# Physics 221 General Physics I

## Spring 2007 Syllabus

| Instructor | Office | Phone | Email |
|---|---|---|---|
| Alton, Drew | GSC 202 | 274-4924 | alton@augie.edu |

**Text:** Randell D. Knight, *Physics for Scientists and Engineers with Modern Physics*, Pearson/Addison Wesley, 2004

**Lectures:** MWF, 1:00-1:50 PM, GSC 201

**Office Hours:** Scheduled office hours are W 9-11 and MW 2-4. Other times are available by appointment. My schedule is posted on the door of my office, please note that large portions of Thursday are occupied with labs. Email is the most reliable method of contact if you need to find me and I'm not in my office.

**Objective:** Welcome to General Physics I. Physics studies the interaction of matter and energy via the four fundamental forces, and therefore is the foundation for all studies of nature. This semester we will begin to figure out how the physical world works. Most of the semester will be concerned with mechanics (the study of motion) and later, thermodynamics. We will focus on developing a conceptual understanding of physical principles that enables a student to solve real problems.

**Learning Outcomes:** Students should become familiar with basic concepts of mechanics, waves, and thermodynamics and display the ability to use these concepts to solve physical problems. In addition, students should be proficient with basic laboratory and data acquisition equipment, and be able to practice systematic scientific inquiry.

**Class Structure:** Recent educational research[1] has shown students learn physics better when actively involved in the class rather than listening passively and taking notes. This semester will we encourage this by using a technique called "peer instruction". The idea is simple: A few times per class, I will ask a conceptual multiple choice question. You get a few minutes to think about it. If the balance of the class gets the question right, we will move on. If not, then you will be given a few minutes to talk with your neighbors and discuss the problem, trying to reach some agreement. I hope you will find this a rewarding, interesting, and most importantly, effective way to learn physics.

**Reading:** This sort of class structure places large responsibilities on the student. I will be spending less time lecturing about concepts and doing example problems in order to have time to work with the concepts in class. Therefore, you will need to have some knowledge of the concepts before you come to class. The best way to do this is to read the relevant material from the textbook and be familiar with the basic ideas prior to class. To encourage this, a small but significant portion of your homework grade (see below) will be based on simple questions ("warm-ups") from on the reading material. These "warm-up" exercises are to be completed before class.

The biggest tip for success in this class is also one of the simplest. **Read the assigned text before coming to class**. Reading is very important because I will ***assume*** that you have read the text before coming to class, and class time will not be spent repeating the main points of the text. Rather, examples will be worked and discussed, problem solving strategies developed, and concepts tested. Come to class ready and expecting to be actively involved. If you fall behind on the reading, class time will be unrewarding.

**Homework:** There will be four types of 'homework' in this class: warm ups, in class, weekly online, and weekly worksheets. The multiple choice questions mentioned in the "peer instruction" described above will form the "in class" portion of the homework. This is expected to be a small portion of your homework grade. Research has found that requiring students to follow a specific problem-solving strategy helps them become more sophisticated problem solvers. The "weekly worksheet" assignments will be one or two problems where you are required to follow this pattern. "Warm-ups", discussed above, are primarily designed to test your knowledge of the reading

[1] For a recent review of the subject and an extensive collection of references, see B.A. Thacker, Rep. Prog. Phys. **66**, 1833 (2003).

material for a particular class session. The "Weekly Online" will consist of more challenging problems. Both types of homework will be completed using MasteringPhysics (www.masteringphysics.com). The MasteringPhysics system is a web-based method of submitting homework results. The MasteringPhysics system will strictly enforce homework deadlines so you are encouraged to complete the assignment at least 30 minutes before the deadline so that last minute difficulties with a network connection do not keep you from receiving credit on the assignment.

Each student will need to register at the MasteringPhysics website. First, go to the bookstore and get a student access kit. Then go to www.masteringphysics.com and select the option that corresponds to your textbook. To register, you need (1) a valid email, (2) a course ID, (3) a student ID, and (4) a student access code. The email may be your ole account, or it may be another account you use more often. I will email this account with information from time to time, so you should check it on a regular basis. The course ID is **AUGIEPHYS221** (all caps). Be careful entering this field, it puts you in the right class and cannot be changed. The student ID is your Augustana ID number. Finally, the student access code is the six-"word" printed code supplied beneath the pull-tab inside your MasteringPhysics Student Access Kit. It is valid for registering one student. **Once you are registered, your code is valid for two years.** You won't need to buy another student access code next fall. But you might want to keep the code available.

Alternatively, the whole process may be done by going to www.masteringphysics.com , picking the correct text, and clicking on "Buy Now" and following the instructions. You will still need the information given above, this just lets you buy the student access code online instead of at the bookstore.

MasteringPhysics is quite powerful. The tutorial problems follow a Socratic system and each problem has been researched to be as effective as possible. The system guides students through the solution of multi-step problems, removing roadblocks with wrong-answer-based feedback and on-demand hints. It includes multi-step problems that incorporate a wide variety of answer types, including symbolic math, fill-in-the-blank, numerical, and multiple-choice. The system encourages students to work through problems, moving incrementally toward a procedural understanding of problem types. There are three main problem types.

- Skill Builders (SB): These offer detailed worked examples with multiple hint-giving options that focus on improving conceptual understanding or developing key skills. Hints and feedback on these problems have been developed from detailed educational research of students solving these problems and are ranked according to the most common difficulties at each step.
- Self-Tutoring Problems (STP): These are "standard" homework problems that provide similar individualized help as a result of an incorrect answer or when requested. Including hints and simpler sub-problems, Self-Tutoring Problems help bridge the gap between worked examples and textbook end-of-chapter questions. They develop the student's ability to solve more complex multi-step problems and motivate them in this process with immediate feedback and grading. They also give students an accurate measure of how well they understand the material and where they need to study further.
- End of chapter problems (EOC): These do not have hints or tutoring elements.

The program has its quirks, however, and I encourage you to read through the introduction and FAQ list after you register. I will sometimes give homework for you to do in order to prepare for class. This is called a warm up, and will often be of the SB problem type. I may also ask a short answer or essay question and discuss some of your answers in class.

As a general rule, you should work the homework problems on paper as well as entering your final answers into the computer. I encourage you to try solving these in the worksheet style, especially in the beginning of the class and when you encounter problems that you have trouble with. These practices will allow you to review the problems before exams.

You are encouraged to work together and discuss homework with your colleagues. Science is a collaborative process, and you can learn a great deal from each other. All students, however, are required to enter their own answers into MasteringPhysics, and turn in their own written solutions when required. If you work with

other students or a tutor (or me) on the homework, please indicate on the paper. Proper attribution is also a part of proper professional conduct in the sciences.

**Labs:** Held in GSC 211 unless otherwise noted. Labs will meet as indicated. Labs will meet weekly, unless otherwise indicated during the semester. The diagnostic test scheduled for March 15 is an important part of the Physics Department assessment program. While the results of this diagnostic test will not be graded (bonus points may be available), you are required to take this exam to pass the laboratory part of the course.

| Section | Day | Time | Assistant |
|---|---|---|---|
| A | Thursday | 10:40 AM-12:30 PM | Jenn Francis |
| B | Thursday | 1:00-2:50 PM | Nate Jastram |
| C | Thursday | 3:00-4:50 PM | Jenn Francis |

**Exams:** I am tentatively planning to have three hour long exams during the semester. The exams will be closed book; however, a formula sheet will be provided. Calculators are permitted. Correct understanding of physical concepts will be emphasized on the exams. Rote memorization is not a good learning strategy for this course, and students that employ this technique are frequently disappointed with their exam scores. More details on the exams will be given as the exam dates approach.

**Final Exam:** The final exam is scheduled for Friday, May 14, at 8:00 AM. This exam will cover material from the entire semester.

**Grading:** Assuming four exams during the semester, grades will be weighted as follows:

| | |
|---|---|
| Semester Exams | 3 x 15% = 45% |
| Final Exam | 25% |
| Homework | 15% |
| Labs | 15% |

Semester Grades will be assigned on a fixed scale, so there is no need to feel like you are competing against each other. If the class average is particularly low I reserve the right to adjust grades to be higher than the scale given below, but I will not adjust your grade to be lower.

| Grade | Percentage | Grade | Percentage | Grade | Percentage | Grade | Percentage |
|---|---|---|---|---|---|---|---|
| A+ | 100-96 | B+ | 89-87 | C+ | 79-77 | D+ | 69-67 |
| A | 95-92 | B | 86-82 | C | 76-72 | D | 66-62 |
| A- | 91-90 | B- | 81-80 | C- | 71-70 | D- | 61-00 |

**Tutors:** Tutors will be available Sunday-Thursday nights in GSC 210. Please take advantage of them. They have all been through this class and many other advanced courses, and should be a significant resource for you. If they are not used on a regular basis, it is unlikely they will be funded at this level in the fall. The exact time for each tutoring session will be announced and posted around the department.

**Exceptions to Deadlines:** The will be no exceptions to deadlines on homework or labs for planned absences due to extracurricular activities. The assignments or labs should be completed prior to the absence. Please contact me before a planned absence so that arrangements can be made. If no arrangements are made and an assignment or exam is missed, a grade of 0 will be recorded. Deadlines will be extended in extreme cases, such as serious illness or a family emergency. Please notify me as soon as possible in such circumstances. A last minute computer crash or network outage does not meet the definition of an "extreme case", and a deadline will not be extended in this case.

**Academic Honesty:** Collaborative work on homework in this class is encouraged. Working with one another on problem sets enhances learning for all involved. If you do work together, you are required to note who you worked with on your paper. Each student is required to turn in separate homework results. Exceptions to this policy (*e.g.* a group project in which work will be turned in as a group, or a take-home portion of a test on which you are

forbidden to collaborate) will be clearly noted by the instructor during class. You are also required to cite any outside sources you use for problems sets or work of any kind, including, for example, a student solution manual or a solution to a problem found on the web. Failure to cite an outside source [1] that contributed to your understanding of the problem is plagiarism. Plagiarism (as defined in the College Catalog) or cheating on exams are serious offenses and will be dealt with harshly. If you are caught cheating or plagiarizing in any form, you will receive a failing grade for the course and be reported to the college for appropriate disciplinary action.

Attempting to abuse, misuse, or otherwise violate the integrity of the MasteringPhysics site is a violation of academic honesty and will result in at least failure of that assignment and probably the entire course. In addition, it may be a violation of state and federal laws that could result in prosecution. In passing, I note that MasteringPhysics has a number of built in checks to catch most of the standard methods (sacrificial lamb, phantom student, etc) to cheat on online homework. It is probably easier to actually do the homework than to figure out how to beat the system.

**Disabilities and Special Needs:** Augustana College strives to assure there is accessibility to activities and programs for students with disabilities. Any students with disabilities who need reasonable accommodation in this course are encouraged to speak with the instructor as soon as possible. It is the students responsibility to inform the Susan Bies in the Disabilities Office (MC 140, Phone: 274-5503) of special needs.

**Final Words:** Please come and see me about any questions or concerns you have. Sooner is almost always better than later.

[1] An outside source is defined, for the purposes of this course, as any material except the textbook and notes taken by the student about what I say or write during class.

## Tentative Schedule for Physics 221 – General Physics I

| Date | | Topic | Text Section | Lab |
|---|---|---|---|---|
| Feb | 5 | Introduction/Diagnostic Test | -- | |
| | 7 | 1-D Motion – Position and Velocity | 1.1-1.4 | Motion & Graphing I (Feb 8) |
| | 9 | 1-D Motion – Acceleration and Kinematics | 1.5-2.2 | |
| | 12 | Kinematics | 2.3-2.8 | |
| | 14 | Vectors | 3 | Motion & Graphing II (Feb 15) |
| | 16 | Forces I | 4.1-4.5 | |
| | 19 | Forces II | 4.5-4.7 | |
| | 21 | Forces and 1D Motion | 5.1-5.3 | Newton's Second Law (Feb 22) |
| | 23 | Frication and Drag in 1D | 5.4-5.6 | |
| | 26 | **Exam I** | **1-5** | |
| | 28 | 2-D Motion: | 6.1-6.2 | Motion in Sports (Mar 1) |
| March | 2 | Projectile Motion | 6.3 | |
| | 5 | Uniform Circular Motion | 7 | |
| | 7 | Newton's Third Law | 8.1-8.2 | Friction (Mar 8) |
| | 9 | **Peace Prize Forum no class** | | |
| | 12 | Net Forces as a Vector Sum | 8.3-8.5 | |
| | 14 | **Exam II** | **6-8** | Diagnostic Test (Mar 15) |
| | 16 | Momentum and Impulse | 9.1-9.2 | |
| | | **Spring Break** | | |
| | 26 | Conservation of Momentum | 9.3-9.4 | |
| | 28 | Angular Momentum | 9.6-9.7 | Collisions & Conservation of Momentum (Mar 29) |
| | 30 | Potential Energy | 10.1-10.3 | |
| April | 2 | Conservation of Energy | 10.4-10.7 | |
| | 4 | Work and Kinetic Energy | 11.1-11.3 | Energy in Springs (Apr 5) |
| | | **Easter Break** | | |
| | 11 | Force & Displacement & Net Work | 11.4-11.8 | Planetary Motion (Apr 12) |
| | 13 | Gravitation | 12 | |
| | 16 | Translation and Rotation | 13.1-13.3 | |
| | 18 | Rotational Inertia and Torque | 13.3-13.10 | SHM & Oscillations (Apr 19) |
| | 20 | Oscillations I | 14.1-14.3 | |
| | 23 | Oscillations II | 14.4-14.8 | |
| | 25 | **Exam III** | **9-14** | TBA (Apr 26) |
| | 27 | Static Fluids and Pressure | 15.1-15.2 | |
| | 30 | Macroscopic Matter | 16 | |
| May | 2 | The First Law of Thermodynamics | 17 | Projectile Motion (May 3) |
| | 4 | Macro/Micro connections | 18.1-18.5 | |
| | 7 | Irreversible Processes | 18.6-19 | |
| | 9 | Waves I | 20.1-20.3 | Projectile Motion Rain Date (10) |
| | 11 | Waves II | 20.5-20.7 | |
| | 14 | **Final Exam (8:00 AM)** | **Comprehensive** | |
| | | | | |