Physics 150-02: Introductory Physics I *Fall 2012*

URLs in the PDF version of this syllabus are clickable links *Version 1.4*

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	Room	Time
Lecture 02	Geneva Room	11:15-12:10 MWF
Laboratory 11, 13	Eaton B13	1:30-5:00 W
Recitation 11, 13	Eaton 111	1:30-5:00 W
Laboratory 12, 14	Eaton B13	1:30-5:00 R
Recitation 12, 14	Eaton 111	1:30-5:00 R

Texts & Materials

- Hugh Young, Roger Freedman, and A. Lewis Ford, *University Physics*, 13th Edition
- Physics 150 Laboratory Manual, available at the College Store
- Hayden-McNeil Physical Sciences Lab Notebook, ISBN 978-1-930882-70-6
- Instructors' Solution Manual, on reserve in the library
- Simple scientific calculator with 1 variable statistics such as the CASIO *fx-260*

About Physics 150

The subjects covered in this class relate to phenomena that are common and objects that are visible. Most of what we'll study was well understood before the 20th century; this is perhaps the last "common sense" physics course, though we will study a little relativity and quantum mechanics, the two pillars of 20th century physics.

This course is primarily a problem-solving course. There are only a few principles a week that we will study, however there are many ways to use those principles. Learning to use the principles is best accomplished through solving lots of problems. Working together in groups is a good way to learn this material. Just having a numerical answer is usually not very useful for understanding; it is much better to spend time first trying figure out how to get to the answer from what you know and *then* calculating the answer. To do well in this course, most students will need to study at least ten hours per week outside of class. Going to office hours, at least occasionally, is also necessary for most students and strongly recommended.

This class satisfies both goal 3 (quantitative reasoning) and goal 4 (scientific inquiry).

About Your Instructors

Prof. Allen is a theoretical physicist working on particle physics and gravitation. He has been teaching at the University of Wisconsin, the California Institute of Technology, SUNY Utica/Rome, and HWS since 1980.

Prof. Dumitriu is an experimental physicist working on atomic and optical physics. She has been teaching at College "Mihai Viteazu," Western Michigan University, Gustavus Adolphus College, and now HWS since 1992.

Dr. Spacher is the physics department technician. He builds research and teaching equipment for the science division. He has been teaching at the University of Massachusetts at Lowell, the University of Pittsburgh, Rochester Institute of Technology, several Rochester high schools, and HWS since 1984.

Course Objectives
Physics is the fundamental study of the behavior of matter, energy, space, and time. It is a quantitative and mathematical science. By the end of the course, students should have a working knowledge of the elementary principles of mechanics and waves and their expression in mathematical form. Students should be able to apply these principles to simple problems stated in plain English.

Grading
The class will be graded on a straight percentage with the following breakdown:

A: 88% – 100% B: 75% – 87% C: 60% – 74%
D: 50% – 59% F: < 50%

The exams are not graded on a "curve," unless there is evidence that the exams were inappropriately difficult. In that case, extra points will be added to each exam to bring the average up to the appropriate level. In other words, an exam score of 80% is guaranteed to be at least a "B−." The course grade will be composed of five elements, three of which are the quizzes and exams. The other two elements are the laboratory and participation. The numerical grade will be computed using two schemes and your course grade will determined by the higher of the two.

α	β	Element
10%	5%	quizzes
10%	10%	participation
20%	20%	laboratory
30%	15%	hour exams
30%	50%	final exam

Homework
It is very important that you do the homework. Doing the homework thoroughly and correctly is the most important and valuable part of the course, at least insofar as learning the material is concerned. It is also helpful to do additional problems of your own choosing from the course text or any other source. Your grade is more a reflection of how much useful work you did outside of class than of how "mentally quick" you are. *Homework may be collected at any time after it is assigned.*

Quizzes
There will be short quizzes in lecture or recitation every so often, announced in advance. They will usually be a single problem, sometimes two or three very short problems. You will be allowed to bring a *handwritten* 3″× 5″ card (one side) of notes to each quiz.

Exams
There will be two hour exams and a final exam. The hour exams will be in lecture on October 3 and November 7. The final exam will be during the period set by the Registrar's office, which should be Tuesday, December 11, 2012 at 7:00 PM. The hour exams will each be at least three problem pages. You will be allowed to bring one *handwritten* 8.5″× 11″ page (one side) of notes to each hour exam and two *handwritten* 8.5″× 11″ pages (two sides total) to the final exam.

Discussion
The discussion section is a place to get your questions answered, to see if you did the homework correctly, to learn how to approach problem solving, and to discuss the reading. I expect students to attend recitation and to be interactive. Recitations happen during the normal laboratory time. *Attendance in recitation will count toward your participation grade. Be sure to sign in.*

Laboratories
The laboratories are taught by Dr. Peter Spacher. ***All of the laboratories must be completed in order to pass the course.*** A laboratory is not complete until you have handed in a laboratory report. You must have a laboratory manual and you must bring the lab manual, your lab notebook, and a calculator to each laboratory. The laboratory notebook is *bound* and *has quadrille (graph paper) lines.* It also makes copies of your entries as you write. Laboratory sections do not meet every week, so you should pay attention to the meeting times in the syllabus. You must have studied the lab manual *before* entering the laboratory. All students in laboratory are expected to contribute to their lab group's efforts and to solve any problems that may arise by thinking about what they should do to get the experiment to work and trying it before asking for help. Keeping a neat lab notebook is important (especially since concise, neat notebooks are generally much more helpful when you are writing your lab report.) If you cannot state what you are doing or what you learned simply and concisely, then you probably need to think more about it! Laboratory reports are due in discussion section the following week.

Prof. Allen's Office Hours
Office hours are Monday 1:30 – 3:00, Thursday 10:30 – noon, and Friday 2:30 – 4:00, and by appointment. You may stop by outside of regular office hours to see if Prof. Allen is available. If his office door is closed, he is very likely to be busy. *Going to office hours will count toward your participation grade. Be sure to sign in.*

Prof. Dumitriu's Office Hours
Office hours are 10:00 – noon MWF and by appointment. If you have questions outside of regular office hours, stop by to see if Prof. Dumitriu is available. If her office door is closed, she is very likely to be busy. *Going to office hours will count toward your participation grade. Be sure to sign in.*

Physics Teaching Fellows Program
Assistance with course concepts is available through the Teaching Fellows Program. The Teaching Fellows Program provides a collaborative approach to teaching and learning. The Fellows were nominated by the Physics Department and selected jointly by the Center for Teaching and Learning (CTL) and the department. The Fellows have been trained by the CTL.

The Teaching Fellows act as learning facilitators, helping their peers adapt to a subject's discourse and promoting academic interaction between students and faculty as well as among students. Time spent working with a Fellow is time well spent.

The Physics Teaching Fellows hold sessions in Eaton 105. Their hours will be posted outside the door. The Physics Department encourages you to take full advantage of this program. *Going to sessions with the Teaching Fellows will count toward your participation grade. Be sure to sign in.*

Disability Accommodations
Students with a documented disability for which they may need accommodations should self-identify and register for services with Mr. David Silver (x3351), the Coordinator of Disability Services at the CTL. Accommodations and services will generally not be provided until the registration and documentation process is complete. See the guidelines for documenting disabilities.

Late Policy
If you miss a quiz and you have a valid excuse, you may take a quiz the next day for 80% credit. If you miss an hour exam and have a valid excuse (a note from your physician or an acceptable alternative), you will be allowed to count the other hour exam for twice the weight. You must check with me ***before*** you miss the exam unless you fall ill suddenly before the exam, in which case you should contact me as soon as you are well. *There will be no makeup for the final exam.*

Syllabus Revision Policy
This syllabus is subject to revision. Any revised version will be distributed on my website and notice of revision will be given in class. The grading policy is only subject to revisions that cannot result in a lower letter grade for any set of scores.

Syllabus: Topics and Laboratories

This is the schedule of the subjects to be discussed in lecture and the laboratories that will be done that week in your laboratory section, either on Wednesday or Thursday, depending on which laboratory section you are in. On a week in which your laboratory section does not meet, your section will meet with Prof. Allen and Prof. Dumitriu for discussion section. Following this table, there is a table of homework assignments and reading, keyed by lecture number.

Date	**#**	**Lecture Topics**	**Laboratory**
Mon 27 Aug	1	Units – Uncertainty – Order of Magnitude – Scaling	*Discussion Sections*
Wed 29 Aug	2	Vectors – Components – Algebra – Geometry	*Units, Trig, & Vectors*
Fri 31 Sep	3	Displacement – Velocity – Acceleration	*Sections 11, 12, 13, & 14*
Mon 3 Sep	4	Motion with Constant Acceleration – Free Fall	*Random Error &*
Wed 5 Sep	5	2D & 3D Motion – Projectiles	*Experimental Precision*
Fri 7 Sep	6	Circular Motion – Relative Motion – Frames of Reference	*Lab Sections 11 & 12*
Mon 10 Sep	7	Einsteinian Revolution – Simultaneity – Time Dilation	*Random Error &*
Wed 12 Sep	8	Forces – Newton's Laws – Weight – Free Body Diagrams	*Experimental Precision*
Fri 14 Sep	9	Using Newton's Laws	*Lab Sections 13 & 14*
Mon 17 Sep	10	Friction	*Instantaneous*
Wed 19 Sep	11	Dynamics of Circular Motion – Fundamental Forces	*Velocity*
Fri 21 Sep	12	Work – Kinetic Energy – Work-Energy Theorem	*Lab Sections 11 & 12*
Mon 24 Sep	13	Work & Energy in General – Power	*Instantaneous*
Wed 26 Sep	14	Gravitational Potential Energy – Elastic Potential Energy	*Velocity*
Fri 28 Sep	15	Conservative Forces – Force & P.E. – Energy Diagrams	*Lab Sections 13 & 14*
Mon 1 Oct	16	Momentum – Momentum Conservation	*Force Table*
Wed 3 Oct		**Exam 1**	*Lab Sections 11 & 12*
Fri 5 Oct	17	Inelastic & Elastic Collisions – Center of Mass	
Mon 8 Oct		**Fall Recess**	*Force Table*
Wed 10 Oct	18	Relativistic Energy & Momentum – Correspondence Principle	*Lab Sections 13 & 14*
Fri 12 Oct	19	Angular Motion – Angular Kinematics	

Date	#	Lecture Topics	Laboratory
Mon 15 Oct	20	Relating Linear & Angular Motion – Rotational Energy	*Newton's 2nd Law*
Wed 17 Oct	21	Torque – Newton's 2nd Law for Rotation	*Lab Sections 11 & 12*
Fri 19 Oct	22	Rotation about a moving axis – Angular Work & Power	
Mon 22 Oct	23	Angular Momentum – Gyroscopes & Precession	*Newton's 2nd Law*
Wed 24 Oct	24	Equilibrium – Center of Gravity	*Lab Sections 13 & 14*
Fri 26 Oct	25	Deformations – Stress – Strain – Elasticity	
Mon 29 Oct	26	Fluids – Density & Pressure – Hydrostatic Pressure	*Simple Harmonic*
Wed 31 Oct	27	Buoyancy – Describing Fluid Flow	*Motion*
Fri 2 Nov	28	Bernoulli's Equation	*Lab Sections 11 & 12*
Mon 5 Nov	29	Universal Gravitation – Potential Energy – Spherical Mass Distributions	*Simple Harmonic*
Wed 7 Nov		**Exam 2**	*Motion*
Fri 9 Nov	30	Kepler's Laws – Satellites – Black Holes	*Lab Sections 13 & 14*
Mon 12 Nov	31	Simple Harmonic Motion – Governing Differential Equation – Energy	*Standing Waves*
Wed 14 Nov	32	Pendula – Damped Oscillations – Resonance	*Lab Sections 11 & 12*
Fri 16 Nov	33	Waves – Wave Equation & Solutions – Sinusoidal Waves	
Mon 19 Nov	34	Waves on a String – Energy & Power in Waves	*No Labs*
Wed 21 Nov		**Happy**	*or Discussion*
Fri 23 Nov		**Thanksgiving!**	*Sections*
Mon 26 Nov	35	Superposition – Interference – Boundary Conditions	*Standing Waves*
Wed 28 Nov	36	Standing Waves – Normal Modes	*Lab Sections 13 & 14*
Fri 30 Nov	37	Quantum Revolution – Einstein – de Broglie – Energy Quantization	
Mon 3 Dec	38	Sound Waves – Sound Speed – Sound Intensity – Normal Modes of Pipes	*Discussion*
Wed 5 Dec	39	Resonance – Interference – Beats – Doppler Effect	*All Sections*
Fri 7 Dec	40	**Summary & Final Exam Review**	*11, 12, 13, & 14*
Tue 11 Dec		**Final Exam Section 02 7:00 PM**	

Syllabus: Reading and Homework Problems

The assigned readings and homework are in Young and Freedman. *The reading assignments are to be done before lecture* on the day in which they are assigned.

Homework assignments are to be *done* before the next lecture in the table. *They may be collected at that lecture or any later time.* Problems that are daggered† require integral calculus, which is not a requirement of the course.

Prof. Walter Lewin's MIT Open Courseware lectures, while not required, are strongly recommended. Hearing his excellent explanation of the material is very helpful. The URLs for these lectures are linked into the PDF version of this syllabus.

Lec #	Reading & Suggested Viewing	Homework Following the Lecture
1	Ch 1; §*1-6*; Lewin's Lec 1	Q1.1, Q1.8, Q1.10, Q1.11; 1.1, 1.10, 1.14, 1.16, 1.21
2	Ch 1: §*7-10*; Lewin's Lec 3	Q1.13, Q1.19, Q1.22; 1.31, 1.35, 1.39, 1.40, 1.47, 1.91
3	Ch 2: §*1-3*; Lewin's Lec 2	Q2.3, Q2.5; 2.1, 2.3, 2.8, 2.9, 2.17. 2.65
4	Ch 2: §*4,5*	Q2.15, Q2.18; 2.19, 2.23, 2.31, 2.41, 2.88
5	Ch 3: §*1-3*; Lewin's Lec 4	Q3.5, Q3.6; 3.4, 3.13, 3.19, 3.43, 3.59
6	Ch 3: §*4,5*	Q3.10, Q3.11, Q3.12; 3.28, 3.29, 3.34, 3.35, 3.71, 3.79
7	Ch 37: §*1-4*	Q37.2, Q37.5, Q37.7 ; 37.2, 37.3, 37.7, 37.9
8	Ch 4: §*1-6*; Lewin's Lec 7	Q4.4, Q4.28, Q4.31, Q4.40, Q4.41; 4.1, 4.4, 4.16, 4.25, 4.37, 4.43
9	Ch 5: §*1,2*; Lewin's Lec 6	Q5.1, Q5.3; 4.54, 5.6, 5.15, 5.56, 5.93
10	Ch 5: §*3*; Lewin's Lec 8	Q5.18; 5.25, 5.34, 5.35, 5.89, 5.97
11	Ch 5: §*4,5*; Lewin's Lec 5	Q5.23; 5.42, 5.44, 5.45, 5.47, 5.119
12	Ch 6: §*1,2*; Lewin's Lec 11	Q6.1, Q6.4, Q6.12; 6.3, 6.8, 6.16, 6.20, 6.18
13	Ch 6: §*3,4*	Q6.16, Q6.20, Q6.22; 6.34, 6.35, 6.37, 6.75, 6.86, 6.101
14	Ch 7: §*1-3*	Q7.1, Q7.5, Q7.17; 7.5, 7.9, 7.12, 7.15, 7.30, 7.55
15	Ch 7: §*4,5*; Lewin's Lecs 12 & 13	Q7.13, Q7.15, Q7.21; 7.34, 7.38, 7.39, 7.46, 7.63
16	Ch 8: §*1-3*; Lewin's Lec 15	Q8.2, Q8.9; 8.3, 8.7, 8.24, 8.31, 8.41
17	Ch 8: §*4,5*; Lewin's Lec 16	Q8.10, Q8.22, Q8.24; 8.42, 8.46, 8.49, 8.86, 8.106, 8.111
18	Ch 37: §*7-9*	Q37.9; 37.27, 37.28, 37.33
19	Ch 9: §*1,2*	Q9.4, Q9.6, Q9.7; 9.5, 9.10, 9.14, 9.15

Lec #	Reading & Suggested Viewing	Homework Following the Lecture
20	Ch 9: §*3,4*; Lewin's Lec 19	Q9.9, Q9.10, Q9.14; 9.25, 9.45, 9.71, 9.77
21	Ch 10: §*1,2*	Q10.1, Q10.3, Q10.10; 10.1, 10.5, 10.8, 10.9, 10.59, 10.73
22	Ch 10: §*3,4*	Q10.18, Q10.27; 10.20, 10.21, 10.32, 10.69
23	Ch 10: §*5-7*; Lewin's Lec 20	Q10.20, Q10.21, Q10.24, Q10.29; 10.42, 10.43, 10.67, 10.94
24	Ch 11: §*1-3*; Lewin's Lec 25	Q11.4, Q11.5, Q11.7; 11.5, 11.11, 11.14, 11.76
25	Ch 11: §*4,5*; Lewin's Lec 26	Q11.14, Q11.17, Q11.20; 11.25, 11.34, 11.41, 11.86, 11.96
26	Ch 12: §*1,2*	Q12.4, Q12.5, Q12.16; 12.5, 12.12, 12.50, 12.59
27	Ch 12: §*3,4*; Lewin's Lec 27	Q12.13, Q12.18, Q12.20; 12.31, 12.37, 12.74, 12.85†
28	Ch 12: §*5,6*; Lewin's Lec 28	Q12.23, Q12.25, Q12.29; 12.41, 12.42, 12.91, 12.94
29	Ch 13: §*1-4*; Lewin's Lec 14	Q13.1, Q13.7, Q13.9, Q13.10; 13.4, 13.5, 13.19, 13.72
30	Ch 13: §*5,6,8*; Lewin's Lecs 22 & 24	Q13.14, Q13.17, Q13.21; 13.24, 13.28, 13.37, 13.69, 13.82†, 13.84†
31	Ch 14: §*1-4*; Lewin's Lec 10	Q14.1, Q14.3; 14.4, 14.9, 14.16, 14.19, 14.30
32	Ch 14: §*5-8*; Lewin's Lecs 24 & 21	Q14.12; 14.41, 14.53, 14.72, 14.93, 14.97
33	Ch 15: §*1-3*	Q15.1, Q15.6; 15.2, 15.3, 15.8, 15.9, 15.12, 15.52
34	Ch 15: §*4,5*	Q15.4; 15.15, 15.22, 15.23, 15.26
35	Ch 15: §*6,7*	Q15.15; 15.37, 15.38, 15.70
36	Ch 15: §*8*; Lewin's Lec 31	15.40, 15.43, 15.72
37	Ch 39: §*1*; Ch 40: §*1,2*	Q39.1, Q40.1, Q40.2; 39.1, 39.7, 40.11
38	Ch 16: §*1-4*	Q16.1, Q16.5, Q16.8; 16.3, 16.8, 16.20, 16.26, 16.30
39	Ch 16: §*5-8*	Q16.11, Q16.18; 16.33, 16.35, 16.39, 16.41, 16.59, 16.70