

Physics 21 – Spring 2024

(any Physics 19 students please contact us ASAP)

Prof. Jerome Licini, 610 758-5137, LL408, JCL3@lehigh.edu, <http://www.lehigh.edu/~jcl3>

Please record...

Recitation instructor and
section number:

Their contact information:

Textbook: "University Physics," Hugh D. Young and Roger A. Freedman, **Fifteenth Edition**, Pearson Addison-Wesley. The ELECTRONIC TEXTBOOK has been included for all enrolled students at a significantly discounted price as part of your Learning Unlimited program. If you do not want or need this access, you may OPT OUT of these electronic textbooks and the corresponding fee. The link for accessing the e-textbook or for opting out is at the top of the CourseSite website. We will be focusing on the content that would be labelled "Volume 2" in a paper edition, so you should make sure that whatever you purchase contains Chapters 21-36. We will also touch on material from chapters 14-16 and 38-39, but you can get by without owning those. There are multiple avenues to obtain the textbook material. The least expensive is an e-book (as is included automatically in your course fee), but please note that there is research that indicates that students learn and retain better when using a paper textbook. If you want additional resources, you might also consider purchasing the Student Study Guide / Solutions Manual for Volume 2 (ISBN 013521694X) which contains full solutions for half of the odd-numbered problems

Reading Assignments are essential! Look through the chapter **before** the corresponding material is discussed in lecture, then read in detail as needed to solve the problems.

Attendance at all course meetings is required for continued enrollment in the course under University policy (Section 3 of Rules and Procedures). We anticipate being in-person but will move to remote if necessary.

Written Homework: Keeping in mind that your goal is to be able to solve physics problems by yourself on the exams: 1) The assignments are graded primarily on whether you've made a serious effort instead of numerical accuracy, so it is far better to actually work on the problems than to copy somebody else's perfect solution, and 2) Start working on the assignments **early** so that if you get stuck, you have time to discuss the problems with your coursemates or your instructor during recitation. Homework will usually be due every Tuesday and Thursday morning at the beginning of lecture via the bins in the back of LL270.

Quizzes: Quizzes are given in recitation. The quiz questions are typically similar to homework problems. Missed quizzes count as a zero. Only your highest five quiz scores are used in the computation of your course grade, so no makeup quizzes will be offered.

Exams: Two midterm exams will be given at the Common Hour Exam timeslot of 4:25pm on Wednesday February 28 and Wednesday April 10, 2024. The final exam will be scheduled by the Registrar May 7-15 and will NOT be cumulative but cover only the material after the second midterm exam. The allowable resources for in-person exams will be one page of your own notes, plus the equation sheets that are already available on CourseSite.

Course grading: Please schedule these midterm exams on your calendar now: 4:25 PM - 5:40 PM on Wednesday February 28 and Wednesday April 10. Makeups for exams require approval of the Dean of Students. Makeups for the final exam also require a written petition to the Committee on Standing of Students. No makeups will be given for quizzes, because we only use the top five quiz scores. Students with an unusually high level of medical issues or conflicts should contact Professors Licini or Reed.

Course Grading:	Midterm Exam 1 (Wed February 28)	100
	Midterm Exam 2 (Wed April 10)	100
	Final Exam (scheduled by Registrar)	100
	Written homework	100
	Recitation Quizzes (best 5)	50
	Recitation Attendance	50
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	TOTAL	500

IN-PERSON STRUCTURE:

- Plans are for Spring 2024 to be in-person.
- Homework should be placed in the bin for your recitation section number as you arrive for lecture.
- The lectures (10:45am and 12:10 pm on Tuesdays and Thursdays) will present 50 minutes of content followed by 25 minutes of optional-attendance problem-solving workshop.
- The recitations on Wednesdays and Fridays will present 50 minutes of content that is typically focused on homework and problem-solving techniques. Quizzes will usually be held at the beginning of recitation.

COMMUNITY EXPECTATIONS DURING IN-PERSON INSTRUCTION: Students must follow all University Covid-related guidance. Whenever required, masks must be worn properly, covering both your mouth and nose. No eating or drinking is permitted during class.

CONTENTS: Physics 21 “Introductory Physics II” is the four-credit “content” portion of the second semester of Lehigh University’s calculus-based two-semester introductory physics sequence, designed primarily for science and engineering students. In Physics 21, we cover two broad subject areas, ELECTROMAGNETISM (including electrostatics, magnetostatics, electrodynamics, and circuits) and WAVES AND OPTICS (including mechanical and electromagnetic waves, optics, diffraction and interference, and quantum phenomena). **Prerequisites/Corequisites:** Physics 21 requires prior mechanics course credit (Physics 10 or 11) and prior second-semester calculus credit (Math 22, 32, or 52). **Other related courses:** Physics 22 “Introductory Physics II Laboratory” is the separately-scheduled one-credit laboratory course, which should typically be taken during the same semester as Physics 21. Physics 072 is an additional one-credit online option that parallels our course for students interested in advanced topics via independent study. Physics 13 “General Physics II” covers comparable material with a more biological orientation and somewhat lower math expectations. **Structure:** During each of the 14 weeks in the semester, we meet for two 50-minute lectures (primarily content-delivery) and two 50-minute small-group recitations (primarily problem-solving practice, coaching, and evaluation). There will be an optional problem-solving workshop in the 25 minutes after most of the lectures.

FINAL COMPETENCIES:

- 1) Students demonstrate competence with the mathematical tools and techniques required (units, conversions, exponential notation, significant figures, algebra, quadratic equations, simultaneous equations, geometry, trigonometry, vector components, scalar and vector products, differentiation and integration of polynomial, trigonometric, and vector functions, and interpreting and creating graphs).
- 2) Students demonstrate competence at analyzing word problems into underlying physical principles, visual depictions, equations, and graphs as appropriate.
- 3) Students understand the relationships between sources and fields and can determine electric and magnetic fields.
- 4) Students understand the consequences of time-varying fields and can use them to analyze and predict induced electric and magnetic fields.

- 5) Students understand applying the above concepts to discrete circuits elements and can use them to solve the overall behavior of DC, transient, and AC circuits.
- 6) Students understand wave principles and can use them to describe and predict the behavior of mechanical, sound, and electromagnetic waves.
- 7) Students understand the propagation of electromagnetic waves as manifested in geometric optics as well as polarization, interference, and diffraction.
- 8) Students understand that wave phenomena apply to particles as well, and can understand basic quantum principles of photons, particles, and atoms.

CELL PHONES AND ELECTRONIC DEVICES:

During exams, absolutely no use of cell phones or other networkable electronic devices. (This will be automatically treated as an academic integrity violation.) During lectures and recitations, please do not use your cell phone or other electronic device. (This is a distraction to yourself and other students, as demonstrated by peer-reviewed research studies.) These course policies are backed up by official policy from the College of Arts and Sciences: “No cell phones, laptops, tablets, e-readers, MP3 players, calculators, or other electronic devices are allowed to be used during any class, quiz, or exam in the College of Arts and Sciences, unless otherwise specified by the instructor or authorized as an accommodation of disability. Electronic devices must be silenced and put away out of sight during class unless their use is permitted.”

TUTORING RESOURCES:

The Dean of Students office is a great starting place for academic help! Their Center for Academic Success (<http://studentaffairs.lehigh.edu/success>) usually offers tutoring for Physics 21. Another resource is the Writing and Math Center in Drown Hall (<http://studentaffairs.lehigh.edu/node/1261>). Some issues can be handled best by the University Counseling Service.

Accommodations for Students with Disabilities:

Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University’s educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or online at <https://studentaffairs.lehigh.edu/disabilities>.

The Principles of Our Equitable Community:

Lehigh University endorses The Principles of Our Equitable Community [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom..

Religious holidays: (<https://chaplain.lehigh.edu/node/6>)

1. Inform your instructor that you will be absent from class due to observance of religious holidays.
2. Arrange with the instructor to complete assignments or any required make-up work.
(Dates for many religious holidays are posted on the Chaplain's web page listed above.)

Student Senate Statement on Academic Integrity: We, the Lehigh University Student Senate, as the standing representative body of all undergraduates, reaffirm the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the University's Code of Conduct.

WE FULLY ENFORCE ALL UNIVERSITY STANDARDS FOR ACADEMIC INTEGRITY.

STATEMENT ON IRRESPONSIBLE ACADEMIC BEHAVIOR: (after Prof. Barry Bean, Biology)

There are many forms of irresponsible behavior that can ruin opportunities for you or for others in this course; there is no room and no excuse for bad behavior. Examples of irresponsible behavior cover a wide range, and include cheating, plagiarism, creating hazards or disruptions, slacking on responsibilities, unfairly exploiting the efforts of others, etc. Appropriate penalties should be expected. Offenders may lose points from their course totals, and serious offenders may be dropped from the course. Further explanation and guidelines on academic integrity at Lehigh can be found on the University Student Conduct System web page (<http://studentaffairs.lehigh.edu/conduct>) and on the Provost's Academic Integrity Site (<http://www.lehigh.edu/~inprv/faculty/academicintegrity.html>). It is firm policy in this course that cheating or plagiarism are unacceptable violations of academic integrity, and will earn an F as the semester grade in the course. **ALL EXAMS AND QUIZZES ARE REQUIRED TO BE STRICTLY YOUR OWN INDIVIDUAL WORK!**

HOMEWORK COLLABORATION POLICY: (after Prof. Edwin Kay, CSE)

Learning on homework assignments allows for healthy cooperation and collaboration. In grappling with the course work, the SHARING of ideas is educationally useful. The COPYING of ideas is destructive, fraudulent, and unacceptable. It is difficult to know where to draw the line between educationally useful sharing of ideas and the educationally destructive copying of ideas. I will paraphrase Roger D. Eastman of Loyola College (attributing the source material!): "I encourage you to help each other with homework assignments, but I also want you to understand where the help should stop. Don't take someone else's solution to copy or "for reference," or give yours for copying or "for reference." If you want to show someone your solution to illustrate the trouble you are having, that's fine; if you want to brainstorm about what the assignment requires and how to approach it, that's fine; if you want to share your knowledge of physics, that's fine; but letting someone copy your solution line by line, in fact or spirit, is not fine." Working together on troublesome areas, then continuing individually is a good technique. It is okay to tell the other person what is wrong and coach them toward solving the problem, but do not simply provide the correct equations.

Please note that the homework grading policy is designed so that making a serious attempt earns most of the points. In fact, indicating on your homework where you get stuck or have trouble will INCREASE the chance that you will get some notes of advice from the grader that will actually help you learn how to solve that type of problem. Submitting a copy of someone else's perfect solution will lead to LOWER exam scores since you will be unprepared to work the problems on your own.

Written HW assignments are NOT ENOUGH to develop fluency with exam problems!

Exam preparation: see suggestions on CourseSite

Copies of "3000 Solved Problems in Physics" in Fair-Mart

Student Solution Manual > half of odd-numbered problems (ISBN 013521694X)

Resources at <http://www.lehigh.edu/~jcl3/index.html>

From Prof. Dan Stryer at Oberlin College are two excellent pages: "Study Tips for Introductory Physics Students" and "Solving Problems in Physics"

PHYSICS 21 – Tentative Schedule for Spring 2024

DATE	TOPIC	READING
T Jan 23	Electrostatics, Coulomb's Law	21.0 to 21.3
W Jan 24	Vector techniques	1.7 to 1.10
Th Jan 25	Electric Field	21.4 to 21.s
F Jan 26	HW1	
Tu Jan 30	Gauss's Law	Ch 22
W Jan 31	HW2	
Th Feb 1	Electric Potential Intro.	23.0 to 23.3
F Feb 2	HW3	
Tu Feb 6	Electric Potential Cont.	23.4 to 24.1
W Feb 7	HW4, Quiz 1 (on HW 1-3)	
Th Feb 8	Electrostatic Energy and Capacitance	24.2 to 24.s
F Feb 9	HW5	
Tu Feb 13	Current, Resistance, EMF	Ch 25
We Feb 14	HW6	
Th Feb 15	Kirchoff's Rules	26.0 to 26.3
F Feb 16	HW7, Quiz 2 (on HW 4-6)	
Tu Feb 20	RC Circuits	26.4 to 26.s
W Feb 21	HW8	
Th Feb 22	Magnetic Field	27.0 to 27.3
F Feb 23	HW9	
Tu Feb 27	Optional-attendance review session	review
W Feb 28	Review for midterm exam Midterm 1 @ 4:25 pm	
Th Feb 29	Magnetic Force	27.4 to 27.s
F Mar 1	HW10	
Tu Mar 5	Biot-Savart Law	28.0 to 28.4
W Mar 6	HW11, Quiz 3 (on HW 7-10)	
Th Mar 7	Ampere's Law	28.5 to 28.s
F Mar 8	HW12	
March 11-15	Spring Break	a novel

DATE	TOPIC	READING
Tu Mar 19	Time-varying fields	Ch 29
W Mar 20	HW13	
Th Mar 21	Inductance	Ch 30
F Mar 22	HW14, Quiz 4 (on HW 11-13)	
Tu Mar 26	AC Circuits	Ch 31
W Mar 27	HW15	
Th Mar 28	Wave motion	15.0 to 15.5
F Mar 29	HW16	
Tu Apr 2	Standing waves	15.6 to 15.s
W Apr 3	HW17, Quiz 5 (HW 14-16)	
Th Apr 4	Electromagnetic waves	Ch 32
F Apr 5	HW18	
Tu Apr 9	Optional-attendance review session	review
W Apr 10	Review for midterm exam Midterm 2 @ 4:25 pm	
Th Apr 11	Propagation of EM Waves	33.0 to 33.4
F Apr 12	HW19	
Tu Apr 16	Polarization	33.5 to 33.s
W Apr 17	HW20, Quiz 6 (HW 17-19)	
Th Apr 18	Ray Optics	Ch 34
F Apr 19	HW21	
Tu Apr 23	Interference	Ch 35
W Apr 24	HW22	
Th Apr 25	Diffraction	Ch 36
Fr Apr 26	HW23, Quiz 7 (HW 20-22)	
Tu Apr 30	Photons, Atoms	Ch 38
W May 1	HW24	
Th May 2	Quantum Phenomena	Ch 39
F May 3	HW25, Quiz 8 (HW 23-24)	
Sat May 4	RCS review session for lecture	
M May 6	RCS review session for recitation	
May 7 – 15	Final Exam Period (exam scheduled by Registrar)	