**South Plains College**
**Common Course Syllabus: PHYS 2425**
**Revised 01/04/2021**

**Department:** Science

**Discipline:** Physics

**Course Number:** PHYS 2425

**Course Title:** Principles of Physics I

**Available Formats:** conventional

**Campuses:** Levelland

**Instructor:**
David Hobbs
Office: S118
Office Hours: MW 1:00 – 2:00 pm, TT 2:00 – 3:30 pm, F 8:00 – 11:00 am
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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:** *Matter & Interactions, 4th edition* by R. Chabay and B. Sherwood (John Wiley & Sons, 2015). The e-text through *Perusall.com* is required, paper copy is optional. Textbook errata are at http://matterandinteractions.org/errata/.

**Supplies:** Scientific Calculator

**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.
13. Solve problems involving the First and Second Laws of Thermodynamics.

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 the comprehensive final exam will assess how well students have met targeted student learning outcomes.

**Course Evaluation:** Student grades will be based on daily work (reading, homework, and lab assignments), six tests, and a comprehensive final exam. Final grades will be assigned based on overall, weighted average using the weighting scheme shown below:

| Task | Code | Weight |
|---|---|---|
| Daily Work | D | 10% |
| Tests | T | 60% |
| Final Exam | F | 30% |

Overall Average = 0.10*D + 0.60*T + 0.30*F

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 points of the break) will be decided based on class participation.

**Daily Work:** Daily work consists of reading assignments in your textbook and both in-class (lab) and outside-of-class (homework) practice with feedback. These activities are meant to be formative assessments and are graded primarily on participation rather than correctness. Their purpose is to help develop understanding of the concepts and principles and to prepare you for the tests.

**Tests:** Six 90-minute tests will be given during the semester as shown on the course calendar. Students are required to take all six tests; however, the lowest two test scores will be dropped. There will be no make-up tests given, so a test missed due to an excused absence will be one of the two dropped. A test missed because of an unexcused absence will receive a grade of zero and cannot be dropped. Absences on a test day must be approved before the class in order to be excused. On class days when a test is scheduled, the test will be given during the first 90 minutes of class, followed by a ten-minute break and then lecture for the remainder of the class time. All students will be required to hand in the test at the end of the 90-minute period without exception and the lecture portion of class will begin promptly 10 minutes later.

**Final Exam:** A comprehensive final exam will be given during the scheduled two-hour final exam time. See the course calendar for the day and time.

**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, your health and the health of your classmates is of highest priority. If you have any of the following symptoms: fever, cough, runny nose or nasal congestion with repeated sneezing, chills, muscle or body aches, fatigue, headache, shortness of breath or difficulty breathing, new loss of taste or smell, sore throat, diarrhea, nausea or vomiting please stay home and participate in class remotely. Missed work can be made up or in some cases excused entirely.

**Face Covering Policy:** It is the policy of South Plains College for the Spring 2021 semester that as a condition of on-campus enrollment, all students are required to engage in safe behaviors to avoid the spread of COVID-19 in the SPC community. Such behaviors specifically include the requirement that all students properly wear CDC-compliant face coverings while in SPC buildings including in classrooms, labs, hallways, and restrooms. Failure to comply with this policy may result in dismissal from the current class session. If the student refuses to leave the classroom or lab after being dismissed, the student may be referred to the Dean of Students on the Levelland campus or the Dean/Director of external centers for Student Code of Conduct Violation. Students who believe they have been exposed or may be COVID-19 positive, must contact Health Services, DeEtte Edens, BSN, RN at (806) 716-2376 or dedens@southplainscollege.edu.

**Plagiarism and Cheating:** Students are expected to do their own work on all projects, quizzes, assignments, examinations, and papers. Failure to comply with this policy will result in an F (grade of zero) for the assignment and can result in an F for the course if circumstances warrant.

Plagiarism violations include, but are not limited to, the following:

1. Turning in a paper that has been purchased, borrowed, or downloaded from another student, an online term paper site, or a mail order term paper mill;

2. Cutting and pasting together information from books, articles, other papers, or online sites without providing proper documentation;
3. Using direct quotations (three or more words) from a source without showing them to be direct quotations and citing them; or
4. Missing in-text citations.

Cheating violations include, but are not limited to, the following:

1. Obtaining an examination by stealing or collusion;
2. Discovering the content of an examination before it is given;
3. Using an unauthorized source of information (notes, textbook, text messaging, internet, apps) during an examination, quiz, or homework assignment;
4. Entering an office or building to obtain unfair advantage;
5. Taking an examination for another;
6. Altering grade records;
7. Copying another's work during an examination or on a homework assignment;
8. Rewriting another student's work in Peer Editing so that the writing is no longer the original student's;
9. Taking pictures of a test, test answers, or someone else's paper.

**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.

**Diversity Statement:** 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.

**Disability Statement:** 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.

**Nondiscrimination Policy:** 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.

**Title IX Pregnancy Accommodations Statement:** 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 the Director of Health and Wellness at 806-716-2362 or email cgilster@southplainscollege.edu for assistance.

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.

# Calendar

Phys 2425.001 Spring 2021

| Week | Tuesday | | Thursday | |
|---|---|---|---|---|
| | Readings | Topics | Readings | Topics |
| 1 | 01/19 | Course Introduction | 01/21<br>**1.1 – 1.5** | Newton's First Law; Vectors<br>VP Lab – VPython Introduction |
| 2 | 01/26<br>**1.6 – 1.11** | Position; Velocity; Position Update Equation; Momentum<br>VP Lab – While Loops | 01/28<br>**2.1 – 2.4** | Momentum Principle: Iterative Prediction of Motion when Net Force is Constant<br>VP Lab – Projectile Motion |
| 3 | 02/02<br>**2.5** | Momentum Principle: Analytical Prediction of Motion when Net Force is Constant<br>Lab – Uniformly Accelerated Cart on a Track | 02/04<br>**2.6 – 2.7** | Momentum Principle: Iterative Prediction of Motion when Net Force is Varying<br>**Test 1** |
| 4 | 02/09<br>**3.1 – 3.6** | Fundamental Interactions; Reciprocity; Predicting Motion of Gravitationally Interacting Objects<br>VP Lab – Satellite Orbital Motion | 02/11<br>**3.7 – 3.12** | Electric Force; Conservation of Momentum; Simple Collisions<br>VP Lab – Space Voyage from Earth to Moon |
| 5 | 02/16<br>**4.1 – 4.8** | Atomic Model of Contact Interactions: Tension Forces, Normal Forces, Frictional Forces<br>Lab – Measuring Spring Stiffness | 02/18<br>**4.9 – 4.14** | Speed of Sound in a Solid; Simple Harmonic Oscillator; Contact Forces in Fluids<br>**Test 2** |
| 6 | 02/23<br>**5.1 – 5.5** | Static Equilibrium; Dynamics of Interacting Objects<br>Lab – Mass/Spring Oscillator | 02/25<br>**5.6 – 5.10** | Applying the Momentum Principle to Curving Motion<br>VP Lab – Mass/Spring Oscillator |
| 7 | 03/02<br>**6.1 – 6.6** | The Energy Principle applied to a Single Particle<br>Lab – Work and Kinetic Energy | 03/04<br>**6.7 – 6.11** | The Energy Principle applied to Multiparticle Systems; Potential Energy; Energy Graphs<br>**Test 3** |
| 8 | 03/09<br>**6.12 – 6.15** | Mass of Multiparticle Systems; Binding Energy; Selecting Initial and Final States<br>VP Lab – Energy Graphs in VPython | 03/11<br>**7.1 – 7.3** | Elastic Potential Energy; Potential Energy of Interacting Neutral Atoms<br>Lab – Ball Toss |
| | 03/16 | Spring Break – No Class | 03/18 | Spring Break – No Class |
| 9 | 03/23<br>**7.4 – 7.9** | Internal Energy; Specific Heat; Microscopic Work (Heat Transfer); Energy Accounting<br>Lab – Measuring Specific Heat | 03/25<br>**7.10 – 7.12** | Energy Dissipation; Resonance<br>**Test 4** |
| 10 | 03/30<br>**8.1 – 8.3** | Energy Quantization – Electronic Energy Levels; Emission and Absorption Spectra<br>Lab – Measuring Heat of Fusion | 04/01<br>**8.4 – 8.7** | Vibrational and Rotational Energy Levels; Nuclear Energy Levels, Hadronic Energy Levels<br>Lab – Hydrogen and Helium Emission Spectra |
| 11 | 04/06<br>**9.1 – 9.2** | The Energy Principle Applied to Rotating Rigid Objects<br>Lab – The Great Ramp Race | 04/08<br>**9.3** | The Energy Principle applied to Deformable Objects<br>**Test 5** |
| 12 | 04/13<br>**10.1 – 10.6** | Collisions – Applying both Momentum and Energy Principles Together<br>Lab – Jumping Up | 04/15<br>**11.1 – 11.4** | Angular Momentum and Torque<br>VP Lab – Charged Particle Scattering |
| 13 | 04/20<br>**11.5 – 11.7** | The Angular Momentum Principle; Conservation of Angular Momentum<br>Lab – Conservation of Angular Momentum | 04/22<br>**11.8 – 11.9** | The Angular Momentum Principle; Cases with Nonzero Net Torque<br>Lab – Torque and Angular Momentum |
| 14 | 04/27<br>**11.12** | The Angular Momentum Principle applied to Gyroscopes<br>Lab – Gyroscopic Motion | 04/29<br>**12.1 – 12.2** | The Fundamental Assumption of Statistical Mechanics; Einstein Model of a Solid<br>**Test 6** |
| 15 | 05/04<br>**12.3 – 12.5** | Thermal Equilibrium, Entropy, and Temperature<br>VP Lab – Entropy and Temperature Calculations with VPython | 05/06<br>**12.6** | Predicting the Specific Heat of a Solid<br>VP Lab – Specific Heat Calculations with VPython |
| 16 | 05/11 | | 05/13 | **Final Exam – 8:00 to 10:00 am** |