Syllabus for Physics 0110: Introduction to Physics I
University of Pittsburgh, Fall 2009

Schedule and Instructors. This section of Introduction to Physics I will meet Tuesday and Thursday, 2:30 PM to 3:45 PM, Alumni Hall 343. The instructor is Professor Arthur Kosowsky, Department of Physics and Astronomy. My office is Allen Hall 405. My campus phone is 624-9571, but email is the most efficient way to get in touch: please direct all class-related email to kosowsky0110@gmail.com. I will hold regular office hours on Mondays from 1 to 2 PM and Fridays from 10 to 11 AM. The class will have two teaching assistants: Kevin Sapp, kcs34@pitt.edu and Jen-Feng Hsu, jeh114@pitt.edu. You must be signed up for one recitation section connected to the class. These meet at various times and will be run by one of the two teaching assistants.

Overview. Physics is the fundamental basis for all of science. Observations of planetary motions on the sky during the 16th century led directly to an understanding of the simple laws governing motion of the planets, and the realization that these same laws applied universally. This chain of observation and reasoning during the 17th century culminated with Isaac Newton's formulation of the basic laws of force and motion, which we still use today and will learn in this class. Since then, our knowledge of the basic constituents of the world, the forces between them, and their resulting motions (which we now call "physics") has expanded immensely, but still rest on these universal ideas. Physics formed the first topic for modern science, and helped spark an intellectual revolution which changed the way that people viewed the world.

Physics is one of the most elegant branches of science because of its fundamental simplicity. The details of physics can seem dauntingly complicated, because we express physical concepts and how they relate to each other with mathematics, and the mathematics can be difficult. But all of physics rests on a small number basic concepts which we will learn in this class: uniform motion, forces, conservation of momentum, conservation of energy, conservation of angular momentum. This class will attempt to emphasize this big-picture conceptual unity of physics, even as we work out the particular details.

Our ability to understand physics formed the basis for the industrial revolution and the rise of our modern technological society. Basic physical principles underlie many aspects of modern life: automobiles, airplanes, computers, phones, television, power generation and transmission all operate according to physics. Remarkable devices like GPS receivers and laser scanners are novel applications of physics. Many advances in medical technology have a large physics component, particularly imaging devices like X-rays, CAT scans, and PET scans, and, most recently, genetic sequencing machines. The cells of our body and our biochemical machinery operate according to physical principles; the application of physics to biology is a relatively young and rich field of current research.

This class will cover the most basic principles of physics, and their application to simple systems. At times, the examples considered in class and in the assignments may seem artificial, but it is a small step from understanding these to understanding more realistic situations. Aside from learning physics, you will also learn logical thinking, problem solving techniques, and mathematical reasoning. It is no accident that people with physics training are in demand for jobs ranging from engineering to finance to medical research to business management: physics provides valuable skills for any job which requires logical and quantitative thinking.

Textbook. The textbook for the course is *Physics* by Cutnell and Johnson, 8th edition, Wiley Publishing. This course will cover the first 14 chapters of the book; Physics 0111 covers the second half of the book. If you plan on taking both classes, you can purchase the entire book. If you plan on taking only one semester, or if you find thinner books easier to manage, the book comes in two separate volumes; get volume 1 for this class. Copies of the textbook will be available on reserve at the Benedum Engineering Library. The book is expensive; if you would prefer to get a cheaper used version of the 7th edition, that should be fine.

The class has a Blackboard site set up where course grades and materials will be posted:

http://courseweb.pitt.edu

This syllabus is available on the Blackboard site. Assignments will be made through the Pitt LON-CAPA site:

http://nplq1.phyast.pitt.edu

You will log in with your Pitt userid; your initial password will be set to your PeopleSoft number, but you can change this once you log in. For LON-CAPA instructions and help, go to

http://fafnir.phyast.pitt.edu/LON/loncapa.msu.edu/student/getting_started.html

If you have purchased the 8th edition textbook, you have also purchased access to the WileyPlus site, which has lots of supplementary material that you can use to study if you desire. To register, go to

http://edugen.wiley.com/edugen/class/cls132819/

The instructor name Kosowsky should come up. This site includes the entire textbook in electronic format, if you would like to have a copy on your own computer. The textbook content is located under the heading Read, Study & Practice. (Note that the book may be broken up into a very large number of individual files; it is possible but inconvenient to download all of the material onto your own computer. If you want to do this, use a downloader application.)

Prerequisites You are expected to be comfortable with basic high-school level mathematics, including algebra, geometry, and trigonometry. In particular, you should be able to solve simple algebraic equations and systems of two linear equations in two variables; make and interpret a graph of a function; add and subtract vectors; determine the components of a vector; solve for angles or sides of a right triangle; and be comfortable using exponents, logarithms, and scientific notation. If any of these skills sounds unfamiliar or daunting, look at the mathematical appendices in the textbook for a brief review. More detailed help is available from any textbooks on algebra, geometry, and trigonometry, available in the library.

Class Goals. The main goals of this class are: (1) Understand basic principles of physics; (2) Learn how to apply these principles to simple situations in the real world; (3) Develop the ability to formulate and solve problems using these basic principles; (4) Improve your logical thinking and quantitative skills.

Class Etiquette. No cell phones allowed in class – please turn them off and put them away before class starts. Asking questions about class material is strongly encouraged. If you don't understand, it is likely that many other people also do not understand: no question about the material is a "dumb" question. Please do not talk to your neighbors unless it is directly about the class material – and in that case it is probably better to raise your hand and ask a question. Several times each class, a general question will be asked for group discussion; at this point please DO talk to people seated near you.

Recitation. You must attend one of the weekly recitation sections connected to the class. Recitation will be led by a teaching assistant, who will answer questions, explain course material, work example problems, discuss problem-solving strategies, collect written homework solutions, and give a graded in-class quiz. Recitation quizzes and written homework are together worth 10% of your final class grade.

Homework, Tests and Grades. Two assignments per week will be given through the WileyPlus web site. Answers must be entered on-line by the given deadline, and written solutions must be turned in during recitation. You are encouraged to discuss homework problems with fellow students! Even better, form a regular study group with other people in the class. Collaborative learning has been proven to be much more effective for most physics students than learning in isolation. But do your own work to figure out and and enter your own solutions to the assignments. We have no way of knowing whether you are simply copying answers to someone else's homework, but if you do, you will surely do poorly on the exams, which count for the bulk of your class grade.

Doing homework problems is central to learning physics. Even if your instructor is brilliantly clear and inspirationally lucid, you still don't really know physics until you can take that knowledge and apply it to solving real-world quantitative problems. Sometimes you discover that you don't understand something as well or as deeply as you thought. In doing class assignments, (1) Attempt to solve all of the assigned problems. (2) Enter your solutions into LON-CAPA. You will be told whether your answers are correct or incorrect. (3) Attempt to understand possible errors in the incorrect answers. (4) Re-enter your corrected answers. You get five total attempts to enter a correct answer. (5) Write out clearly your final solution to each problem. These written solutions must be turned in at recitation. Selected problems will be graded by hand. Homework solutions will be posted on the Blackboard web site within one week of their due date.

The class will have three midterm exams and one cumulative final exam. Each exam must be done without consultation with any other students, and without any unapproved sources of information, including books, notes, or electronic media. Simple or graphing calculators are allowed, but no algebraic calculators,

cell phones, palmtop computers, or any device capable of connecting to the internet are allowed (even if this is your regular calculator). A small number of calculators will be available to borrow during exams. You will be allowed one 3-inch by 5-inch handwritten note card with any notes you can fit on it for each midterm exam, and four handwritten note cards for the final exam. The lowest of the three exam grades will not count in the final course grade. If you will miss an exam for a school-related function, make arrangements for scheduling a makeup exam at the earliest possible date. Makeup exams will not be given without a valid excuse, and will not be given without arrangements prior to the exam date.

Your class grade will be based on the total number of points you earn. Your best two out of three midterm exam grades are worth 200 points each, the final exam 300 points, homework solutions entered into LON-CAPA 200 points (10 points each), written assignments turned in at recitation 50 points (2.5 points each) and quizzes 50 points (6 points each for 9 quiz grades, two lowest of 11 total quizzes dropped).

900 total points out of 1000 guarantees a grade of A for the course; 800 points guarantees at least a B, 700 points guarantees at least a C, and 600 points guarantees at least a D. Normally, for this class between 40% and 50% of students will receive an A or a B as a final grade.

You can earn additional points by doing a weekly lab activity at the Physics Exploration Center (see below) throughout the semester starting with the second week. Each assignment, if completed completely and correctly, will be worth 3 points (33 total points possible). Fill out the lab report sheet and turn in at your next recitation section. Attendance at lectures will be taken via the Peer Instruction clickers; attendance at each lecture is worth 1 point (24 total points possible).

Class Resources. Physics is a challenging subject for most students. You are learning not only critical problem-solving and logical reasoning skills, but applying them to concepts that are sometimes abstract, plus using mathematics to quantify and express your reasoning. If you do not have a solid previous background in math and science (or sometimes even if you do), this is a lot to stay on top of. Several academic resources are available to help you with the class.

You are encouraged to take advantage of our **Physics Exploration Center**, located in 311/312 Thaw Hall. This room is generally open and staffed by a physics teaching assistant from 9 AM to 4 PM Monday through Friday. The PEC is a learning center where selected lecture demonstrations have been modified and turned into small experiments for you to explore on your own. One per week will be available. Concrete experiences provided by the hands-on activities are very important for conceptual understanding of physical phenomena. The exploration problems are optional but will count for extra credit if high-quality reports are handed into the TA. A link with the PEC experiment schedule will be posted on the WileyPlus site under Class Section Documents. PEC experiments are required, but each one you finish and turn in a high-quality report to the TA will count as one extra-credit assignment.

Also in 311/312 Thaw Hall is the Physics Resource Room, staffed by teaching assistants from 9 AM to 5 PM each weekday. These TA's are available to answer questions and help with assignments as needed.

The Academic Resource Center in the Gardner Steele Conference Center (across the street from Allen Hall) will sometimes have physics tutors available; times will be publicized when known.

A number of Undergraduate Teaching Assistants will run problem-solving help sessions and PEC experiment help sessions. Their schedules will be set by week 2 of the semester. Undergraduate Teaching Assistants are students who previously earned grades of A+ in Physics 0110.

Academic Integrity. Students in this course are expected to comply with University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, or obtain exam materials before the beginning of the exam.

Students with Disabilities. If you have a disability, please speak to the course instructor and to the Disabilities Resources and Services office by the second week of class to make any necessary arrangements to support a successful learning experience, and provide documentation through your disabilities coordinator. The Disabilities Resources office is located in 216 William Pitt Union, 648-7890 (voice or TTD).

Course Schedule

The following is a tentative course schedule. Adjustments to the schedule and order of the material may be made depending on the pace of the class. Your understanding will be much improved if you read the relevant portions of the textbook before coming to class. Study guides for each chapter, interactive solutions to sample problems, links to simulations and material from the web, and MCAT review problems are available on WileyPlus under the Read, Study, & Practice heading, and you are encouraged to make use of these materials. Assignments will generally be made on Tuesday, due the following Friday, and on Friday, due the following Tuesday. Assignments will be posted on the WileyPlus web site under the Assignments heading. This syllabus is available under the Class Section Documents link.

Week of August 31: General introduction. Problem Solving. Brief math review. Kinematics in 1 dimension. Reading: Chapter 1 and 2. Math review in Appendices.

Tuesday Sept 1: FIRST DAY OF CLASS

Week of September 7: Kinematics in 2 dimensions. Newton's Laws of Motion. Reading: Chapter 3. Chapter 4, Sections 4.1 to 4.5

Week of September 14: Applications of Newton's Laws to linear motion. Reading: remainder of Chapter 4.

Week of September 21: More applications of Newton's Laws to linear motion.

Week of September 28: Application of Newton's Laws to circular motion. Reading: Chapter 5.

Thursday Oct. 1: EXAM 1

Week of October 5: Impulse, momentum, and the conservation of momentum. Reading: Chapter 7.

Week of October 12: Energy, work, and the conservation of energy. Reading: Chapter 6.

Tuesday Oct. 13: NO CLASS (Monday class schedule due to Fall Break day)

Week of October 19: More on energy and work.

Week of October 26: Rotational kinematics. Reading: Chapter 8.

Thursday Oct. 29: EXAM 2

Week of November 2: Torque, moments of inertia, static problems. Reading: Chapter 9 sections 1-5.

Week of November 9: Rotational dynamics. Reading: Rest of Chapter 9.

Week of November 16: Simple harmonic motion. Elastic deformation, stress, and strain. Reading: Chapter 10.

Week of November 23:

Tuesday, Nov. 24: EXAM 3

Thursday, Nov. 26: NO CLASS (Thanksgiving Break)

Week of November 30: Fluids and gases. Reading: Chapter 11.

Week of December 7: Heat, temperature, heat transfer, and the ideal gas law. Reading: portions of Chapters 12, 13, and 14 to be assigned.

Week of December 14: FINAL EXAM (TO BE SCHEDULED)