

5th Line – Plausible: Your solution will earn full credit here if your initial result (whether a number or formula) has a plausible sign and units and (if a number) a plausible magnitude **OR** you have written a short comment recognizing that your result is not plausible.

A corrected result should be plausible, but if an implausible result is not fixed, then the circle notation may be used to denote taking off an extra half-point.

You also may get points off if you made an error (or failed to catch an error) in a correction because of a bad habit such as (1) defining symbols poorly (for example, using the same symbol for different quantities), (2) doing algebra with numbers, (3) using bad vector notation, (4) not tracking units, or some similar problem.

Penalties: Initial efforts submitted after solutions are posted at 6 pm will earn zero points in the "I" column (though you may still submit a "correction"). Accidentally doing the wrong problem automatically earns 2 points of initial credit: write a version of the posted solution with your green or purple pen of the actual problem in your own words to earn up to 4½ more "correction" points. You may submit a similar "correction" for any problem you did not submit initially (to earn up to 4½ points).

Calendar

Phys 2425 Fall 2025

Week	Monday		Wednesday	
	Readings	Topics	Readings	Topics
1	08/25	Course Intro, SI Units, Significant Figures, Measurements and Uncertainty	08/27 **Ch1**	Concepts of Motion, MVSR Problem Solving Strategy
2	09/01	Labor Day – No Class	09/03 **Ch2**	Kinematics in 1 Dimension
3	09/08 **Ch3**	Vectors and Coordinate Systems	09/10 **Ch4:1-3**	Kinematics in 2 Dimensions – Projectile Motion
4	09/15 **Ch4:4-6**	Kinematics in 2 Dimensions – Uniform and Nonuniform Circular Motion	09/17 **Ch5**	Force and Motion – Newton's First and Second Laws **Practice Test Due 6:00 pm Sunday 09/21**
5	09/22 **Ch6**	Dynamics of Motion in a Straight Line	09/24 **Ch7**	Newton's Third Law; Dynamics of Interacting Objects
6	09/29 **Ch8**	Dynamics in Two Dimensions, Uniform and Nonuniform Circular Motion	10/01 **Ch9**	Work and Kinetic Energy; Dissipative Forces and Thermal Energy
7	10/06 **Ch10:1-3**	Interactions and Potential Energy	10/08 **Ch10:4-8**	Conservation of Energy; Force and Potential Energy
8	10/13 **Ch11**	Impulse and Momentum; Collisions and Explosions	10/15 **Ch12:1-4,9**	Rotational Energy and Moment of Inertia; Rolling Motion
9	10/20 **Ch12:5-8**	Vector Description of Rotational Motion; Torque and Rotational Dynamics	10/22	**Test 1**
10	10/27 **Ch12:10-12**	Angular Momentum and Torque; Conservation of Angular Momentum	10/29 **Ch13**	Newton's Theory of Gravity
11	11/03 **Ch15**	Oscillations	11/05 **Ch18**	Pressure, Temperature, Ideal Gas Law
12	11/10 **Ch19:1-4**	Work in Ideal Gas Processes, Thermal Interactions, First Law of Thermodynamics	11/12 **Ch19:5-8**	Thermal Properties of Matter, Heat Transfer Mechanisms
13	11/17 **Ch20:1-5**	Kinetic Theory of Gases	11/19	**Test 2**
14	11/24 **Ch20:6-9**	Entropy and Second Law of Thermodynamics	11/26	Thanksgiving – No Class
15	12/01 **Ch21**	Heat Engines and Refrigerators	12/03	Analyzing a Heat Engine Cycle
16	12/08	**Comprehensive Final Exam 1:00 – 3:00 pm**	12/10	

This schedule may be subject to change. Any necessary changes will be announced in class and through Blackboard.