PHY 110 Physics for Science and Engineering I

Instructor: Dr. George Rutherford ghr@ilstu.edu MLT 308-A 438-2934

Lecture: TWRF 11:00 – 11:50 in MLT 208

Labs: Section 2 – Tues 1:00 – 3:50 pm MLT 217 Jonathan Unger
Section 3 – Tues 6:00 – 8:50 pm MLT 217 Santiago Pinto

Section 5 – Wed 6:00 – 8:50 pm MLT 217 Jonathan Unger

Laboratory Manual for PHY 110 is required and may be purchased at the usual bookstores.

Text: *Physics for Scientists and Engineers*, 9th edition, by Serway and Jewett, published by Brooks/Cole Cengage Learning.

Note: While you are not required to purchase the hard-copy of the text, you are required to have electronic access (which includes electronic access to the full text) in order to do the online homework problems. A good compromise might be the publisher's "hybrid" version, which includes full electronic access and a paperback version of the text (this limited version of the text does not include the end-of-chapter problems, but they are included in the electronic access). Be sure you purchase "Multi-Term" access if you plan to take PHY 111 and/or PHY 112 in following semesters. The multi-term access can be purchased at the bookstores or online when you first access the WebAssign site. You may also wish to check out other products offered by Cengage. For instance, they offer a Cengage Unlimited subscription when registering for the course. It includes access to Cengage's entire library of over 22,000 ebooks, digital learning platforms and study tools for **$119.99 per term**. One subscription can be used across as many courses as you like, with the option to get a print rental for just $7.99 + free shipping for every activated digital product.

Please check out the **Start Strong webpage** for a short, tailored video and downloadable step-by-step guides to help you easily register for *WebAssign*.

The class key for our course is **ILSTU81378757**. Go to http://www.webassign.net and use this class key to sign up for the online part of the course.

Calculator: A scientific calculator is also required and should be brought to every class or lab meeting.

Course Objectives: This is the first of a three-semester sequence in a calculus-based treatment of fundamental physics topics. This first semester will cover topics in mechanics. The associated laboratory will focus on measurement, data analysis, and presentation skills. Upon successful completion of this course, you should:

- Be familiar with important concepts in mechanics.

- Be comfortable using calculus in the theoretical treatment of those concepts.
- Be able to solve problems in mechanics by identifying the relevant principles and performing the necessary mathematical operations.
- Be able to perform estimates and measurements, analyze the data obtained, address the uncertainty associated with measurements and calculations, draw reasonable conclusions from your analysis, and present the results a clear and concise way.

Course Format: The course consists of lecture periods and laboratory sessions. Hour exams will occur during the Friday lecture sessions indicated on the tentative schedule. Pop quizzes can occur at any time.

Grading: Your performance will be assessed in a number of ways. There will be three hour-long exams and a comprehensive final exam, several pop-quizzes, electronic homework problems and lab reports. These components will be combined with the following weights to determine your final course grade:

Exams (3 x 10% each)	30%
Pop Quizzes (drop lowest)	15%
Electronic Homework (drop lowest)	15%
Lab Reports (drop lowest)	20%
Final Exam	20%
Total	100%

Letter grades are typically determined by: A: $\geq 90\%$, B = 80 to 89%, C = 70 to 79%, D = 60 to 69%, and F: $\leq 59\%$. A curve is possible but not guaranteed. Class behavior and participation can influence letter grades awarded for course averages near the numerical boundaries between letter grades. In addition, your course grade can be reduced even further for rude or disruptive behavior, chronic late arrival to class, use of mobile electronic devices in class, or similar behavior. **Cheating or plagiarism is considered grounds for failure in the course**.

Quizzes and exams can be a combination of multiple choice, short answer, or show-your-work problems, and they can cover any topic in the text (**whether we discuss it in class or not)**, lectures, or lab. Since one pop quiz grade, one electronic homework grade, and one lab report grade will be dropped before your course average is calculated, no make-ups are allowed in those categories. A make-up or rescheduled exam may be possible in rare cases with sufficiently good reason (sickness, death in the immediate family, official university absence, etc.).

General Advice: The following is a collection of general advice gleaned from more than twenty years of teaching physics.

- Don't get behind. As soon as you realize you don't understand a topic or problem, make sure you get the issue straightened out NOW. Drop by or make an appointment to see me as soon as possible.

- Avoid just memorizing or "getting the answer in the back of the book". Make sure you understand the principles involved in a problem and how your approach to the problem would change if some aspect of the problem were changed.
- Work in groups. Someone in the group will understand any given concept, and everyone will benefit by letting that person explain it to the group.
- Read the text, but don't use that as an excuse to skip class. The text has good stuff in it, but in class you get a chance to see and hear how it all fits together. And sometimes we do things that aren't in the text.
- Take the lab seriously. It teaches very valuable skills, and it's worth 20% of your grade.
- Physics is hard, and it takes effort, so use your time wisely, work lots of problems, and don't be afraid to think about it even when you don't have to. Physics is a fundamental part of the scientific mindset, so if you intend to stay in science or engineering, you may as well practice thinking physics while you're learning it.

The following is a tentative schedule of the topics we'll cover, lab assignments, and exam dates, etc. Remember that it is tentative and subject to change at my discretion.

DATE	Lecture Topic	Lab/Exam/Etc
8/21	Intro to class; scientific notation; uncertainty; dimensional analysis	Lab 0: Intro to Mathematica
8/22	Unit conversion; 1D motion	
8/23	Calculus refresher	
8/24	More 1D motion	
8/28	1D motion problems and graphs	Lab 1: Making and Using Graphs
8/29	Vectors	
8/30	Problems and demonstrations	
8/31	2D motion; projectile motion	
9/4	More projectile motion; uniform circular motion	Lab 0.1 Curve Fitting in Mathematica
9/5	General curvilinear motion; relative motion	
9/6	Problems and demonstrations	
9/7	Laws of motion	
9/11	Laws of motion, continued	Lab 2: Intro to DataStudio
9/12	Friction	
9/13	Problems and demonstrations	
9/14	Circular motion	
9/18	Resistive forces	**NO LAB**
9/19	Scalar product; work	

9/20	Problems and demonstrations	
9/21	**EXAM 1: Chapters 1 – 5**	
9/25	Work-energy theorem	Lab 3: Freefall
9/26	Potential energy and conservative forces	
9/27	Problems and demonstrations	
9/28	More energy problems	
10/2	Conservation of energy	Lab 4: Projectile Motion
10/3	Problems using conservation of energy	
10/4	Problems and demonstrations	
10/5	Linear momentum; intro to collisions	
10/9	2D collisions	Lab 5: Newton's Second Law
10/10	Center of mass	
10/11	Problems and demonstrations	
10/12	Angular variables and kinematics	
10/16	Torque and kinetics and moment of inertia	Lab 6: Conservation of Energy
10/17	…continued	
10/18	Problems and demonstrations	
10/19	Conservation of energy in rotation; rolling motion	
10/23	Vector cross product	**NO LAB**
10/24	Conservation of angular momentum	
10/25	Problems and demonstrations	
10/26	**EXAM 2: Chapters 6 – 10**	
10/30	Static equilibrium	Lab 7: Ballistic Pendulum
10/31	Statics problems	
11/1	Review of Chapters 13 and 14	
11/2	Oscillatory motion; mass on a spring	
11/6	Simple harmonic motion; add energy	**NO LAB**
11/7	Pendulum; damped and forced oscillation	
11/8	Problems and demonstrations	
11/9	Motion of a disturbance; traveling pulses	
11/13	Traveling harmonic waves	Lab 8 Simple Harmonic Motion
11/14	Sound waves; pressure variation	

11/15	Problems and demonstrations	
11/16	Intensity and sound level	
11/19 – 11/23	**Thanksgiving Break**	
11/27	Doppler effect	**NO LAB**
11/28	Superposition and interference	
11/29	Problems and demonstrations	
11/30	**EXAM 3: Chapters 11 – 12, 15 – 16**	
12/4	Standing waves	Lab 9: Standing Waves
12/5	…continued	
12/6	Problems and demonstrations	
12/7	Review and catch-up	

The final examination schedule has not yet been announced. It should be available via iCampus around the middle of October. You will have two hours to take the final, which will cover all the topics we discuss during the semester, with a slight emphasis on Chapters 16–18.