This course is a key part of the foundation upon which the study of engineering is built. If you are in chemistry, or the geological, biological, or environmental sciences, physics provides you with critical insights into the physical world as well. The harder you work in this course, the easier all your future work in engineering and the richer your other science courses will be. While I will be challenging, pushing, and nagging you, I will also make every effort to help you achieve the goals we will be setting on the first day. You are going to learn physics conceptually AND mathematically. Your math skills will improve dramatically with the practice of applying mathematics to REAL physical phenomena that we will directly experience in lab and through demonstrations. You will find out – perhaps for the first time – exactly why a derivative and an integral are useful – very useful. You cannot learn physics by listening to me and watching me solve problems: you must actively wrestle with these ideas and make them your own. You must prepare for class by reading the book and completing pre-lecture activities BEFORE class. All the work will be worth it though: you are starting an intellectual adventure of the best kind!

**Instructor:** Dr. Eric Hagedorn; ehagedorn@utep.edu Office: PSCI 221B Phone: 7540 PSCI 314 Office Hours: MW 9:30 – 10:30 am, Th 3:00 pm - 4:00 pm and by appointment (email me).

**Structure:** Two 80-minute lectures weekly (PSCI 208, MW 9:00 am – 10:20) CRN 11419

1 LAB per week (time and location depends on your section)

1 recitation/discussion per week (time and location depends on your section).

**Textbook:** University Physics, Young and Freedman, 13th edition. It is not a problem if you use an earlier edition (12th or maybe even 11th). DO NOT BUY if bundled with Mastering Physics.

**Online Homework:** Sapling Learning Sapling Learning Online Homework (One-Term Access): ISBN 978-0-9833859-5-0. [http://www2.saplinglearning.com/](http://www2.saplinglearning.com/) If you purchase online from Sapling, the cost is $29.99 for the semester. If you must purchase through the bookstore, it is available there for about the same price.

**Laboratory:** Laboratory Exercises: Introductory Mechanics, by William G. Durrer. If you have taken lab before, be sure to have verifiable grade from your previous instructor.

**Quizzes:** Quizzes will be given during recitation. You can make up 1 quiz during the semester, but only if you do so before the next recitation.

**Exams:** Closed book. Will include both conceptual and problem solving type questions.
Grading: 15% Final Exam (cumulative with emphasis on most recent): Wed., May 15th from 1:00 – 3:45pm.
30% Exams: Three exams during the semester, lowest one dropped (15 % each).
15% Quizzes (lowest grade dropped)
15% Lab: where you experience physics in reality (if you fail lab, you will fail the course even if your total score is passing – so don’t plan on getting perfect tests and quizzes and blow off lab)
25% Homework: to be submitted online (or on paper when asked). This includes Sapling Learning AND Blackboard Assignments

Learning Goals
This semester you will be learning how to carefully describe HOW objects move and explain WHY objects move the way they do. You will be doing this in terms of words (carefully defined terminology), quantitative variables, tabulated measurement, and graphs of measurements. The list following provides details about what physical phenomena you will be studying and the mathematics involved. It is very important that you not only learn the terminology and understand the concepts, but that you learn how to solve mathematical word problems describing specific examples of these phenomena. I will provide you with carefully developed problem solving strategies, guidance, and plenty of practice.

1. You will describe how objects move (kinematics), which requires carefully understanding:
   a. a reference frame and coordinate system
   b. how you define position (where something is)
   c. how you define displacement (going from one place to another)
   d. average and instantaneous speed (how fast something is moving)
   e. average and instantaneous velocity (how fast something is moving AND its direction)
   f. average and instantaneous acceleration (the rate of change of velocity: speeding up, slowing down and/or turning)

2. Mathematically, this entails:
   a. using an xy (and later xyz) coordinate system
   b. defining vectors and adding and subtracting them
   c. understanding the hypotenuse of a right triangle
   d. understanding the sine, cosine, and tangent as applied to a right triangle
   e. understanding the inverse tangent as applied to a right triangle
   f. manipulating algebraic expressions (using letter variables to represent physical quantities)
   g. calculating slopes and rates of change
   h. taking the first derivative of a function
   i. integrating a function (anti-differentiating)

3. You will describe how objects move when undergoing constant acceleration, which can be completely described (position and velocity) by four equations affectionately referred to as the “Big 4.”

4. You will describe why objects move (dynamics) in terms of forces and acceleration using:
   a. Newton’s first law (inertia)
   b. Newton’s second law (net force causes acceleration)
c. Newton’s third law (forces are interactions between at least two objects – when one object exerts a force on another, the other object exerts the same force back)
d. Free body diagrams (a useful way to)

5. You will describe why objects move (in terms of work, kinetic & potential energies) using:
   a. Work-Kinetic Energy Theorem: work changes an object’s kinetic energy
   b. Work done by varying forces
   c. Conservative forces (such as gravity or springs)
   d. Conservation of Mechanical Energy (kinetic AND potential energy)
   e. Work and potential energy and force from potential energy

6. Mathematically, calculating the work done by a varying force entails
   a. integrating (definite & indefinite)

7. You will describe why objects move (in terms of momentum), which specifically entails understanding that:
   a. In collisions momentum is conserved
   b. In elastic collisions momentum and kinetic energy are conserved
   c. In inelastic collisions, only momentum is conserved

8. You will describe circular motion (kinematics)
   a. is similar to linear kinematics (displacement, velocity, acceleration) each linear quantity has a counterpart in angular kinematics
   b. in terms of angular displacement (radians)
   c. in terms of angular velocity (radians per second)
   d. in terms of angular acceleration (radians per second squared)
   e. with constant angular acceleration is very similar to doing so with constant linear acceleration: the “Big 3” equations have angular counterparts

9. Mathematically, describing circular motion requires an understanding of the relationships between angles (in radians), radii, and arc lengths.
   a. You should be able to work with angular displacements in degrees, radians, and revolutions

10. You will describe why objects rotate (dynamics) in terms of torques and angular acceleration using:
    a. Rotational inertia (moment of inertia)
    b. Newton’s second law for rotation (net torque causes rotational acceleration)

Classroom Policies
- Cell phones are wonderful, but please do not plan on using them during class time, unless it is an emergency (feel free to step out).
- Punctuality – coming to class on time – is expected. This is part of the professional behavior you will need to demonstrate if you wish to be successful in your field.
- Missed classes – if you are sick, or have transportation troubles, or a family emergency, please make use of the Blackboard, Sapling, and your classmates to find out what you missed. You are responsible for what you have missed.

Missed Exam
Make up exams will only be considered if you have a signed letter from your medical doctor or other appropriate authority. These letters must be verifiable. Contact information must be provided and when the appropriate individual is contacted, they will need to be able to
corroborate the absence. If the letter cannot be verified, the case will be turned over to the Dean of Students as being suspected of Academic Dishonesty.

**Students with Disabilities**

If you have a disability (physical or psychological) and require reasonable accommodations to enable you to participate in this course (such as note takers, readers, or extended time on exams and assignments) please contact your lecture instructor as soon as possible and provide the appropriate documentation from Disabled Student Services (747-5148 or dss@utep.edu). Without this documentation, no accommodations will be made. Please take care of this before the first exam.

**UTEP Policies on Academic Dishonesty**

If an instructor suspects a student of cheating, he/she is to collect evidence that he/she believes indicates this (e.g. exams, student work, etc). This evidence is then turned over to the Assistant Dean of Students (ADS). The student will receive an incomplete on whatever piece of work is under consideration. No other actions will be taken by the instructor until the case is closed: no discussion, no accusation, and no different treatment. The student is encouraged to continue participating in the class. The ADS will consider the evidence provided her and then contact the accused student (and possibly peers) and investigate the allegations. The ADS will then make a decision as to whether cheating occurred and determine what the consequences will be. The instructor will be consulted by the ADS as to whether the results of the investigation are acceptable to him/her. If acceptable, the instructor will simply carry out the consequences sent to both the student in question and the instructor in a formal letter from the Dean of Students. While the seriousness of the identified dishonest actions determines the nature of the consequences, possible consequences include: a counted “zero” on the piece of work, a letter grade reduction, or being placed on academic probation. Students have the right to appeal a decision and participate in a formal public hearing.

**Online Homework**

Sapling Learning screens

When you click on “US Higher Ed” you will proceed to this screen:
The first time, click on “Create an Account.”

Your “Username” should be your UTEP email username. “Institution” is “University of Texas at El Paso” and will be in the Institution drop down menu, but you need to wait patiently for it to sort and populate.

If you have a credit card, the online cost for one semester is $29.99.

Do not buy this for an entire year, as there is no guarantee the PHYS 2421 instructor will use Sapling.

### Calendar till First Exam

<table>
<thead>
<tr>
<th>Tuesday</th>
<th>Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27/2013 Physical measurements/units/conversions (book sections 1.3, 1.4 and 1.5) For next class, read Ch 2, sections 1 and 2 (displacement, velocity)</td>
<td>8/29/2013 Displacement, average &amp; instantaneous velocity For next class, read Ch 2, section 3 (acceleration)</td>
</tr>
<tr>
<td>9/3/2013 Average and instantaneous acceleration For next class read Ch 2, section 4 and 5 HW 3</td>
<td>9/5/2013 Motion with constant acceleration/Free fall For next class read Ch 1, sections 7,8 and 9 (vectors) HW 4</td>
</tr>
<tr>
<td>9/10/2013 Vectors &amp; scalars For next class read Ch 3, sections 2 and 3 HW 5</td>
<td>9/12/2013 Projectile motion</td>
</tr>
<tr>
<td>9/17/2013 Projectile Motion and exam review</td>
<td>9/19/2013 First Exam</td>
</tr>
</tbody>
</table>