

PH 352-4B Modern Physics II

Time: 5:30-6:45 PM, Tues/Thur

Classroom: CH 396

Text: Modern Physics for Scientists and Engineers, Thornton & Rex, 2nd Ed., 2000

Halliday, Resnick & Walker, Fundamentals of Physics, 6th Ed., 2001 (Vol 1, Pt 2)

Prerequisite: PH 351

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Office Hours: Mon 10:00 AM-noon; Thurs 10:00 AM-noon Other: by appt.

Course objectives: PH 352 is the final semester of your 2-year equipping with the general tools of Physics. After this and concurrently-taken math courses, you will be prepared to grapple with more intensive mathematical physics, as well as specialized courses which may form an integral part of your career. Objectives: (i) Become fluent in elementary and intermediate statistical and thermodynamic methods and their applications in science; (ii) complete a course study of major 20th century developments in Physics; (iii) begin your scientific engagement with cutting edge 21st-century Physics; (iv) become one of the few who can explain and defend modern Physics developments and mathematically and scientifically defend your assertions; (v) gain your first experience with written and oral expectations common in the professional world.

Milestones: (i) Complete a ~5-week mini-course in thermodynamics and statistical mechanics, with separate exam; (ii) take the Physics Major Field Test to assess your strengths & weaknesses at this first plateau in your Physics curriculum; (iii) write an AIP-journal formatted report as a term project; (iv) make a 30-min oral presentation of your project. (iii and iv are expectations of all Physics majors.)

Grading: Homework 30%, Exams 2 x 20% ea; Term project (inc. lab) 30%. The exams and project will be graded A-, C+, etc.; overall homework % will also be converted to a letter grade.

Homework: Weekly, due in class.¹ The homework load will lighten during the last 4 weeks to allow more time for term project work. Selected/requested solutions will be posted on course web site. However, your primary problem-solving resource should be office hours.

Lab: There will not be a formal lab this semester. However, as part of your term project, you will do not just a literature investigation, but also an experimental or computational investigation of one aspect of your project. See me within the first three weeks, so I can direct you to the appropriate lab resources or research group.

Text reading assignments. Material should be read before class. The syllabus will guide your reading, but keep track of whether the class is proceeding ahead or behind schedule.

Exams.² The exams will be a full class period in duration. *Problems* will mirror homework problems and class examples; *conceptual questions* will assess qualitative understanding of lecture and assigned reading. One 3x5 note card may be used, as well as math tables.

Term Project. In place of a final exam you will complete a written and oral term project in which you will demonstrate your grasp of Modern Physics applied to a specific area of science. See end for details. Begin your consideration of a topic after the first class.

¹ Day late: 25% off; two days late, 50% off; >three days late, no credit. Occasionally may shift to Thurs due date.

² Tables of integrals and math data are allowed on exams, unless explicitly restricted before the exam.

Tentative schedule

Date	Reading ³	Topics	Notes
Jan 4,6	HRW 19	Heat, 1 st Law of Thermo	
Jan 11,13	HRW 20	Kinetic Theory, Averages, Fluctuations	Some material added to HRW
Jan 18,20	HRW 21	Entropy, 2 nd Law	MLK holiday
Jan 25,27	9.1-9.2	Intro., Maxwell distrib	
Feb 1,3	9.3-9.5	Equipart., class/quantum stat.	
Feb 8,10	9.6-9.7	Fermi-Direc, Bose-Einstein	
Feb 15,17	10.1-10.3	Molec bonds, lasers, solids	Exam 1⁴ : HRW, R Ch 9
Feb 22,24	10.4-10.6	Thermal, magnetic, conduct.	
Mar 1,3	11.1-11.2	Band, semicond. theory	
Mar 8,10	11.3-12.1	Semiconductors, nuclei	Physics MFT ⁵
Mar 15,17	12.2-12.8	Nuclear forces, processes, dating	Physics Major Field Test (MFT)
Mar 22,24	13.2-13.7	Fission, fusion	
Mar 27- Apr 2	<i>Spring Break</i>	<i>Spring Break</i>	<i>Spring Break</i>
Apr 5,7	15.1-15.3	General relativity G. Waves,	
Apr 12,14	15.4-16.2	Black holes, Big bang	
Apr 19,21	16.3-16.7	Astron. objects	Exam 2 : Ch's 10-13, 15-16
Apr 26,28	tba	String Theory, Student presentations	
May 3 4:15-6:45 PM		Student presentations.	Student presentations.

PH 352 Project: Written Paper and Oral Presentation

- Write a 15-page⁶, double-spaced review paper, complete with appropriate diagrams/graphics and references, in AIP/APS-publication submission format for the journal you choose. (If you do not know what this format is, find out! See also “Lab” on page 1.)
- In place of a formal lab for this semester, you should do a targeted experiment or computation of your own, related to your project. You should incorporate this experiment into your paper, but present fuller details in a separate lab report, which you should cite in your paper appropriately (usually as a “private communication”).
- Present a 30-minute talk to the class during the scheduled times. Use transparencies or PowerPoint + computer projector to present the talk. A laptop + projector will be available.
- Clear the topic with me by the end of the 4th week (no earlier than end of 2nd week). For this purpose, you should show me at least two primary reference papers. One (and only one) of these should be from a popular journal reporting on recent scientific/engineering developments in the year 2002 or later. Science News is a good source. Everyone's topic should be different.
- On the scheduled final exam day, turn in a bound booklet containing
 - the report plus a copy of the APS Instructions to Authors (Information for Contributors, etc.) for the journal you have chosen (specify which journal).
 - xerox copies of your presentation transparencies or an electronic file of your PowerPoint presentation,
 - a CD or floppy disk(s) containing your report in MS Word, pdf, html or other AIP-journal-approved format.
- To be graded on written paper (85%, inc. lab report) and oral presentation (15%).

³ The actual lectures will likely shift slightly from this schedule; take note of the class pace. “HRW”=Halliday, Resnick & Walker text; “R” = Thornton & Rex text; chapters w/o HRW are from Rex.

⁴ We will choose the day of each midterm, Tues or Thurs, the 2nd week before the exam.

⁵ Description to be handed out separately.

⁶ 15 pp, not including title page, references, appendix, figures.