

PHYSICS 135AL: PHYSICS FOR THE LIFE SCIENCES

FALL 2020

Instructor Information:

Prof. James Boedicker

Email: boedicke@usc.edu

Office hours: Wednesday 3 – 4 pm (online)

Course Information:

Welcome to Physics 135aL! This is the first course in the physics sequence for students majoring in the life sciences or preparing to enter a health-related profession. Physics 135aL will cover the most basic concepts of classical mechanics, sounds, fluids, and thermodynamics. These physical theories explain a huge variety of phenomena directly accessible to our senses, and have revolutionized technology and our understanding of nature. No prior knowledge of physics is required.

Lecture: Prof. Boedicker (50342): Tuesday and Thursday 9:30 am- 10:50 am online
Quiz: *Meets only on days of midterms* Wednesday, 5:00 – 6:30pm online

1. COURSE MATERIALS

1.1 Required for lectures

“D. Nemeschansky, *Physics 135a USC*, Fall 2020, USC Custom Publishing.” This is available on line. This course reader will serve as our textbook as well as be the source of all homework assignments. It has been written specifically for USC’s 135a class!

1.2 Required for lab

General Physics Laboratory Manual (available online through the laboratory *Blackboard* page). Questions concerning the laboratory should be referred to the Lab Director, Dr. Gökhan Esirgen (KAP B19; Email: esirgen@usc.edu).

2. GUIDELINES

2.1 Mathematics prerequisites

Mathematics is the language of physics. However, only minimal mathematical knowledge will be assumed for this course. The prerequisite for this course is a working knowledge of elementary algebra and trigonometry. Use of trigonometry will be restricted to simple situations (*i.e.*, almost entirely right triangles).

2.2 Registration and administration

Your registration for this course consists of three separate parts: the lectures, a “quiz section,” and the laboratory. You must register for each of them. The only exception is that, if you have previously completed the laboratory and have received permission to carry its grade into the

current semester, then you would register only for the lecture and the “quiz section.” The “quiz section” is the time slot allocated to the midterms.

Attention: Students who are repeating 135aL must obtain written permission from the Undergraduate Physics Office (*in ACB439*) in order to be excused from repeating the laboratory. A copy of the written memo must be turned in to the instructor *during the first week of classes*.

The Undergraduate Physics Office in ACB439 deals with all administrative aspects of this class. Additional help regarding administrative issues is from Kimberly Burger in ACB 439 with phone number 740-1140 and email address tobinwil@usc.edu.

2.3 Disabilities

Students who need to request accommodation based on disability are required to register each semester with the Office of Disability Services and Programs (DSP). This office can be found at STU 301 with phone number 231-740-0776. A letter of verification to the instructor from the DSP is needed for the semester you are enrolled in. If you have any further questions please contact the DSP or the instructor.

2.4 Grading

Your grade will be determined according to the following key:

80% lectures:

10% Homework and Class participation

18% Midterm 1

18% Midterm 2

34% Final exam

20% laboratory

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. In addition, you must receive a passing grade on the **final examination**. Each semester a few students fail to complete the laboratory experiments 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.

The average score for the laboratory part of the course is about 95/100. The average score for homework and class participation is 80/100.

Broadly speaking, grading is done by the distribution curve of the combined scores of exams, homework, and lab. No rigid percentage marks (such as, e.g., a rule that 90% corresponds to an A-, or similar) are used. Further details about the grading procedure are given in class.

2.5 Homework

Homework is assigned each week and is due on Thursday at 2pm. The homework must be turned on Blackboard under the section called assignments. Blackboard accepts only **PDF** files. Do not attempt to submit a JPEG file.

As a general policy, no late homework will be accepted and will receive a grade of 0. However, if extraordinary circumstances arise you should email Prof. Boedicker prior to the 2 pm Thursday deadline to discuss the possibility of submitting the homework late. Whether or not late homework will be accepted is at the discretion of Prof. Boedicker.

We expect that it will take several hours to complete each of your 13 homework sets. The homework sets are the central means by which to master the course material, and, consequently, to perform well in the exams. “Understanding physics” does not mean knowing the words by heart and reading the textbook. “Understanding physics” implies the development of the necessary skills to solve physics problems you have not seen before. This means being able to translate real-life situations into the mathematical framework of physics, and making quantitative predictions which can then be related back to the real world. A common misconception is that physics is about “plugging numbers into formulas.” In almost all physics problems you will need to be able to combine a several different physical and mathematical concepts in a novel way. The lectures and homework assignments are designed to help you achieve these goals, and do well in the exams.

Homework problems will range from medium difficult to difficult. Midterm and final exam questions will resemble (and perhaps in some isolated cases even be identical to) many of these homework problems. We urge you to attempt every homework problem, even if you are not able to complete each one.

We encourage you to discuss homework problems with your fellow students. This does not imply, however, simply copying solutions from each other. You can learn a tremendous amount by cooperating and explaining to each other how to analyze a problem, but everyone must turn in independently written solutions. Based on our previous experience, you will learn more physics, and earn a higher grade, if you take the homework problems as an opportunity to learn, which implies making mistakes! If you carefully review your mistakes after receiving the graded homework sets, you will be very unlikely to repeat the same mistakes in the future (and, in particular, on the exams).

All the assigned homework problems are in the course reader. Solutions to the homework sets will be posted on *Blackboard* after the due dates.

2.6 Exams

There will be two midterm exams and a final exam. The midterms will be given during the quiz section. The midterms will cover the course material incrementally throughout the semester, and the final exam will cover the whole course, i.e., it is cumulative.

Please note carefully the date and time of the midterms and the final examinations (see Sec. 8). No exceptions to these dates and times are allowed. If you have a conflict, please attend to it immediately.

There will be *no make-up exams given for any tests in this course*. A missed exam will prevent you from passing unless you have approval from your professor *before the exam* because of an *extreme* emergency.

Please note that the final exam for Phys 135a is considered an *exceptional final*, which means it does *not* follow the standard rules for determining the date and time of the final. ***Our final exam will be held on Friday, November 20th from 8:00 – 10:00am.*** If you have a scheduling conflict with this course's exam and another course's exam please inform your instructor ASAP so that appropriate accommodations can be made.

The midterm exams will be held on

Midterm 1: Wednesday, September 23rd from 5:00 – 6:30pm

Midterm 2: Wednesday, October 21st from 5:00 – 6:30pm

2.7 Class room behavior

This will be an all-online semester. Please keep your microphone muted when not speaking so that you do not add background noise. If you feel comfortable doing so, please keep your video on. Interaction is more difficult than in person, so please be assertive in asking questions! I encourage you to ask questions. All the lecture will be recorded on zoom and they will be available on Blackboard. I will use my iPad as substitute for the blackboard. I will post my iPad notes for each lecture on Blackboard

2.8 Online exams

The exams will be on-line on zoom. During the exam you must have the camera on and pointed on you so that the proctors can see you all the time. You cannot mute you microphone. If the noise from other students disturb you during the exam, you can turn down the volume of your computer. You should periodically check the chat on zoom for any updates during the exam. After you have finished your exam you must scan your work and submit a pdf file to Blackboard.

The online exam is based on the following ethics code which you must sign:

This is a closed book exam. You must work alone and cannot seek any help from another person nor help another. Please rewrite the follow sentence and then sign it.

I pledge my honor that I have not attempted to give or receive an unfair advantage during this Physics 135a examination.

Any violation of the ethics code will result in an automatic F in the class

2.9 Calculators and formula sheet

Only non-programmable calculators are allowed during exams. In order to free you to focus on “understanding physics” rather than “learning physics by heart”, you will be given a formula sheet for the exams. It is your responsibility to understand the meaning of the various symbols, and in what situations the different mathematical relationships apply (and in what situations they do not apply).

2.10 Laboratory

Physics is an experimental science and therefore the laboratory is a very important part of this course. Each of you is being sent a lab kit, free of charge, to enable you to perform experiments in

your residence. These kits will arrive within the first few weeks of the semester. After you receive a lab kit, your Physics 135aL laboratories *will meet* each week.

You will keep a careful laboratory notebook which will be graded each week. There will be no quizzes and no lab homework. Each week you will receive a laboratory grade based solely on the quality of your lab notebook. Your final lab grade will be the simple average of your weekly lab grades.

As noted previously, it is necessary for you to pass the laboratory portion of the course in order to pass the course as whole, and to pass the lab you must receive a final passing grade in the lab.

Questions concerning the laboratory should be referred to the Lab Director, Dr. Gökhan Esirgen (KAP B19; [Email: esirgen@usc.edu](mailto:esirgen@usc.edu)).

3. SUPPORT

You have a variety of opportunities for support available to you.

3.1 Lecture

Do not underestimate the value of questions during the lecture period. In large lectures, many students are reluctant to pose questions which they fear might seem silly to their instructor or to their peers. Almost always, if one student asks a question, there are several other students who were wondering about the same issue. Often such questions tell the instructor what material might benefit from a more detailed discussion. Usually, a portion of each lecture will be devoted to illustrative examples, sometimes taken from previous homework sets, and questions help the instructor select those problems which you've had the greatest difficulties with. Some exam problems may closely resemble homework problems or problems discussed during lectures.

3.2 Laboratory TA's

All lab TA's are graduate students, usually pursuing a PhD in physics. They are all capable of answering any questions you might have regarding the course material covered in the lectures or in the lab. Usually your lab TA can answer questions immediately, either at the beginning or at the end of the lab period. However, some problems you pose may require some additional thought. In either event, you should regard your TA as a resource not only for the laboratory but also for lecture-related questions.

3.3 TA office hours

All physics TA's have online office hours for 100-level physics courses. The TA office hours will be arranged during the first week of class and the links will be posted on Blackboard. TA office hours take place most days (usually Monday through Thursday) and last for several hours each day. Usually there is a different TA available each hour. Sometimes it helps to hear different people answer the same physics question, so if you feel that you did not understand the TA's explanation you might want to see a different TA a little bit later on the same day or on another day. *This is an excellent resource should you need immediate help.*

3.4 Instructor office hours

If you wish to speak to the instructor outside lectures, the instructor's office hours are online on the days posted at beginning of the syllabus. The link to the online office hours can be found on Blackboard.

3.5 Electronic assistance

Everyone registered in this course should find a link to the course in their *Blackboard* account. All information about the course will be posted on *Blackboard* at

<http://blackboard.usc.edu>.

At this address, you will find this *Syllabus*, *important announcements*, *useful hints about some of the homework problems*, as well as *examinations from previous semesters*. Sample exams should only be considered as samples illustrating the types of problems given in previous Physics 135aL exams. Solutions to your homework sets (after the due date) will be placed on *Blackboard*.

4. OBTAINING YOUR GRADES

You will be able to access your grades in Physics 135aL via *Blackboard* at

<http://blackboard.usc.edu>.

5. ACADEMIC INTEGRITY

Homework assignments may be discussed with other students, and help is available as noted above. *Under no circumstances should students seek out homework solutions from alumni of Physics 135aL or from any solution sets or manuals.*

Failure to abide by these rules will result in an automatic zero for the assignment involved and a report to the Office for Academic Integrity. Violations may also result in an F for the course.

An overview of the USC academic integrity policy may be found at

<http://www.usc.edu/student-affairs/SJACS/forms/AcademicIntegrityOverview.pdf>

As mentioned above, working hard on the homework sets is the best preparation for the exams. You would hurt yourself, as well as your fellow students, by cheating.

6. 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, 213-740-1101, SSC 204.

7. FEEDBACK

Feedback regarding all aspects of these lectures is very much appreciated and welcome at any time. Please get in touch with your instructor via email, after lectures, or during office hours.

8. SOME USEFUL DATES

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|-------------------------------|---|
| August 17 | Fall semester classes begin |
| September 7 | Labor Day (University Holiday) |
| September 13 | Last day to drop class without a mark of “W,” and last day to change enrolment option |
| September 23 5– 6:30pm | Midterm 1 |
| October 21 5– 6:30pm | Midterm 2 |
| November 6th | Last day to drop class with mark of “W |
| November 13th | Fall semester classes end |
| November 14-16th | Study days |
| November 20 8-10am | Final exam (Note this is an <i>exceptional final</i>) |

9. COURSE SCHEDULE

Turn in your assignments at the beginning of class on the due dates indicated. Late homework will not be accepted.

You should read through the relevant chapters prior to coming to the lectures each week, and review them again after each lecture before attempting the homework problems.

| Week | Start date | Chapter assignment and subject | Homework problems | Due date |
|--|-------------------|--|--------------------------|-----------------|
| 1 | 8/17 | Chapter 1: One Dimensional Kinematics | Homework set 1, pg. 33 | 8/27 |
| 2 | 8/24 | Chapter 2: Two-dimensional motion | Homework set 2, pg. 74 | 9/3 |
| 3 | 8/31 | Chapter 3: Dynamics and Newton's laws | Homework set 3, pg. 110 | 9/10 |
| 4 | 9/7 | Chapter 4: Circular motion, gravity | Homework set 4, pg. 158 | 9/17 |
| 5 | 9/14 | Chapter 5: Work and energy | Homework set 5, pg. 212 | 9/24 |
| 6 | 9/21 | Chapter 6: System of many particles and conservation of momentum | Homework set 6, pg. 263 | 10/1 |
| Midterm 1 9/23(5:00pm – 6:30pm): Chapters 1 – 4; Online | | | | |
| 7 | 9/28 | Chapter 7: Rotational kinematics | Homework set 7, pg. 320 | 10/8 |
| 8 | 10/5 | Chapter 8: Rotational dynamics Chapter 9: Static equilibrium | Homework set 8, pg. 354 | 10/15 |
| 9 | 10/12 | Chapter 10: Fluids | Homework set 9, pg. 393 | 10/22 |
| 10 | 10/19 | Chapter 11: Harmonic Motion | Homework set 10, pg. 449 | 10/29 |
| Midterm 2 10/21 (5:00pm – 6:30pm): Chapters 5 – 9; Online | | | | |
| 11 | 10/26 | Chapter 12 Waves Chapter 13 Sound | Homework set 11, pg. 481 | 11/5 |
| 12 | 11/2 | Chapter 14: Thermal Physics | Homework set 12, pg. 519 | 11/12 |
| 13 | 11/9 | Chapter 15: Thermodynamics | Homework set 13, pg. 569 | 11/13 |
| Final exam on 11/20 8am-10am | | | | |