

Course Syllabus
College Physics II (PHYS 2020)
Adam Johnston
Spring 2009

The further we progress in knowledge, the more clearly we can discern the vastness of our ignorance.

Karl Popper

OVERVIEW:

This course is a continuation of College Physics I (PHYS 2010). This semester will show how we can take the knowledge of physics as we have come to know it and further expand our ideas of how nature works. In the process we will start to understand more about the fundamental forces of the universe, the building blocks of matter, and what energy is. At the same time that we continue to expand on previous ideas, the “vastness of our ignorance” will become increasingly clear as we see the shortcomings in the very physics that we’ve been learning. Historically, major corrections in our understanding of physics have been made so that time is relative, space is warped, and particles are waves. We will explore the reasons for and the implications of these findings of the last century.

Like the previous semester, this course will force you to both conceptualize the fundamental ideas within physics and apply them to problem solving situations. Somewhat different from last semester, however, is that many of the applications of this semester’s subject matter are more abstract: You will imagine fundamental submicroscopic particles, the initial conditions of the universe, and traveling at speeds approaching the speed of light. Although the coverage of this semester is not meant to be more difficult than the one previous, its level of abstraction does challenge us to consider situations that we cannot possibly consider firsthand. Perhaps the greatest lesson of this entire semester will be to see how we piece together the natural world, even when we cannot experience that which we are describing directly.

COURSE OBJECTIVES:

Students who successfully complete this course should learn the following:

- Conceptual understandings of physics in the areas of electricity, magnetism, optics, and modern physics.
- The ability to think critically about and solve problems regarding the above concepts.
- Practical laboratory methods used to study the above concepts.

THE DETAILS:

Instructor: Dr. Adam Johnston

Phone: 626.7711 (Extension 7711 on campus)

Email: ajohnston@weber.edu

Office: SL 207

Office Hours: Daily, 9-11 AM. Please feel free to drop by, call, or email if you would like to meet at some other time.

Meeting times: Daily, 8:00 – 8:50 AM

Meeting place: LL 121

Final exam period: Wednesday, April 29th, 7:00 – 9:00 AM

Texts:

- Giambattista, Richardson, & Richardson, *Physics*. McGraw Hill.
- Lab Manual for Physics 2020/2220. (This is produced by printing services on campus and located in an appropriate section of the bookstore.

Course Web Page: <http://physics.weber.edu/johnston/genphsx>

Basic course information, lab schedule, assignments, and homework solutions will be posted on the web page. In addition, you should be able to access your recorded scores via this page.

Prerequisite: PHYS 2010. It is *crucial* that you have passed and understand the material from *College Physics I*. If you “barely survived” PHYS 2010, you should consider taking it again before taking this course. Please see me if you have any concerns about this.

Corequisite: You must also be registered for a PHYS 2029 laboratory section that meets once per week.

GRADING:

Although most of you are concerned only with how to better understand the natural world from the physicist's perspective, some of you might also be interested in how you will be graded in this course. The table at right shows how tasks will be weighted for grading.

"What about homework?" you ask? Homework will be assigned for each chapter, however it will not be turned in or graded. Solutions will be posted and you are expected to complete the homework, for it will prepare you for quizzes and exams. You must do the homework to succeed in this class. You will find the problems on quizzes and exams to be very much like those assigned for homework. At the end of each chapter or two, before you take a quiz or exam (see calendar below), we will review any difficulties you may have had with the homework.

Exams: 4 midterms @ 12% ea.: 1 final exam @ 24%:	= 48% = 24%
Quizzes: Best 5 (out of 7):	= 10%
In-class activities:	= 3%
Lab reports:	= 12%
Lab exam:	= 3%
Total:	=100%

Each chapter end quiz will take about 20 minutes of class time. On it will be about 3 to 6 multiple choice questions either asking you to solve for a numerical answer to a problem or to consider some concept or situation. There will also be 1 or 2 questions for which you need to show your work and provide your own answer. Midterms will cover 3-4 chapters of material, and will simply be longer versions of the quizzes, although with a greater emphasis on worked out problems over multiple choice conceptual questions. At least one problem on each midterm (worth about 10% of the exam) will directly cover material from the laboratory. The final exam will be comprehensive and will be about twice as long as a midterm exam, but similar in its questions and content. A list of potentially useful information, including equations and constants, will be provided on each quiz or exam. It will still be up to you to determine which equations and numbers are useful in solving a given problem.

In-class activities will range from brief papers to group problem solving activities. Count on these occurring about once every week. If you're not there, you won't get credit, even if you have a good excuse. That's just the way it is. Don't worry – missing a single in-class activity isn't going to destroy your grade.

Lab report scores will be assigned by your lab instructor and reported to the course instructor. A final, practical lab exam worth 3% of your total grade will be written by the main course instructor to be given during the last week of laboratory and will then be graded by the main course instructor. Once all of these grades have been reported, scores will be normalized so that each lab section has approximately the same average grade. In most cases, lab report grades are relatively high and will bolster your total grade, since lab reports are done with lab group members and with the assistance of a lab instructor and/or a lab aide. You should pay close attention to labs throughout the semester in order to prepare for the practical lab exam and because about 10% of each midterm in this course will include material directly from the lab. The lab schedule is posted online at the course web site.

Once all scores have been recorded and tallied, your percentage score (after the above weighting is applied) will determine your grade. The grading scale will look something like the one shown at right. Note that your scores will be calculated to the nearest one-tenth of a percentage, and scores are not rounded up, even if you're on the border between two grades. For all grades (except E), a "plus" or "minus" will be assigned for the top or bottom two points within each scale (e.g., a 74.0 % gets a C+). As with most anything in this course, this grading scale may be revised in the event that it becomes obviously unfair. The basic philosophy of this scale is to show you that you are not competing with one another (as may be the case with certain "curved" grade scales) and to also allow for a fair distribution of scores and grades. Please let me know if this creates any anxiety or concerns on your part.

A	90.0 - 100
A-	85.0 - 90.0
B	75.0 - 85.0
C	65.0 - 75.0
D	55.0 - 65.0
E	below 55.0

IMPORTANT NOTES:

- Although your attendance of lecture is not recorded, it is virtually required that you show up for class. This is for several reasons. First, lecture is surely to cover and/or clarify material that is not presented in the text and that you could be responsible for on exams. Scheduled quizzes and homework assignments will be given in class. Many lectures involve demonstrations that are potentially harmful to the instructor, and you wouldn't want to miss any disastrous, life-threatening accidents. Finally, in-class activities are, obviously, done during class.
- A reminder on homework: Yes, that's right: you don't have to turn in any homework. And yes, that's right: the solutions to the homework are all posted. However, you must do the homework in order to do well in

this course. The assigned homework is meant to be a tool to help you prepare for quizzes and exams. If you run out of homework to do, find more problems at the end of each chapter or re-read the text. Still looking for something to do? Start making up your own problems and solving them. Work with others on the homework and when studying whenever possible – trying to explain ideas to other people is perhaps the best way to learn something.

- Your lab instructor has the freedom to design many aspects of your lab section as he/she sees fit. If you have concerns regarding how your lab section is being graded relative to another lab section, you should feel free to talk with the lab instructor and/or me; however, random moaning and crying won't be tolerated. Remember that adjustments to your lab grade may be made after all work is turned in and the average grades for each lab section have been evaluated.
- No make-up exams or quizzes will be presented without prior permission from the instructor. The final will be given only at the scheduled time. Individual "dog-ate-it" and "had-to-get-married" stories will be considered on a case-by-case basis. In order to get more leniency, notify me in advance of any problems you might have. Since you have two quizzes to "drop," most pleas (however logical, sincere, and/or honest) to make up a quiz will not be granted.
- Cheating is the most personally offensive action you can make towards the course instructor and the person sitting next to you. Academic dishonesty on any work will not be tolerated. Extreme violations will result in automatic failure of the course. Of course, studying and doing homework in groups is strongly encouraged, for the most successful students in this course tend to be those who study in regular, well-organized groups.
- Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Service Center. SSD can also arrange to provide course materials (including this syllabus) in alternative formats if necessary. You are also welcome to discuss any special needs with me, though you are not required to do so.
- While this is a lecture based course, I will make every effort to make it as interactive as possible. I am always open for questions during class, regardless (almost) of their nature. Students tend to bring to light very important issues that should be fit into the course. And, as any instructor will tell you, if you have a question about something, chances are good that the person next to you or across the room from you has (or should have) the same question.
- Please do not hesitate to visit me if you have any questions, concerns or comments about the course, or to discuss favorite cross-country ski routes, my daughters, music, physics, my dog, backpacking trails, etc. Often I sit in my office, lonely and sad, during office hours that should be filled with student interactions; so please feel free to drop in. Also, I respond relatively quickly to e-mail, especially when addressing student questions.

CALENDAR:

In addition to course topics and quiz/exam dates, each day shows the chapter and section (e.g., 3.1) that you should be reading in the text. Numbers on quizzes refer to the chapters being covered by that particular quiz.

	Monday	Tuesday	Wednesday	Thursday	Friday	Lab topic:
Week I	January 5 Course intro; Charge and Coulomb's Law (Ch 16)	6 Charge and Coulomb's Law (Ch 16)	7 Electric Fields & Gauss's Law. Ch 16)	8 Debriefing of electric charge and fields. (Ch 16)	9 Debriefing of electric charge and fields. (Ch 16)	Introduction to Electricity
Week II	12 Electric field & Electric potential (Ch 17)	13 Electric potential (Ch 17)	14 Review Quiz 16	15 Conservation of energy. (Ch 17)	16 Conservation of energy. (Ch 17)	NO LABS
Week III	19 Holiday	20 Capacitors (Ch 17)	21 Electric current (Ch 18)	22 Circuits (Ch 18)	23 Review Quiz 17	Electric Fields and Potentials
Week IV	26 Kirchoff's Laws (Ch 17)	27 Power and Energy in circuits (Ch 17)	28 RC Circuits (Ch 17)	29 Review	30 EXAM I Chapters 16 – 18 and labs	Voltage, Current, and Resistance

	Monday	Tuesday	Wednesday	Thursday	Friday	Lab topic:
Week V	Feb. 2 Magnetic fields and forces (Ch 19)	3 Magnetic fields and forces (Ch 19)	4 Magnetic fields and forces (Ch 19)	5 Ampere's Law (Ch 19)	6 Review Quiz 19	DC Circuits: Kirchhoff's Rules
Week VI	9 Electromagnetic induction (Ch 20)	10 Faraday's and Lenz's Laws (Ch 20)	11 Faraday's and Lenz's Laws (Ch 20)	12 Applications of induction (Ch 20)	13 Review Quiz 20	The Oscilloscope and RC Circuits
Week VII	16 Holiday	17 AC Circuits (Ch 21)	18 Faraday, Lenz, Maxwell, and the wave of E & B . (Ch 22)	19 Electromagnetic waves (Ch 22)	20 Polarization and Doppler effect (Ch 22)	Magnetic Field
Week VIII	23 Reflection and Refraction (Ch 23)	24 Review	25 EXAM II Chapters 19 – 22 and labs	26 Reflection and Refraction (Ch 23)	27 Thin lenses, etc. (Ch 23)	AC Circuits
Week IX	March 2 Thin lenses, etc. (Ch 23)	3 Mirrors, etc. (Ch 23)	4 Optical instruments (Ch 24)	5 Diffraction and superposition (Ch 25)	6 Review Quiz 23-24	Refraction of Light
SPRING BREAK						
Week X	16 Michelson interferometer (Ch 25)	17 Thin films (Ch 25)	18 Slits and Diffraction gratings (Ch 25)	19 Intro to Special Relativity. (Ch 26)	20 Review Quiz 25	Thin Lenses
Week XI	23 Derivation of Special Relativity. (Ch 26)	24 Implications of Special Relativity. (Ch 26)	25 Implications of Special Relativity. (Ch 26)	26 Review	27 EXAM III Chapters 23-26 and labs	Diffraction and Interference
Week XII	30 Quantization (Ch 27)	31 Photoelectric effect (Ch 27)	April 1 A "classical" atom (Ch 27)	2 The Bohr atom (Ch 27)	3 Wave particle duality (Ch 28)	The Photoelectric Effect
Week XIII	6 deBroglie waves and the atom (Ch 28)	7 Uncertainty principle (Ch 28)	8 Wave functions and hydrogen (Ch 28)	9 Tunneling and other applications (Ch 28)	10 Review Quiz 27-28	Atomic Spectroscopy
Week XIV	13 Nuclear structure (Ch 29)_	14 Binding energy (Ch 29)	15 Nuclear reactions (Ch 29)	16 Review	17 EXAM IV Chapters 27-29	Radioactivity
Week XV	20 Particle physics: Why we should care (Ch 30)	21 Particle physics: Unification of all laws? (Ch 30)	22 The rest of what we do not know. (Ch 30)	23 The future of all physics?	24 Final review.	Practical Exam
Finals	27	28	29 Final Exam 7:00 – 9:00 AM	30	May 1 <i>College of Science Commencement</i>	NO LABS