

Principles of Physics I

Physics 1408-001 Winter / Spring 2023

Professor: Robert Duncan, Ph.D., *President's Distinguished Chair in Physics*
Time: Tuesday & Thursday (TR) 3:30 PM - 4:50 PM in Chemistry 107
Office Hours: Tuesday, 5:00 PM – 6:00 PM, in ESB-1, Room 153, or by appointment.
E-mail: Robert.Duncan@ttu.edu **PREFERRED CONTACT METHOD**

Texts: R. A. Serway and J. W. Jewett, Jr., Physics for Scientists and Engineers. You must buy the WebAssign website access to do the on-line homework, and an electronic version of this text is available at no additional charge on this website. I recommend that you utilize this online version of your textbook, but paper copies are available for purchase in the bookstores if you prefer. The Laboratory Manual is available in the University Bookstore during the first two weeks of the term. You must purchase your lab manual BEFORE you will be admitted to the first meeting of the lab. Note that the labs start on the week of January 30, 2023.

Course Coverage: The course will cover material from Chapters 1-15 in the text. We will cover kinematics, statics, dynamics, rotational kinematics and rotational dynamics, fluids, gravity, and periodic motion. This course emphasizes Newton's Laws, and their applications.

Course Delivery: This course will be taught in person in the Chemistry 107 lecture hall. Class attendance is mandatory, and class attendance and participation is 10% of your overall grade. Note that we use WebAssign as our web access to all course materials (not Blackboard) in this class. Online instruction options are not supported, except in highly unusual circumstances.

Grading Policy: The following scores will be accumulated during the semester; Labs, Homework, Interactive Video Vignettes (IVVs), Class Attendance / Participation, Exam 1, Exam 2, and the comprehensive Final. **NO MAKE-UP EXAMS WILL BE GIVEN.** These exams, including the final, are only 40% of the course grade. Most of your grade (60%) comes from the lab, IVVs, on-line homework, and class participation exercises, so it is very important to participate in all classes and labs to keep up with the course. I grade on a mathematically-defined curve, so the final grade distribution will be determined only at the end of the course, but your approximate grade will be displayed on your WebAssign account throughout the class. The curve works this way: the class average score will become the break point between a C+ and a B- at the end of the class, once all grades are in. Each standard deviation of the numeric grades will roughly correspond to a full letter grade. So, if the class average is 65%, and the standard deviation is 15% (a typical outcome from earlier semesters of this course), then the C+/B- break point would be 65%, the B+/A- break point would be 80%, the D+/C- break point would be 50%, an A+ would be above 95%, and a F would be below 35%, etc. I have assigned thousands of grades in my career, but I have never 'given' one. The only way to get a good grade in this course is to earn it. Each component of this course contributes as follows in the calculation of your final grade:

| | |
|-----------------------------------------|-----|
| Exam 1 (February 14 th) | 10% |
| Exam 2 (March 28 th) | 10% |
| Final Exam (May 5 th , 2023) | 20% |
| Lab | 20% |
| Interactive Video Vignettes (IVVs) | 15% |
| Homework | 15% |
| In-Class Participation | 10% |

Labs, Homework, and IVVs: The lab portion of the course has a separate syllabus that will be handed out in the lab. The Lab is an opportunity to learn the course material from a hands-on perspective. More details on the Labs will be provided by Dr. Keith West, who directs the Labs. The IVVs will be due each week before the Tuesday class. In combination with the textbook readings, the IVVs will help you become prepared for the Tuesday lectures, and to learn how to solve problems. Our Thursday class meetings will follow a ‘flipped classroom’ model, where we will focus on the problem solving that is necessary for you to complete your weekly homework exercises. Problem solving is essential to your understanding of the course material, and essential to your homework and exam grades. More importantly, your ability to creatively solve problems will make you awesome, and very valuable to your future employers as you advance in your career. Physics fits together in an interesting and beautiful way, and I think you will find it both fascinating and lucrative as you master physics. Notice that your Lab, IVV, Class Attendance / Participation, and Homework grades together are more important to your final grade than the exams. Be sure to take these components very seriously. You will do well on the exams if you do well on these other components of this class.

WebAssign: Homework problems, exams, and IVVs are assigned and graded through **Cengage’s** commercial web site called **WebAssign**. Once you are registered at that website, you will be able to access the assignments and IVVs. The assignments and the due dates are posted. You will be able to study the questions with the correct answers after the due date. The instructions on the website describe how the homework and IVVs are scored. This course requires WebAssign, and anyone who has not registered for WebAssign by the drop date will be asked to drop this class. WebAssign is available for purchase on its own, or through Cengage Unlimited, a subscription that gives you access to all your Cengage access codes and online textbooks for **\$124.99** (4 months), **\$189.99** per year or **\$249.99** for two years. No matter how many Cengage products you use, they are included in Cengage Unlimited, and the price stays the same. WebAssign includes a digital on-line version of the textbook at no extra charge. If you want a paper copy of the text, then you may elect for a textbook rental when you activate WebAssign through Cengage Unlimited for **\$8.99** + free shipping. You also have the option to purchase a loose-leaf version of your textbook, which you can keep. Most students may readily complete this course using just the electronic on-line version of the text, but the hardcopy versions are available from the **on-campus bookstore**, or as described above, if you prefer.

CHECK THIS WEBSITE FOR REGISTRATION AND PURCHASING INFORMATION. Your WebAssign course key will be listed below and you will also have a free WebAssign trial for the first two weeks of school in case you have lingering questions.

COURSE KEY – ttu 8628 4837

Need help?

1. Go to https://www.cengage.com/coursepages/StartStrong_StudentSupport to access online office hours and extensive support from Cengage.
2. Create a tech support ticket by going to support.cengage.com. Be sure to share a screenshot and as many details as possible.
3. Email lindsey.leslie@cengage.com with your case number from tech support and your professor's name (Robert Duncan).

You will need to **use your TTU email address to sign in to WebAssign**. You must self-register. **USE THE EXACT SAME NAME THAT YOU USED FOR YOUR TEXAS TECH REGISTRATION.** If you do not have an access code (purchased from the bookstore), you will need to purchase one through the WebAssign website. It is your responsibility to assure that you have an adequate internet connection to the WebAssign site to complete and submit your homework problems and IVVs on time. Start your assignments early to assure that unexpected internet outages don't cause you to miss a deadline. Similarly, the WebAssign site performance may vary with your browser/version. I recommend using the Google Chrome browser. A list of compatible browsers is provided on the web site.

The assigned homework problems will help you develop the conceptual understanding and problem-solving skills that will be tested on the exams. Doing well on the homework is **crucial** to your success in the course. ***The single best indicator of success in the course is your genuine, conceptual understanding of the homework.*** You simply must do the homework in order to do well in the course. Remember, while you may study together with others, you take the exams alone. If you do not understand something in the textbook, IVVs, lectures, or on the homework, then you owe it to yourself to ask about it in class, in the lab, or at an Office Hour.

The IVVs will be due before Tuesday's class on the posted dates, and no late submissions are accepted. We will cover the problem-solving techniques necessary to complete the Homework during the Thursday meetings of the class, and I recommend that you do the homework as, or right after, we cover it in class. If you do not understand the first few chapters, then that lack of understanding will limit you severely as the course advances, and as you take future physics and engineering classes. This course builds rapidly upon itself, so it is essential that you keep up. **On average, this course will require about 10 full hours of effort a week. Please be certain that you have the time and discipline to commit to this level of effort in this class.**

Exams: Two in-class exams will be given as scheduled, and **there are NO make-up exams**. All exams will be delivered in-person, not online. The exams test problem solving ability, so don't try to just memorize the equations, since once you genuinely understand the material, the equations and the math will come naturally. If you cannot solve the problems, then you really don't understand the course material. Grades will be available on WebAssign for each exam once they are graded, which usually occurs on the same day that each exam is given.

Final: The comprehensive final exam will be conducted in our classroom. The final is scheduled for Friday, May 5, 2023 from 10:30 AM to 1:00 PM in our lecture room: Chemistry 107. The final exam schedule is: https://www.depts.ttu.edu/officialpublications/class_schedule/final_exams.php and none of us can change it. **Please do not assume that the final exam (or any other exam) can be moved to accommodate your schedule, since that is a nearly certain way to fail.**

Sadly, from our prior experience, a few of students (usually less than 10%) will fail this course. Almost all of these failures are students who abandon all effort toward this class, and for some reason don't drop it. Please talk with me during office hours if you are having trouble, or if you are considering dropping this course. I really want to keep you in, and on-track to meet your career expectations! If you need a particular grade, then you must earn that grade. There is no other way.

Course Goal: The essential Learning Outcomes and Competency standards are listed below. Everyone who completes this course in good standing will have accomplished them to some degree. I want this course to be profoundly useful to you professionally. I want to introduce you to the wonderful way in which scientists and other objective professionals think. We strictly follow the Scientific Method. Through a reductionist approach, pioneered primarily by Isaac Newton, you will learn how to analyze and solve mechanical problems. Intricate phenomena that were once mysterious to you will become easy to understand. Keep up, ask when you are confused, and center your efforts on developing a genuine understanding, not simply on getting a grade to check off a requirement within your degree program. You will be amazed by how your understanding expands, and how hard problems will become easy for you to solve. In short, work hard, push yourself, experience the profound joy of rigorous scientific thought, and if you honestly seek help when you get confused, then I promise that you will quickly become genuinely **awesome!** This, more than anything else, is what I want you to achieve for yourself in this class.

Consider this: On October 9, 1903, the New York Times printed the following: ***“The flying machine which will really fly might be evolved by the combined and continuous efforts of mathematicians and mechanicians in from one million to ten million years.”*** Well, Orville Wright, on that exact same day, entered in his journal: **“We started assembly today.”** He was referring to the Wright Flyer, which would achieve human piloted, heavier-than-air flight only two months later. Two bicycle mechanics from Dayton changed the world! Consider further that only 67 years later human beings were walking on the moon, and they returned home safely. No ‘magic’ was involved in achieving these goals! The uninhibited, creative efforts of thousands of dedicated scientists, engineers, and other professionals working world-wide on this common grand-challenge made this possible. This resulted from the simple and direct application of the Scientific Method, over and over again. Please do not look at this class merely as a course requirement, but rather as a bold adventure that is essential to your personal intellectual development. Take this course and *really apply yourself*, and I promise that it will be transformative for you.

Other Sections of Physics 1408: We will stay in-step with the other sections of Physics 1408 throughout this semester. Your Lab section will include students who attend the other lecture classes, as well as your own. The labs operate separately from this lecture-centric course, and Dr. Keith West will provide you with an additional Syllabus for your laboratory section. Labs start during the week of January 30, 2023.

Learning Outcomes: Students will thoroughly understand the concepts and methods in Newtonian Mechanics calculus-based problems, both familiar and unfamiliar, in this area of physics.

Outcome assessment: The expected course outcomes will be assessed through online homework, lab exercises, class participation, and exams. The exams will provide a mixture of relatively familiar and unfamiliar problems, which will test the students' abilities to apply reasoning and math skills to obtain solutions.

Important Notes:

ADA: Any student who, because of a disabling condition, may require special arrangements to meet these course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide special accommodations to a student, such as additional time to complete exams, until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Religious Holidays: A student who intends to observe a religious holy day should make that intention known in writing to the instructor, preferably by email, prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be excused or allowed to take an examination or complete an assignment, within a reasonable time.

Academic Integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense, and renders the offenders liable to serious consequences, possibly suspension. For details, see TTU OP 39.12.

Core Competency Statement: Students graduating from Texas Tech University should be able to: explain some of the major concepts in the Natural Sciences and to demonstrate an understanding of scientific approaches to problem solving, including ethics.

| Learning Outcome | Assessment |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Describe the basis of the Scientific Method | Embedded questions within the in-class exams |
| Distinguish between a scientific theory and speculation | Embedded questions within the in-class exams |
| Quantitative understanding of energy and motion | Guided classroom discussions, lab exercises, homework, many questions in the in-class exams |

Tentative Class Schedule PHYS 1408 - 001 Spring 2023

| TUESDAY | THURSDAY | LAB (TENTATIVE SCHEDULE) |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------|
| | January 12th Intro, Scientific Method | No Lab |
| January 17th 1D Motion | January 19th 1D Motion | No Lab |
| January 24th 2D Motion / Vectors | January 26th 2D Motion / Vectors | No Lab |
| January 31st Newton's Laws | February 2nd Newton's Laws | Experimental Uncertainties |
| February 7th Applications of Newton's Laws | February 9th Application of Newton's Laws Exam 1 Review | Motion in 1D, Part 1 |
| February 14th Exam 1 | February 16th Exam 1 Solutions | Motion in 1D, Part 2 |
| February 21st Work and Energy | February 23rd Work and Energy | Motion in 2D |
| February 28th Conservation of Energy | March 2nd Conservation of Energy | Force, Mass, and Acceleration |
| March 7th Linear Momentum / Collisions | March 9th Collisions | Work and Energy |
| March 14th No Class – Spring Break | March 16th No Class – Spring Break | Spring Break |
| March 21st Rotation | March 23rd Rotation Exam 2 Review | Friction |
| March 28th Exam 2 | March 30th Exam 2 Solutions | Conservation of Linear Momentum |
| April 4th Angular Momentum | April 6th Angular Momentum | Statics and Torque |
| April 11th Statics and Elasticity | April 13th Statics and Elasticity | No Lab |
| April 18th Gravity | April 20th Gravity | Periodic Motion |
| April 25th Fluids | April 27th Oscillations / Periodic Motion | Standing Waves (Last lab of this semester) |

We will conduct a comprehensive review of this course on May 2nd (the last day of class).

The FINAL EXAM is on Friday, May 5, 2023 from 10:30 AM to 1:00 PM in our regular lecture room: Chemistry 107. No make-up exams are allowed. Please be certain not to miss this final exam!