

# PHYSICS 151L: FUNDAMENTALS OF PHYSICS I

## COURSE INFORMATION

### Fall 2019

**\*\*\* If you were absent the first day of class and have not filled out the Day One Questionnaire, please see your professor IMMEDIATELY \*\*\***

#### 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 that 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

##### Prof. Eli Levenson-Falk

*Email address:* elevenso@usc.edu

*Office:* SSC 222

*Office hours:* Monday and Tuesday 3:00-4:00 pm in SSC 319, *and by appointment*

##### Dr. Chris Sutherland

*Email address:* cjsuther@usc.edu

*Office:* SHS 361

*Office hours:* Monday Wednesday 10:30-11:30 am, Tuesday and Thursday 12:00-1:00 pm in SHS 363, *and by appointment*

#### Course Materials

##### A. Required for the Lecture

Cengage WebAssign subscription (must last at least 1 semester—included in Cengage Unlimited)  
Use class key “**usc 5661 9546**” for Prof. Levenson-Falk’s lecture.

Serway, Jewett, and Peroomian, *Physics for Scientists and Engineers*, 10th ed. (Cengage); e-book (included in Cengage Unlimited) or physical book

Smartphone or laptop with internet access, brought to lecture each day (*contact your professor if this will be a financial hardship*)

We recommend purchasing the Cengage Unlimited subscription for 1 term (cost \$120), which will give you access to all Cengage books for 1 semester, and access to WebAssign and this course’s textbook for the next 3 courses (i.e. for Physics 151, 152, and 153). You can also rent or purchase a

physical textbook in addition to the e-book for a small additional charge.

## 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.

## Administrativa

### 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.”)

Section	Days	Time	Instructor	Location
Lecture 50380R	MWF	8:30 – 9:50am	Chris Sutherland	SLH200
Lecture 50382R	MW	12:00 – 1:50pm	Eli Levenson-Falk	SLH200
Quiz 50383R	W	5:00 – 6:20pm		TBA

The quiz section is shared by both lecture sections so that a common time for all sections can be set aside for the midterms. **Quiz sections will only be used for the two midterms in this course** (see pp. 8 - 9). The location for each midterm will be announced shortly before it is given.

There are also laboratory sections, meeting once a week for three hours. For current information, please see [http://physics.usc.edu/Undergraduate/ta\\_lab.html#151](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,  
<http://www.usc.edu/student-affairs/SJACS/forms/tio.pdf>
- (ii) The Undergraduate Guide for Avoiding Plagiarism,  
<http://www.usc.edu/student-affairs/SJACS/forms/tig.pdf>

## E. Classroom Behavior

Please use cell phones and laptops only for note-taking and in-class assignments. The lecture rooms are designed with excellent acoustics, so your “inaudible” conversation with your neighbor is actually quite loud to the lecturer—if you have a question, raise your hand! Please ask questions early and often!

## F. Student Ombudsman

All courses in the Department of Physics & Astronomy have an assigned Student Ombudsman to serve students as a confidential, neutral, informal, and independent resource when they wish to discuss issues concerning their course without directly confronting their instructor. The Student Ombudsman for this course is Chris Gould, [gould@usc.edu](mailto:gould@usc.edu), 213-740-1101, SSC 204.

## Grading

### A. Grading Breakdown

Your final course grade will be based upon four major components: homework, midterms, final exam, and laboratory work. There are 3 possible weighting formulas for the midterm and final exams—each student’s grade will be weighted using the formula that gives them the highest grade.

<u>Grade Component</u>	<u>Weight option 1</u>	<u>Weight 2</u>	<u>Weight 3</u>
Homework and and in-class activities	15%	15%	15%
Midterm 1	20%	10%	25%
Midterm 2	20%	25%	10%
Final Exam	25%	30%	30%
Laboratory	20%	20%	20%

The Laboratory component of the course has the following grade breakdown:

<u>Grade Component</u>	<u>Weight</u>
Pre-lab quiz	20%
Lab performance	40%
Lab write-up	40%

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

### B. Minimum Requirements for Passing the Course

In order to receive a passing grade in the course (D or above) you must receive a passing grade in **both** the lecture **and** the laboratory portions. Specifically, you must earn a minimum score of 70% on the laboratory portion of the course. Failure to do so will result in an automatic F in the course.

Additionally, **you must turn in at least 75% of all homework assignments** (typically 9 out of the 12 assignments that are due). It does not matter if you do only part of an assignment that is turned in, but **failure to turn in at least 75% of the assignments will result in an automatic F in the course.**

Finally, independent of the homework that is to be turned in, you must have completed at least 67% of in-class group activities during the semester. **Failure to complete at least 67% of in-class activities will result in a 0 for your total homework score in the class.**

Each semester a few students fail to complete the laboratory experiments or turn in homework and consequently fail the entire course. Please don't let this happen to you. If you miss a lab session due to some emergency, make sure to arrange a lab make-up session as soon as possible with your lab TA.

### C. Homework Assignments

There will be a two-part homework assignment every week. The first part will count for 2/3 of the grade and will be using the Webassign online system; each student will receive the same problems but with different numerical values in the problem statement. The second part will count for 1/3 of the grade and will be a single problem requiring a handwritten paper solution and will be handed in in class. We expect that it will take you, in total, approximately 6 hours to complete the weekly homework. 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. Experience shows a strong positive correlation between total homework scores and total exam scores. **So do the homework and do it honestly.**

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. Work in groups to figure out a problem, and then **write up your own solution** or input your own answer into Webassign.

We also understand that many 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.

**Homework will be due by the end of class on Wednesday.** Solutions to the homework assignments will be posted on Blackboard immediately after the deadline. As such, late work will NOT be accepted. Written assignments will be returned in class after being graded.

It is very important that your written 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.

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>, 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.

## D. Examinations

There will be two Midterm Examinations (October 2 and November 6 at 5:00 pm) and a Final Examination (Monday, Dec 16 from 4:30 pm to 6:30 pm). The midterm exams will last 60 minutes and will be given during the weekly quiz period to all sections simultaneously. The Final Exam will last 120 minutes and will be comprehensive of the entire semester.

You will not have homework on exam weeks. Instead, you will receive a very difficult written take-home exam at least 1 week before the in-class exam, due when you enter the exam room. These take-home exams will count for 50% of your grade on the midterms; the grade percentage on the take-home part of the final is TBD. **You may use any and all available resources to solve the take-home exam problems.** We strongly encourage students to work together on the take-home exams—they will be hard! The in-class exam will have difficult but short problems that are based on the take-home exam. A student who understands how to solve all the problems on the take-home exam will ace the in-class exam. A student who copies take-home exam solutions and doesn't understand them however will fail the in class exam.

All exams are closed-book and closed-notes. However, we will include equation sheets in each exam similar to those provided in previous semesters. Numerical constants will also be provided.

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. Prior to turning in the exam, no student may leave the exam room unless personally accompanied by a 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, or as soon as the accommodation is granted.

## E. 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](mailto:esirgen@usc.edu).

## 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. Instructor 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 and you need to meet with the instructor privately, 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. We will not schedule private meetings for homework help—we'd love to, but there are just too many students!

Office hours in ACB 238 will be live-streamed and archived on Blackboard; instructors will answer questions from students who show up in person and will also take some electronically-submitted questions.

### 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 and Discussion Section- ACB 438

All laboratory teaching assistants hold an office hour / discussion section in ACB 438 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, please 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, <http://www.usc.edu/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, Abbey Stepnitz ([stepnitz@usc.edu](mailto:stepnitz@usc.edu)) who will be working together with the instructors and attending the same lectures as you do. For further information, see the SI web site, or contact its director, Judy Haw ([judyhaw@usc.edu](mailto:judyhaw@usc.edu)).

## G. Viterbi Academic Resource Center

The Viterbi Academic Resource Center (<http://viterbi.usc.edu/varc>) 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](mailto:viterbi.varc@usc.edu).

## H. Published Solutions

Images of midterms and final examinations from previous semesters are available on Blackboard. Note that the take-home and in-class exams from this year **will not** closely resemble the exams from years past. 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:

- Serway and Jewett, Physics for Scientists and Engineers
- Tipler and Mosca, Physics for Scientists and Engineers
- Ohanian and Markert, Physics for Engineers and Scientists
- Halliday, Resnick, Walker, Fundamentals of Physics
- Resnick, Halliday, Krane, Physics, v.1,
- Young and Freedman, University Physics
- Knight, Physics for Scientists and Engineers with Modern Physics

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

## J. 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 already 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, to find out class logistics, 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. **Your email subject *must* include “[Physics 151]” as your instructors are teaching multiple courses this semester; e-mails which do not include this subject may be ignored.**

Prof. Levenson-Falk and Dr. Sutherland will answer e-mail within 48 hours (usually faster), except on weekends, and will answer almost any question *except* “How do I do this homework problem?” For homework help, use any of the other resources listed here! General physics questions or clarifications of an assignment are ok; occasionally a question cannot be answered easily in e-mail, in which case you will be asked to come to office hours.

## B. Course Web Site

Everyone registered in PHYS 151 should find two separate “courses” already set up within their Blackboard account (<https://blackboard.usc.edu>), 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. The instructors will sometimes join these discussions.

*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.

## Course Calendar and Important Dates

August 26	Fall semester classes begin
September 2	Labor Day (university holiday)
October 2	Midterm 1
October 11	Last day to drop class without a mark of "W," and last day to change enrollment option
October 17-18	Fall Recess
November 6	Midterm 2
November 15	Last day to drop class with mark of "W"
Nov 27-29	Thanksgiving Recess
Dec 6	Fall semester classes end
December 16 4:30 – 6:30 pm	Final exam

### Course Schedule

#	Week of	Topic	Reading
1	Aug. 26	Dimensional Analysis, Estimation, Vectors and Coordinate Systems, Concepts of Motion, Math Review	Ch. 1, 3
2	Sep. 2	<b>September 2, University Holiday</b> 1-D Kinematics	Ch. 2
3	Sep. 9	2-D Motion, Projectile Motion, Circular Motion, Relative Velocity	Ch. 4
4	Sep. 16	Newton's Laws, Free-Body Diagrams, The Force of Gravity	Ch. 5
5	Sep. 23	Applications of Newton's Laws: Multiple bodies, Strings and Pulleys, Friction, Dynamics of Circular Motion	Ch. 6
<b>Midterm #1 Wednesday, October 2, 5:00 PM Location TBA</b>			
6	Sep. 30	Work and Energy	Ch. 7
7	Oct. 7	Conservation of Energy	Ch. 8
8	Oct. 14	Impulse and Linear Momentum <b>October 17-18, Fall Recess</b>	Ch. 9
9	Oct. 21	Rotational Kinematics, Rotational Dynamics	Ch. 10 - 11
10	Oct. 28	Statics, Gravitation	Ch. 12, 13
<b>Midterm #2 Wednesday, November 6, 5:00 PM Location TBA</b>			
11	Nov. 4	Pressure, Temperature, Ideal Gases, Calorimetry	Ch. 18, 20
12	Nov. 11	Thermodynamic Processes, Work and Heat, First Law of Thermodynamics	Ch. 19

13	Nov. 18	Entropy and the Second Law of Thermodynamics	Ch. 21
14	Nov. 25	Entropy and the Second Law of Thermodynamics <b>November 27-29, Thanksgiving Recess</b>	Ch. 21
15	Dec. 2	Review	
<b>*** Final Exam, Monday, December 16 4:30-6:30 pm, Location TBA ***</b>			

\* 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, see us **immediately**.