

Physics 121 Syllabus
General Physics I: Mechanics
Summer 2014

“Young professors like to cover a lot of material—I prefer to uncover a little.”

—V. Weisskopf.

Content. Kinematics, Particle dynamics, Newton’s laws of motion, Work, Kinetic Energy, Energy and Momentum Conservation, Rotational Motion, Conservation of Angular Momentum, Path integrals, Gravity, Relativity, Astrophysics and Cosmology.

Pre-requisites. Concurrent Math 121 or one year of high school calculus.

Schedule. Lectures M, T, W, Th 9:30 a.m. - 11:20 a.m. in Rockefeller 306. Dates: Monday June 2 to Thursday July 3.

Lab schedule. Labs T and Th 12:30 p.m. to 3:30 p.m. starting Thursday June 5 ending Thursday Jun 26. For more information see separate Lab announcements document.

Instructors and contact info

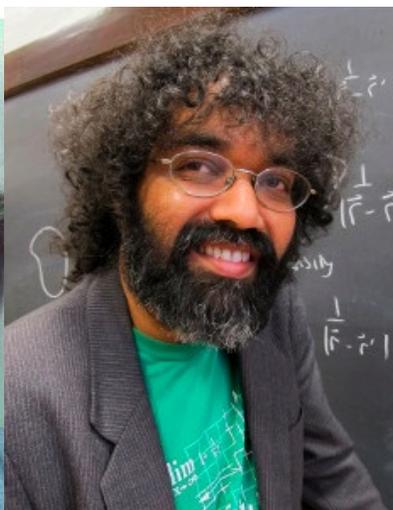


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Course website

Lab website <http://physicslabs.phys.cwru.edu/MECH/121>

Office hours To be announced.

Recommended texts Hans Ohanian and John Markert, *Physics for Engineers and Scientists*, vol 1 (3rd edition, 2007) is the recommended text. The text is recommended, not required. If you wish you may substitute another textbook at the same level such as Halliday, Resnick and Walker, *Fundamentals of Physics* (10th edition, 2013) or Young and Freedman, *Sears and Zemansky's University Physics with Modern Physics* (13th edition, 2011). The new textbook by Shankar, *Fundamentals of Physics* (Yale University Press, 2013) is a companion to the Open Yale Course and is remarkably compact and inexpensive. Another recommended text is Gonick and Huffman, *The Cartoon Guide to Physics*, less formal than a conventional textbook, but with great artwork, and a refreshingly lucid presentation, closer to this course than other texts.

Workload and grading rubric

Homework - 20%

Midterm Exams - $10\% + 10\% + 10\% = 30\%$ or $5\% + 10\% + 15\% = 30\%$, whichever leads to the higher total score.

Final Exam - 25%

Laboratory - 25%

As a rough guide the cutoffs for grades might be A - 90% and higher, B - 80% to 90%, C - 70% to 80%, D - 60% to 70%. The actual cutoffs will be determined by the instructors at the end of the semester. They will be based on our assessment of the difficulty of our exams and might differ substantially from the numbers that are given here solely as a rough guide. The grading will not be curved: we do not have fixed quotas for the number of students who will get each letter grade. It is essential to satisfactorily complete the lab component of the course and to come to the final exam in order to get a passing grade.

Homework Generally homework will be assigned twice weekly on Mondays and Wednesdays. Homework assigned on Monday will be due the following Thursday by 5 p.m. Homework assigned on Wednesdays will be due the following Monday by 5 p.m. Solutions to the homework will be posted by the instructors on the course website soon after it is due. Your lowest two

homework scores will be omitted in computing your aggregate score on the homework. However doing all homework is essential to properly learning the material. The deadlines for homework submission will be strictly enforced. Late homework will generally not be graded. Exceptions may be made in case of illness or personal emergencies. In such cases you must notify one of the instructors as soon as possible, preferably before the deadline. Collaboration on homework is permitted. The purpose of collaboration is to encourage students to learn from each other. You may discuss problems with other students as well as the instructors. However you must write up the answers on your own. Outright copying of another student's work without understanding does not constitute legitimate collaboration. It is plagiarism and is not acceptable.

Midterm Exams There will be three midterm exams during the semester. Each exam is of 45 minutes duration. Tentatively it is planned that the exams will be held in class on Thursday June 12, Thursday June 19 and Thursday June 26. We can schedule make up exams only under circumstances such as illness or a personal emergency. In such cases you should notify the instructors in advance if possible and at the earliest in any event. The exams are open book to this extent: to each exam you may bring one single-sided sheet of handwritten notes. Use of computers, phones or any devices with communication capabilities during the exam is not permissible.

Final Exam The final exam is three hours in duration and is schedule for Thursday July 3, 9:30 a.m. to 12:30 p.m. The rules for the final are similar to the midterms except that you may bring up to three sheets of handwritten notes.

Office hours Office hours provide an opportunity to interact with the instructors one on one or in small groups. Coming to office hours is beneficial whether you are doing well or struggling; it is encouraged in either case.

How to study Here are a few common sense tips. Although obvious, they bear repeating. If you were looking for profound insights based on the latest developments in learning theory, this is not the place to look. (1) Come to class and pay attention. It will save you an incredible amount of time if you can learn material directly from the lectures. "Showing up is 80% of life" (W. Allen, 1977). (2) Do all the homework and practice problems. Make sure you understand all of them fully. The book is a great resource for additional practice problems if needed. (3) An hour of work when you are well rested is worth many under conditions of sleep deprivation. Give yourself plenty of time to do the homework. Don't save it up for the night before it's due. The

same for exam prep. Regular work is particularly important for a fast paced summer course.

A document entitled “How to get an A in this course” provides more guidance and will be available on the course website.

Goals of Physics 121 (1) To convey the deep understanding of nature provided by physics. (2) To introduce Newtonian mechanics and classical physics that is the foundation of all of modern science. (3) To have students learn to apply these concepts and methods to solving problems with precision and mathematical sophistication. (4) To familiarize students with applications of physics to related sciences and to give a flavor of cutting edge research. (5) To teach problem solving skills that are characteristic of the field of physics but are much more broadly applicable.

Majoring in Physics Physics is an excellent major if you want to be a physicist. But it is a remarkably good major even if your long term interests lie elsewhere. Physics majors are consistently the top performers or close to the top on the MCAT and LSAT exams. At CWRU our majors have gone on to graduate school in fields that range from Mathematics and Engineering to Nursing. Nationally approximately 50% of all physics majors go on to graduate school. Typically, a larger fraction of our majors have gone on to graduate school, approximately 2/3 of them in physics and the rest in other fields. Physics majors who join the workforce directly after their undergraduate degree pursue careers in diverse fields, notably engineering and finance. Recognizing the varied interests of physics majors, the Physics Department at CWRU offers a number of different physics degree programs. More information about our degree programs is on the department website at <http://www.phys.cwru.edu/undergrad/programs/> You may also wish to contact Professor Gary Chottiner (gsc2@case.edu) for information about the BS and BA in Physics, Professor Harsh Mathur (hxm7@case.edu) for information on the BS in Mathematics and Physics and BS Mathematical Physics Concentration, Professor Michael Martens (mam18@case.edu) for information about the Engineering Physics major and Professor Robert Brown (rwb@case.edu) for information about the BS Biophysics Concentration.

Accommodations for disabilities If you wish to request accommodations for disabilities please contact Educational Services for Students (ESS), Sears Building Room 470 (phone: 216 368 5230) early in the semester.

Tentative calendar

The calendar is intended as a rough guide. Occasional departures from the script are to be expected. Chapter numbers refer to the text of Ohanian and Markert.

Week 1 Jun 2 - Jun 5.

Monday: Chapters 1 and 2 Linear Motion

Tuesday: Chapter 3 Vector Review

Wednesday: Chapter 4 Projectiles, relative motion, circular motion

Thursday: Chapter 5 Forces and Newton's Laws.

Week 2 Jun 9 - Jun 12.

Monday, Jun 9. Chapters 5 and 6 Newton's Laws and Free Body Diagrams

Tuesday, Jun 10. Chapters 5 and 6 continued, Chapter 7 Work and Energy

Wednesday, Jun 11. Chapters 7 and 8 Work and Energy and Conservation

Thursday, Jun 12. **Exam 1.** Chapter 8 continued.

Week 3 Jun 16 - Jun 19.

Monday, Jun 16. Chapter 9 Gravity

Tuesday, Jun 17. Chapter 10 and 11 Systems and Collisions.

Wednesday, Jun 18. Chapter 11 and 12 Collisions and Rotations.

Thursday, Jun 19. **Exam 2.** Chapter 12 Rotations.

Week 4 Jun 23 - Jun 26.

Monday, Jun 23. Chapter 13 Statics and Angular Momentum.

Tuesday, Jun 24. Chapter 14 Solids and Fluids and Chapter 15 Oscillators.

Wednesday, Jun 25. Chapter 15 Oscillators, Chapter 16, Waves and Sound.

Thursday, Jun 26. **Exam 3.** Chapter 17 Einstein's relativity.

Week 5 Jun 30 - Jul 3.

Monday, Jun 30. Chapter 17 Einstein's relativity.

Tuesday, July 1. Review

Wednesday, July 2. Review

Thursday, July 3. **Final Exam. 9:30 a.m. - 12:30 p.m.**