Phys 151L: Fundamentals of Physics I
Course Information
Spring 2015

Course Description

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.

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.

Course Instructors

Stephan Haas  
shaas@usc.edu  
(213) 740-4528

office hours: Mondays, Wednesdays 2:00pm-3:00pm

Vahe Peroomian  
vaheusc@gmail.com  
(213) 740-2386

office hours: Mondays, Tuesdays, Wednesdays 2:30pm-3:30pm

Course Materials

A. Required for the Lecture


One version includes all 42 chapters of the complete textbook in a single hardback volume. Another version breaks the textbook into five volumes. The material covered this semester is in the first and second volumes. Buying separate volumes might be cheaper this term, but will cost you more in the long run because you will need to buy the rest of the book next semester.

B. Required for the Laboratory

1. 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.

2. Laboratory Manual (Department of Physics and Astronomy, current term). 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.
Administrativia

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.

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.”)

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Time</th>
<th>Instructor</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec50380R</td>
<td>MWF</td>
<td>9:00-9:50 am</td>
<td>Dr. Haas</td>
<td>SLH 200</td>
</tr>
<tr>
<td>Lec50381R</td>
<td>TTH</td>
<td>8:30-9:50 am</td>
<td>Dr. Peroomian</td>
<td>SLH 200</td>
</tr>
<tr>
<td>Lec50382R</td>
<td>MW</td>
<td>12:00-1:50 pm</td>
<td>Dr. Haas</td>
<td>SLH 200</td>
</tr>
<tr>
<td>Qz50383R</td>
<td>W</td>
<td>5:00-6:20 pm</td>
<td></td>
<td>TBA</td>
</tr>
</tbody>
</table>

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

D. Academic Integrity
Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the university. Since dishonesty in any form harms the individual, other students and the university, policies on academic integrity will be strictly enforced. The academic integrity guidelines can be found in

(i) The Trojan Integrity Guide,

(ii) The Undergraduate Guide for Avoiding Plagiarism,

E. Classroom Behavior
Please turn off (or silence) your cell phone. Generally speaking, during class we do not want open laptop computers. Owing to the nature of this course and its lectures, laptop computers have no demonstrated productive pedagogical use. 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.

Grading
Your final course grade will be based upon four major components:

<table>
<thead>
<tr>
<th>Grade Component</th>
<th>Weight</th>
<th>Minimum Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>15%</td>
<td>Submit at least 75%</td>
</tr>
<tr>
<td>Midterms</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>20%</td>
<td>Pass</td>
</tr>
</tbody>
</table>

Laboratory Detail
<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Lab Quiz</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Lab Performance</td>
<td>40%</td>
<td>Complete at least 2/3 of all experiments</td>
</tr>
<tr>
<td>Lab Write-Up</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

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

There will be a homework assignment every week. The problems will be either from the textbook or created especially for this course by the professors. We expect that it will take you, in total, approximately 6 hours to complete each of these homework assignments. 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 some instances may be identical to) homework problems on the more difficult end of the spectrum. Experience shows a strong positive correlation between total homework scores and total exam scores. So DO THE HOMEWORK!

The counsel to do your own homework does not mean that you cannot work with other students in the class. On 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.

We also understand that may solutions can be found online (this is why we are going to create some new problems). However, the more important point is that, apart from being an academic integrity violation, copying pre-existing solutions denies you an essential learning experience and this will typically result in a poor performance on midterms and the final exam.

The deadline for homework submission will be on Fridays at 5pm when the grader will collect all assignments from the course mailboxes. Students in the Haas morning section may turn in the assignment to the course mailbox marked “151 Haas morning” on the second floor of Seaver Science Center. Students in the Peroomian section may turn in the assignment to the course mailbox marked “151 Peroomian”. Students in the Haas noon section may turn in the assignment to his course mailbox marked “151 Haas noon”. (The building is locked shortly after that time and stays locked until Monday morning.) Written assignments will be returned in class after being graded.

It is very important that your solutions are written legibly with enough details so that anybody, not just the author, can understand what is going on. Specifically, be sure to show intermediate steps and use words, not just equations, to explain the solution. A solution consisting of a string of equations with no comments, a figure if required, or some minimal explanation will be considered unsatisfactory and graded accordingly.

The minimum threshold 75% submission rate cited in the grading criteria above applies to the homework assignment, not to the individual problem count. A partially completed written homework assignment will satisfy the requirement of submission but, for it to count, there must be some evidence of attempts at the assigned problems.

B. Examinations

There will be two Midterm Examinations (February 18 and April 1 at 5pm) and a Final Examination (May 11 at 4:30 pm). 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 solutions written entirely in pen will be considered. During exams no calculators or other electronic devices are permitted. Prior to turning in the exam, no student may leave the exam room unless personally accompanied by 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.

C. Laboratory

At every laboratory meeting (except the first) you must bring your *Laboratory Notebook*. The *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 *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.

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, (213) 740-1138, esirgen@usc.edu.

D. Dropping Some Homework Scores

We recognize that from time to time students find it impossible to complete a specific homework assignment owing to illness or other outside commitments. In order to address this issue, before computing your homework grade we will automatically discard your two lowest homework scores. This will happen without any special permission and so no documentation will be required.

This is intended to cover things like, but not limited to, illness, intercollegiate competitions (both academic and non-academic), intramural competitions, conflicts with other courses scheduling required activities outside of their declared times, and family emergencies.

The only exceptions are

(i) Religious observances when documented on the web site of the Office of Religious Life, [http://orl.usc.edu](http://orl.usc.edu), in which case any affected student must inform his/her instructor of the situation no later than the day before the religious observance.
(ii) Extended and well-documented medical issues.

Warning: You should view the fact that the lowest two homeworks will be dropped as a safety-net, and not as an excuse to goof-off on early homework. A student who misses an early homework for inadequate reasons, and then misses later homework for completely legitimate reasons will receive little sympathy.

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.

A. Lectures

Don’t underestimate the value of questions during the lecture period. In large lectures, many students are reluctant to pose questions that 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 that will be similar to those from the assigned homework sets. This is natural considering that midterm questions frequently are derived from homework problems.

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.

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.

D. T.A. Office Hours - ACB 431

All laboratory teaching assistants have office hours in ACB 431 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 end of classes. 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://dornsife.usc.edu/physics/teaching-assistant-resources. If you find the room unoccupied in contradiction to the posted schedule, inform your instructor.

E. 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.

You might find it useful to use the discussion board within the lecture’s Blackboard site to set up and organize discussion groups.

F. Supplemental Instruction

Supplemental Instruction (SI) is an academic program organized by the Dornsife 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 the SI leader, Jessie Rafson (jrafson@usc.edu), who will be working together with the instructors and attending the same lectures as you do (in Pilch’s section). For further information, see the SI web site, or contact its director, Judy Haw (judyhaw@usc.edu).

G. Viterbi Academic Resource Center

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. Regular review sessions are planned. For more information visit VARC in RTH 222, phone (213) 740-3881, or email viterbi.varc@usc.edu.

H. Published Solutions

Images of midterms and final examinations from previous semesters are available on Blackboard. Solutions to all homework sets will become available at any time after you have submitted them for grading.

I. Other Books

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


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

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.

Electronic Assistance

Everyone in this class has convenient access to the USC network. If you do not al-
ready know what your account name is, you should use your favorite Web browser to reach http://www.usc.edu/firstlogin and follow the instructions there. To get help on using the USC network visit http://itservices.usc.edu. For class functions you will need to use your USC account, not one from an external Internet Service Provider such as gmail or yahoo. 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.

A. E-mail

Your instructors use e-mail to communicate with each other and with the laboratory TAs. This is the most efficient method of contacting your instructor and lab TA outside of class. 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.

B. Course Web Site

https://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, homework assignments, important news and announcements, and solutions to examinations in this and previous semesters. Another useful tool is the discussion board within the lecture’s Blackboard site. If 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.

**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.
# Syllabus

## Part I: Why Things Change?
Motion and Newton’s Laws

<table>
<thead>
<tr>
<th>#</th>
<th>Week of</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 12</td>
<td>Dimensional Analysis, Estimation, Concepts of Motion</td>
<td>Ch. 1-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>January 19, Martin Luther King Day – University Holiday</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 19</td>
<td>1D Kinematics, Vectors and Coordinate Systems</td>
<td>Ch. 2-3</td>
</tr>
<tr>
<td>3</td>
<td>Jan 26</td>
<td>Motion in Higher Dimensions: Projectile Motion, Circular Motion, Relative Velocity</td>
<td>Ch. 4</td>
</tr>
<tr>
<td>4</td>
<td>Feb 2</td>
<td>Newton’s Laws, Free Body Diagrams, Weight, Interactions</td>
<td>Ch. 5-7</td>
</tr>
<tr>
<td>5</td>
<td>Feb 9</td>
<td>Applications of Newton’s Laws: Multiple Bodies, Ropes, Friction, Dynamics of Circular Motion</td>
<td>Ch. 7-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>February 16, Presidents Day – University Holiday</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Feb 16</td>
<td>Midterm 1: Wednesday, Feb 18, 5:00-6:30 pm</td>
<td>Covers Chapters 1-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location: To Be Announced</td>
<td></td>
</tr>
</tbody>
</table>

## Part II: Why Some Things Stay the Same?
Conservation Laws and Other Applications of Newton’s Laws

<table>
<thead>
<tr>
<th>#</th>
<th>Week of</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Feb 16</td>
<td>Impulse and Linear Momentum, Collisions</td>
<td>Ch. 9</td>
</tr>
<tr>
<td>7</td>
<td>Feb 23</td>
<td>Kinetic Energy, Potential Energy, Work</td>
<td>Ch. 10-11</td>
</tr>
<tr>
<td>8</td>
<td>Mar 2</td>
<td>Gravity, Rotational Motion and Energy</td>
<td>Sec. 13.2-13.5, 12.1-12.3</td>
</tr>
<tr>
<td>9</td>
<td>Mar 9</td>
<td>Moment of Inertia, Rotational Dynamics</td>
<td>Sec. 12.4-12.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mar. 16-21: Spring Break</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mar 23</td>
<td>Statics, Rolling Motion, Angular Momentum</td>
<td>Sec. 12.8-12.10</td>
</tr>
<tr>
<td>11</td>
<td>Mar 30</td>
<td>Periodic Motion</td>
<td>Sec. 13.6, 14.1-3, 14-6</td>
</tr>
</tbody>
</table>

Midterm 2: Wednesday, Apr 1, 5:00-6:30 pm
Covers Chapters 9-12
Location: To Be Announced
Part III: It’s All About Energy!
Thermodynamics

<table>
<thead>
<tr>
<th>#</th>
<th>Week of</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Apr 6</td>
<td>Pressure, Temperature, Ideal Gases, Thermodynamic Processes, Work and Heat, Calorimetry</td>
<td>Sec. 15.1-15.3 Ch. 16-17</td>
</tr>
<tr>
<td>13</td>
<td>Apr 13</td>
<td>The Micro/Macro Connection</td>
<td>Ch. 18</td>
</tr>
<tr>
<td>14</td>
<td>Apr 20</td>
<td>Thermodynamic Cycles, Heat Engines, Refrigerators</td>
<td>Ch. 19</td>
</tr>
<tr>
<td>15</td>
<td>Apr 27</td>
<td>Second Law of Thermodynamics, Entropy</td>
<td>Ch. 19</td>
</tr>
</tbody>
</table>

**Final Exam: Monday, May 11, 4:30pm - 6:30pm**
Covers Chapters 1-19
Location: To Be Announced

* Important:
  - This is one of the Exceptions in the Schedule of Classes.
  - Don’t make travel plans based upon a different exam date!
  - If you have any issues or conflicts (e.g. you are taking Business Administration 311), see us immediately.

Other important dates
Last Day to drop a class without a mark of “W”: Friday, February 3
Last Day to drop a class with a mark of “W”: Friday, April 10
Final Exam Period, May 6 - 13