

Physics 151L

Course Information

Spring 2010
January 8, 2010

Physics 151L is the first course in the Physics sequence intended for physical science and engineering majors. The subject material is Classical Mechanics and Thermodynamics. The goal of the course is to teach you how to approach and solve physical problems, and to develop an intuition for the important physical properties which affect a given situation. Following this course you should be able to analyze such diverse phenomena as looping roller coasters, satellite orbits, and cars with bad suspensions, and be able to explain to your Aunt Martha why mountaintops are colder than deserts, even though they are closer to the Sun.

This course will make extensive use of Web-based resources keyed to your USC computer account and email address. In particular, reading assignments with associated questions given before each lecture and all homework assignments will be presented and graded on-line.

The sequence of courses 151-153 should be considered as one whole course, and not as three independent nonintersecting courses. In 152 and 153 you will be expected to be able to freely make use of material covered in this course.

I. Course Instructors

<u>Instructor</u>	<u>Pronunciation</u>	<u>Office</u>	<u>Office Hours</u>	<u>Phone</u>	<u>e-mail</u>
Dr. Gould	goold	SSC 204	MW 2-3	740-1101	gould@usc.edu
Dr. Bars	bars	SSC 216B	TTh 2:30-3:30	740-0047	bars@usc.edu

II. Course Materials

II.A. Required for the Lecture

1. Hugh D. Young and Roger A. Freedman, *University Physics*, 12th ed., with MasteringPhysics and Study Guides (Pearson/Addison Wesley, 2008). The package in the Bookstore is a shrink-wrapped bundle with the required textbook (all 44 chapters in a single hardback volume), a MasteringPhysics Access Code, and the two-volume set of the Student Study Guides for the entire text. If you find the textbook outside of the Bookstore, make sure that what you're getting is complete. If you buy a used copy you will need to separately purchase MasteringPhysics online (\$80 with eBook, \$45 without) and the study guides. This book will also be used in PHYS 152 and PHYS 153. Your MasteringPhysics code is valid for two years after registration. *Don't sell your book at the end of this semester.*
2. **TurningPoint RF Response Card (RCRF)**. This transmitter is available at the checkout registers in the Bookstore, and is the University standard for "clickers." If you have already purchased an RF clicker for use in another class you do *not* need to purchase a second.

II.B. Required for the Laboratory

3. **Science Notebook** (National Notebook 43-645). Any equivalent notebook with quadrille ruled pre-numbered pages bound into the notebook, with identically numbered pages for copies (either carbon copies or carbonless forms) is acceptable.
4. **Laboratory Manual** (Dept. of Physics & Astronomy, Spring 2010). The *Laboratory Manual* is provided on the *lab's* Blackboard site. You do not need to print it because a copy will be provided for your reference in the lab meeting room. However, you will need to read the *Manual* in advance of your lab meeting in order to answer the online pre-lab questions.

III. Administrivia

III.A. Prerequisites

The prerequisite for this course is Math 125 (Calculus I). While not an explicit corequisite, Math 126 (Calculus II) should be considered effectively one, as it is a prerequisite for Physics 152.

III.B. Registration

Your registration for this course consists of three separate parts: a lecture, a “quiz,” and a laboratory. You must be registered for one of each. (The only exception is if you have previously completed the laboratory *and* have received permission to carry its grade into the current semester *and* have given the permission form to your instructor. In that case you would register only for the lecture and “quiz.”)

	Section	Time/Day	Instructor	Location
Lec	50380R	9:00 MWF	Dr. Gould	SLH 200
Qz	50381R	5:00-6:30 W	Dr. Gould	TBA
Lec	50382R	4:00-5:20 TTh	Dr. Bars	SLH 200
Qz	50383R	5:00-6:30 W	Dr. Bars	TBA

Associated with each lecture section is its own quiz section immediately following it in the Schedule of Classes. The quiz time is reserved in order that a common time for all sections can be set aside for the midterms. All quiz sections meet at the same time, *but generally do not meet except for midterms*. The dates for the midterms are indicated on the syllabus. The location for each midterm will be announced shortly before it is given. In lecture your instructor will announce if and when there are to be any additional meetings during the quiz section time slot.

There are also laboratory sections, meeting once a week for three hours.

Lab Section	Time/Day	Open Slots	Instructor(s)	Location
50386R	8-10:50 T	—		KAP B8
50387R	8-10:50 W	—		KAP B8
50388R	8-10:50 Th	—		KAP B8
50389R	8-10:50 F	—		KAP B8
50390R	11-1:50 T	—		KAP B8
50391R	11-1:50 W	—		KAP B8
50392R	11-1:50 Th	—		KAP B8
50393R	11-1:50 F	—		KAP B8
50471R	2-4:50 M	—		KAP B8
50394R	2-4:50 T	7		KAP B8
50395R	2-4:50 W	—		KAP B8
50396R	2-4:50 Th	11		KAP B8
50397R	2-4:50 F	—		KAP B8
50398R	5-7:50 T	—		KAP B8
50399R	5-7:50 Th	—		KAP B8

For current information see http://physics.usc.edu/Undergraduate/ta_lab.html#151.

III.C. Disabilities

The DSP office has requested that we include the following statement:

“Students who need to request accommodations based on a disability are required to register each semester with the Disability Services and Programs. In addition, a letter of verification to the instructor from the Disability Services and Programs is needed for the semester you are enrolled in this course. If you have any questions concerning this procedure, please contact the course instructor and Disability Services and Programs at (213) 740-0776, STU 301.”

IV. Grading

Your final course grade will be based upon two major components:

Component	Weight	Minimum Requirement
Lecture Component		
Readings/ Clickers	15%	Submit at least 75%
Homework	15%	Submit at least 75%
In-Class Quizzes	15%	Submit at least 75%
Midterms	30%	Pass (cumulatively)
Final Exam	25%	Pass
Laboratory Component		
Pre-lab Quiz	}	Complete at least 2/3
Lab Performance		
Lab Write-Up		

As indicated in the above table, in order to receive a passing grade in the course (*i.e.*, D- or higher) you must, at a minimum, pass the laboratory, pass the midterms (cumulatively), pass the final exam, and must submit at least the stated fraction of readings/ clickers, homework sets, and in-class quizzes. For example, even if you get the highest grade in the course on the final examination, if you blow off one of the course components and do not meet the stated minimum requirement you will not pass the course. While this may appear rather draconian, we hope that by making clear our expectations in advance, everyone will make a serious effort in each component of the course, thereby making this class a success.

All students in this course will be given the same homework assignments, the same laboratory projects, and the same midterms and final exam, and will be graded on a common scale.

IV.A. Readings/ Clickers

The Readings/ Clickers portion of the class has two components: home (on-line) and in-class. The home component (“ILT”) is assigned for every lecture and is due by midnight the night before each of your lectures. Through this component you will (1) find the reading assignment for the lecture and (2) complete an on-line reading quiz based upon this reading. The in-class component uses RF transmitters (“clickers”) to respond to questions during the lecture.

Both the on-line reading questions and in-lecture clicker questions will be graded. Incorrect answers on reading questions or clicker questions receive more credit than a failure to respond. Full credit for pre-lecture reading questions which ask for explanations of answers require only a reasonably successful attempt at a correct explanation. In computing your course grade, we will drop the lowest two pre-lecture reading assignments, and the lowest two in-lecture sessions.

IV.B. Homework

Each week there will be two online assignments done on the MasteringPhysics site and due Wednesday afternoon at 6 pm, and Friday afternoon at 6 pm.. These assignments are graded as you submit them. In computing your course grade, we will drop the lowest two online homework scores.

We expect that it will take you approximately 6 hours to complete your homework each week. These homework sets are the central way you will learn physics. “Understanding” physics does not mean knowing the words, having read the book. Instead, “understanding” implies having developed the ability to solve physics problems you have not seen before.

Homework problems will range from the trivial to the difficult. Midterm and final examination questions will more closely resemble (and in isolated instances may be identical to) homework problems on the difficult end of the spectrum. Experience shows a strong positive correlation between total homework scores and total exam scores.

The counsel to do your own homework does *not* mean that you cannot work with other students in the class. To the contrary, we recommend students work together, where feasible, in deciding how to solve problems. Of course, working together does *not* mean simply copying solutions from each other. That action is a violation of academic integrity standards. There is, however, a large difference between simply copying and learning by cooperating. Take advantage of this opportunity.

IV.C. In-Class Quizzes

Each week you will be given an in-class quiz based upon the homework assignment(s) of the previous week. These quizzes will take approximately 15 minutes. The day and time during your lecture at which these quizzes will be given may change from week to week. In computing your course grade, we will drop the single lowest in-class quiz score.

IV.D. Examinations

There will be two midterm examinations and a Final Examination. The midterm exams will last 60 minutes and will be given during the weekly “quiz” period to all sections simultaneously. The midterms will cover material incrementally through the semester. The Final Exam will last 120 minutes and will be comprehensive of the entire semester.

All exams are closed-book closed-notes exams. However, we will include in each exam a page (or two – or three) of Possibly Useful Formulae which will contain all of the important formulae from the book which might be useful in generally solving the exam questions. **We recommend that you write all exam answers in pen, not pencil**, because if after reviewing your graded answers you wish to request a reconsideration of their grading, only exams written entirely in pen will be considered. During exams no calculators or other electronic devices are permitted. No one may leave the exam room prior to turning in their exam without an accompanying proctor. There are no scheduled make-up examinations for either midterm or the Final Exam.

Students with special examination requirements as documented by the Office of Disability Services must present their documentation to their instructor as soon after the start of classes as is possible, and certainly no later than seven calendar days prior to the first midterm. See section III.C.

IV.E. Laboratory

Physics 151 laboratories will meet during the first week of classes. You may be dropped from the lab section if you do not attend this first meeting and there is a waiting list for your section.

At every laboratory meeting after this week you must bring your *Laboratory Notebook*. Your *Laboratory Manual* is available on the laboratory’s Blackboard site. A printed copy of the *Manual* will be available in the laboratory for each set of lab partners to share, so you do not need

to print it out yourself. The *Laboratory Manual* will explain how your *Notebook* should be prepared in advance of each week's meeting.

Laboratory grades are determined by

1. A pre-lab quiz due before your lab section meets,
2. Your performance during the lab, and
3. Your lab write-up (the "Green Sheet bundle") turned in at the lab's conclusion.

You must attend *only* the lab section in which you are registered. Lab TAs are forbidden to make exceptions. If you miss your lab, follow the procedure found in the make-up policy on the lab section's Blackboard site in order to attend the make-up session scheduled on the following week.

The laboratory component will not be graded on an A-F basis to raise or lower your course grade. Instead, cumulative laboratory scores will be evaluated so that normal and expected laboratory performance will not change your course grade as determined by the other components. However, laboratory scores which are significantly above or below normal and expected performance will respectively raise or lower course grades.

Complete details about lab grading and make-up policies are provided on the laboratory section's Blackboard site. Other questions concerning the laboratory should be referred to the Lab Director, Gökhan Esirgen, KAP B19, 740-1138, esirgen@usc.edu.

V. Classroom Behavior

Please turn off (or silence) your cell phone. Generally speaking, during class we do not allow open laptop computers. Owing to the nature of this course and its lectures, laptop computers have no demonstrated productive pedagogical use. The computers will have plenty of uses outside of lecture, but during the lecture their use is counterproductive. Similarly, we do not allow open newspapers. If you prefer to browse the web or the newspaper, please do so at home.

VI. Assistance

You have a variety of opportunities for assistance available to you. Here we list a non-exclusive set of these opportunities. Your home department or housing unit may provide others.

VI.A. Lectures

Don't underestimate the value of questions *during* the lecture period. In large lectures, many students are reluctant to pose questions which they fear may seem silly to either their cohorts or the instructor. This probably includes you. Almost always, if one student asks a question, there are several others who have been bothered by the same thing. Often such questions tell the instructor what is not clear to the students. Stopping the lecture and getting everyone together on the issue is much more useful than simply letting a lecture continue without clarification.

A portion of each week's lecture time will be devoted to illustrative examples, including some from the assigned homework sets. This is natural considering that midterm questions frequently are derived from homework problems.

VI.B. Lecturer Office Hours

For more personal attention you can come to the office hours of your instructor listed on page 1 of this document. If at all possible, come to the regularly scheduled office hours listed there. However, if your schedule conflicts with this, it is possible to schedule an appointment at a different time by e-mailing your instructor with the request, or approach your instructor after lecture.

VI.C. Your Laboratory T.A.

All laboratory teaching assistants are graduate students, usually pursuing a Ph.D. in Physics. They are all capable of answering any question you have regarding subject material. Usually your lab TA can answer your question immediately. However, some problems you pose may be ambiguous, so that your TA will need some time to think. In either event, you should regard your laboratory TA as a resource not only for the laboratory, but also for all physics questions.

VI.D. T.A. Office Hours - SGM 409

January 13 - May 4

All laboratory teaching assistants have office hours in SGM 409 for the assistance of students in all 100-level physics courses. The offices will be staffed with at least one TA from 10 am to 4 pm, Monday through Thursday until the start of final exams. The schedule of every TA's office hours will be constructed during the first week of classes and will be posted on the door of the Office Hours room and maintained on the Departmental Web site at <http://physics.usc.edu/Undergraduate/TAofficehours.html>. If you find the room unoccupied in contradiction to the posted schedule, inform your instructor.

VI.E. Published Solutions

Images of midterms and final examinations from previous semesters are available on the course Web site as described below in section VII.B. Solutions to all homework sets are also available at any time after you have submitted them for grading.

VI.F. Other Books

There is no shortage of alternatives to the assigned textbook. Some of these will be in Leavey Library including:

- Tipler and Mosca, *Physics for Scientists and Engineers*, Sixth Ed. (Freeman, 2008).
- Ohanian and Markert, *Physics for Engineers and Scientists*, Third Ed. (Norton, 2007).
- Halliday, Resnick, Walker, *Fundamentals of Physics*, Eighth Ed. (Wiley, 2008).
- Resnick, Halliday, Krane, *Physics*, v.1, Fifth Ed. (Wiley, 2001).
- Serway and Jewett, *Physics for Scientists and Engineers*, Seventh Ed. (Brooks/Cole, 2007)
- Knight, *University Physics*, Second Ed. (Pearson/Addison-Wesley, 2008)

Each of these texts is calculus-based and is used in numerous universities throughout the country.

VI.G. Study Groups

One of the most effective ways to learn new material is to teach it to others. To this end, we encourage you to work together in learning the material, and in doing homework assignments. If you have friends also enrolled in the course, in any section, feel free to discuss homework problems, *approaches* to solutions, and even solutions, though again you are cautioned not to simply copy each other's solutions.

In order to facilitate the formation of study groups, we will prepare a list of students enrolled in Physics 151, ordered by housing unit. This list will contain names and housing units only — no phone or room numbers will be listed in the interest of preserving the privacy of those students who would prefer other arrangements.

VI.H. Supplemental Instruction Program

<http://www.usc.edu/si/>

Supplemental Instruction (SI) is an academic program organized by the College of Letters, Arts, and Sciences, designed to improve student performance in this course and in several other traditionally difficult courses. It is free and does not require academic credit. Each week there will be several sessions led by an SI leader who will be working together with the instructor and attending the same lectures as you do. The SI leaders for PHYS 151 will be

- Ben Vatterott (vatterot@usc.edu) for Dr. Gould's section, and
- Matt Pieper (mpieper@usc.edu) for Dr. Bars's TTh section.

For further information, contact the SI web site, or its director, Judy Haw, at judyhaw@usc.edu.

VI.I. Viterbi Academic Resource Center <http://viterbi.usc.edu/.../varc/>

The Viterbi Academic Resource Center office is located in the Ronald Tutor Hall of Engineering, Room 222. It provides free individual and group tutoring with tutors screened by the School of Engineering. Its hours are 11:00 am - 8:00 pm Monday-Thursday, and 11:00 am - 5:00 pm on Friday. Regular review sessions are planned. For more information visit VARC in RTH 222, phone 740-3881, or email viterbi.varc@usc.edu.

VI.J. Center for Academic Support <http://sait.usc.edu/academicsupport/>

The Center for Academic Support provides, among other things, free tutoring in many subjects. For further information visit the above web site, call 740-0776, email study@usc.edu or visit them in STU 301.

VI.K. Tutors

The Department of Physics and Astronomy does not recommend tutors. The principal function of a tutor is to enforce a regular study of course material. This function, however, is served as well by working together with other students in the course — and it's much less expensive.

VII. Electronic Assistance

Everyone in this class has convenient access to the USC network. If you do not already know what your account name is, you should use your favorite Web browser to reach www.usc.edu/firstlogin/ and follow the instructions there. To get help on using the USC network visit www.usc.edu/its/. For class functions you will need to use your USC account, *not one such as gmail or yahoo from an external Internet Service Provider*. While it is simpler to use your USC account directly, depending upon your circumstances you may prefer to access your USC account from an external ISP using VPN software also available from ITS.

VII.A. e-mail phys151@usc.edu

Your instructors use e-mail to communicate with each other and with the laboratory TAs. You can use e-mail to make appointments to speak privately with your instructor, or to just ask more physics questions. *Important:* Use your USC email account. Non-USC accounts cannot be authenticated and cannot be relied upon for any grade-affecting communication. Email from non-USC accounts may be blocked, deleted, or ignored.

VII.B. Course Web Site <http://blackboard.usc.edu/>

Everyone registered in PHYS 151 should find two separate “courses” already set up within their Blackboard account, one for the lecture and a separate one for the laboratory. In the lecture “course” you will find a copy of the syllabus, links to reading assignments and reading quizzes, homework assignments, important news and announcements, and solutions to examinations in this and previous semesters.

One very effective tool is the discussion board within the lecture's Blackboard site. Whenever you are working on a homework problem, or preparing for an exam, and you can't figure out how to proceed, ask your question on the discussion board. It's not “live chat,” so you won't get an answer back within seconds, but your question will be saved so that others can respond when

they visit the discussion boards – and your instructors have even been known to contribute helpful hints when a given question goes unanswered for too long.

Important Netiquette: When you start a new discussion thread, give your post a useful subject line. Don't title your question, "Question," "Need help," or "I'm having trouble." Instead, describe the topic succinctly, such as "Problem 10.28," or "The Precarious Lunch Problem." If you're starting a new discussion thread, others will recognize that you're asking for help.

VII.C. ActivPhysics OnLine http://media.pearsoncmg.com/aw/aw_activphysics...

Interactive tutorials expanding upon the material in lectures and the textbook. You are encouraged to explore this site. Note: some reading assignments and online quizzes will be based in part upon activities found on this site. You will normally access these tutorials through the MasteringPhysics site's side menu item "Study Area."

VIII. Laboratory Schedule

The tentative schedule of laboratory experiments to be performed is shown below. You will receive a more complete schedule in the laboratory's first meeting. In case of conflict between the schedule below and that given to you in the laboratory, the schedule below would be superceded.

Week Of	Experiments
Jan 11	Mandatory Organizational Meeting
Jan 18	II Measurements and Experimental Errors
Jan 25	I Presentation and Analysis of Data by Means of Graphs
Feb 1	III Free Fall
Feb 8	IV Atwood's Machine
Feb 15	No Laboratory
Feb 22	V One-Dimensional Collisions
Mar 1	VI Two-Dimensional Collisions
Mar 8	VII Moment of Inertia of a Rigid Body
Mar 15	No Laboratory – Spring Recess
Mar 22	VIII Forces and Torques in Static Equilibrium: Cantilever
Mar 29	IX Fluid Flow
Apr 5	X Simple Harmonic Motion
Apr 12	XI Thermal Conduction and Radiation
Apr 19	XII Ideal Gas Law and the Absolute Zero of Temperature
Apr 26	Special Lab Make-up Week

IX. Syllabus

Part I – Why Things Change Motion and Newton's Laws

#	Week of	Topics	Reading
1	Jan 11	Dimensional Analysis, Estimation, Vectors	Ch. 1
January 18: Martin Luther King, Jr. Day — University Holiday			
2	Jan 18	1D Kinematics: Displacement, Velocity, Acceleration	Ch. 2
3	Jan 25	Motion in Higher Dimensions: Projectile Motion, Circular Motion, Relative Velocity	Ch. 3
4	Feb 1	Newton's Laws, Free Body Diagrams, Weight, Applications	Ch. 4 Ch. 5
5	Feb 8	Applications of Newton's Laws: Multiple Bodies, Action-Reaction Pairs, Friction, Dynamics of Circular Motion	Ch. 5
February 15: Presidents' Day — University Holiday			
6	Feb 15	Review and Midterm I: Wednesday, Feb 17, 5:00 - 6:30 pm Covers Chapters 1-5 Location: To Be Announced	

Part II – Why Some Things Stay the Same Conservation Laws and Other Applications of Newton's Laws

#	Week of	Topics	Reading
7	Feb 22	Work, Kinetic Energy, Potential Energy (including Gravitational and Energy in Simple Harmonic Oscillators), Work by Variable Forces, Conservation of Energy	Ch. 6 Ch. 7 Ch. 12-13
8	Mar 1	Linear Momentum, Impulse, Conservation of Linear Momentum, Collisions, Center of Mass	Ch. 8
9	Mar 8	Kinematics of Rigid Body Rotation, Moment of Inertia, Torque	Ch. 9 Ch. 10
March 15-20: Spring Recess			
10	Mar 22	Rolling, Vector Character of Angular Momentum, Gyroscopes, Statics	Ch. 10 Ch. 11
11	Mar 29	Review and Midterm II: Wednesday, March 31, 5:00 - 6:30 pm Covers Chapters 6-11 (plus energy in chapters 12-13) Location: To Be Announced	

**Part III – It’s All About Energy
Thermodynamics**

#	Week of	Topics	Reading
12	Apr 5	Temperature, State and Process Variables, Ideal Gases, Elementary Thermodynamic Processes	§§14.1-14.2 Ch. 17 Ch. 18
13	Apr 12	Calorimetry, Specific Heat, Microscopic Model of Ideal Gases: Kinetic Theory, First Law of Thermodynamics: Work, Heat, and Conservation of Energy, Thermodynamic Cycles	Ch. 18 Ch. 19
14	Apr 19	Second Law of Thermodynamics: Work from Heat Engines, Refrigerators, Ultimate Limit to Efficiency	Ch. 19 Ch. 20
15	Apr 26	Entropy, Final Examination Review	Ch. 20
Last Day of Classes: Friday, April 30			
Final Examination: Wednesday, May 12, 11:00 am - 1:00 pm Important: This is one of the “Exceptions” in the Schedule of Classes. Don’t make travel plans based upon a different exam date! Covers Chapters 1-20 Location: To Be Announced			

Other Important Dates:

January	29:	Last day to add or drop without mark of “W”
February	18:	Statue of Liberty patented, 1879
April	9:	Last day to drop with mark of “W”
April	15:	Earliest recorded Isaac Newton “apple tree” vignette, 1726
May	1-4:	Study Days
May	5-12:	Final Examination Period