PHYS 2020: College Physics II
Course Syllabus
Weber State University, Spring Semester 2008

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Lectures: *MTWRF, 8:00am-8:50am*, Lind Lecture Hall 121
Textbook: *Physics* by Giambattista, Richardson & Richardson
Webpage: `aeon.physics.weber.edu/slarson/classes/phys2010/`

1 Introduction

"From a long view of the history of mankind - seen from, say, ten thousand years from now - there can be little doubt that the most significant event of the 19th century will be judged as Maxwell's discovery of the laws of electrodynamics."
$\sim$ Richard Feynman

Physics is cool – of course, this is the primary reason you are taking a *second semester*, right? Probably not (but maybe). For the most part, those of you in this course come from other academic disciplines than physics, and are sitting out there bright-eyed and bushy-tailed, eager to learn physics as part of your quest to round out your academic background. When you leave this class, you will ultimately finish your days as a student at Weber State University and move on to fill important career roles in each of your respective professions. Here, in the early years of the 21^{st} Century, science and technology pervade our culture and society. You *will* encounter it in your careers! It is only good sense then that you study some physics to familiarize yourself with the science that drives so much of what goes on around us.

In this course, we will explore how science approaches the formulation and solution to problems that describe the goings-ons of virtually everything you see around you. Physics is a science that endeavours to make general observations about Nature, distill those observations into a few simple principles that describe the observations, and use the principles in a predictive way to describe other observations. Our explorations will mimic this time honored lineage – observations, fundamental principles, and predictive calculations. During this second semester we will cover the topics of *electromagnetism*, *optics*, *relativity*, *atomic and nuclear physics*, and *cosmology* — these are topics which are at the forefront of modern physics and technology. You are rapidly approaching the boundaries of what we understand of Nature, and the frontiers of modern science. Perhaps even more than last semester, much of the material we will encounter this semester is directly in your lives everyday in the guise of technology. When appropriate, we will attempt to apply our knowledge about these subjects to problems in the "real world", to better illustrate the facility of science and the role it plays in modern society.

This course will be difficult in many instances, and it quite possibly will bend your brains in directions you are not used to bending. But I fully expect each of you will survive with a better appreciation of the role physics plays in the world today. If all goes well, we will transmogrify physics from a monster that may cause more than a bit of apprehension when you try to look it in the eye, into something you are more comfortable attempting to *grok*.

2 Our Intended Schedule

We are planning to cover the material described in Chapters 16-32 in the text. A *rough* schedule for the semester is shown below. Various topics will slide back and forth, so the exact coverage in a given week will depend on how far we get in lecture.

Week #	Dates	Sections & topic
1	7-11 January	**Ch 16**: Charge & Coulomb Electric fields Gauss Law
2	14-18 January	**Ch 17**: Electric Potential Capacitors Energy and Electricity
3	21 January 22-25 January	*Martin Luther King Day – no class* **Ch 18**: Electric Current Ohm's Law, Circuits
4	28 Jan - 1 Feb	**Ch 18**: More Circuits Kirchoff's Rules ▹▹**Midterm Exam 1**
5	4-8 February	**Ch 19**: Magnetism Magnetic Forces Ampere's Law
6	11-15 February	Induction **Ch 20** Faraday's Law **Ch 21**: AC Circuits
7	18 February 19-22 February	*President's Day – no class* **Ch 22**: EM Waves Energy & Momentum
8	25-29 February	▹▹**Midterm Exam 2** **Ch 23 & 24**: Geometric Optics Optical Instruments
9	3-7 March	**Ch 25**: Superposition & interference Diffraction **Ch 26**: Relativity
10	10-14 March	**Spring Break**
11	17-21 March	Consequences of Relativity Relativistic Energy & Momentum General Relativity (Bonus!)
12	24-28 March	**Ch 27 & 28:** Light & Quantum Physics Wave-particle duality Wave functions
13	31 Mar - 4 Apr	▹▹**Midterm Exam 3** The Bohr Atom More Complex Atoms
14	7-11 April	**Ch 29:** Nuclear physics Fission and Fusion Radioactivity
15	14-18 April	**Particle Physics** Sub-atomic structure Fundamental forces
16	21-25 April	Cosmology The Frontiers of Physics Review, make peace with physics
Final Exam: **WED, 30 April 2007, 7:00am - 9:00am**		

3 Work, Work, Work

- ▷ **MANIC MONDAYS:** On most Monday mornings (except when we have midterms!) we'll spend the lecture hour doing physics problem solving in groups. I'll take questions about problem solving appraoch, questions about physical principles, questions about how Luke built his lightsaber, and questions about anything else you are interested in.
- ▷ **HOMEWORK:** Each week, you will be assigned a series of 10 to 20 homework problems, that will be due the next week. The homework problems will be graded in the following way: Each homework assignment will be worth a total of 20 points. 1 of the problems will be chosen at random, and graded completely out of 10 points. The remaining problems will not be graded, but you will receive up to 10 points credit for demonstrating a diligent effort to work out the problems and arrive at final answers. Solutions to all the problems will be posted on the website the day the homework sets are handed in. *No late homework will be accepted.*
- ▷ **MICROTHEMES:** Microthemes are short (1-2 page) written essays about an assigned topic. Your task in these microthemes will be to describe, in words, a particular physical concept or answer a particular question in a *qualitative way*, using words and *no equations*. You will be graded on the correctness of the physics you describe, and the clarity of your explanations. Microthemes must be type-written, and demonstrate good grammar and spelling.
- ▷ **MIDTERMS:** Midterm exams will be extremely similar in content to your homework (that's a hint – *do the homework!*). They will be held in class on the indicated days.
- ▷ **LABORATORY:** Your lab instructors will grade your laboratory exercises, and report the final result to me, which will be included as part of your course grade. In order to minimize discrepancies between lab instructors, scores will be normalized to a uniform scale.
- ▷ **LABORATORY EXAM:** There will be a practical laboratory exam the final week of labs, which will also be factored into your final grade.

4 Grades derived from the work, work, work

All your work work work will be combined to make your final course grade with the following weights:

Manic Mondays (Class participation)	5%
Homework	10%
Microthemes (3 total, 5% each)	15%
Midterms (3 total, 10% each)	30%
Final Exam (Cumulative)	20%
Laboratory Reports	15%
Laboratory Exam	5%
Total	100%

- ▷ **Late Homework:** There is no late homework. Individual assignments will not be accepted after the date they are due.
- ▷ **Late Microthemes:** Microthemes will be marked off 10% each day they are over-due, up to a maximum of 5 days; no microtheme will be accepted more than 5 days late.
- ▷ **Midterm Exams:** *No make-up exams will be given* without prior permission from the instructor. The final exam will only be given at the scheduled time.
- ▷ **Cheating & Academic Dishonesty:** Cheating and academic dishonesty are among the most heinous crimes that can be perpetrated in the University setting; they are contrary in every way to our traditions of open scholarship and learning, and offensive to the integrity and reputation of the faculty and your fellow students here at Weber State University. Academic dishonesty in any form will not be tolerated in this class. Violations that are deemed severe enough will result in an automatic fail of this course. You are encouraged to work together and discuss homework, and work collaboratively in your laboratory group. Assignments that are turned in, however, must be your own solutions to the work.

5 Final Ramblings

- ▷ **Questions:** If you have a question, *ask!* Either you are confused, or I am confused — in either case, we should probably clear things up! If the question isn't about a point of confusion, but is simply a matter of curiosity, *ask!* At worst, you'll start an interesting discussion about the intricacies of physics and become known as "that egghead who kept us from learning about black holes!" At best, you'll stump me and gain the adulation and adoration of your classmates. In any event, I will entertain any questions you have; if it moves far afield from the current topic of discussion, I will keep it on the side until we can return to it.

- ▷ **Office Hours:** Since I know physics will dominate your every waking thought, and that you'd really rather not think about macro-economics but would rather debate how the meter should be properly defined, I've provided a series of office hours and various times throughout the week. Please stop by to chat about whatever is on your mind, whether you're struggling with something we've covered in lecture, need some help on some homework, want to change your major to physics, or simply want to chat.

- ▷ **Physics is not a spectator sport!** Physics, like most of your other classes, requires practice and participation if you want to become proficient[1]. *Do the homework! Ask questions!*

- ▷ **Students with disabilities:** 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.

6 Reading beyond this class

There will be an occasional evening when you've mastered all there is to master in physics, and there isn't anything on television except reruns of *Golden Girls*, and you find yourself thinking "If only I had something about *physics* to read, I wouldn't be so bored!"

What follows is a short, non-exhaustive list of interesting books to read, ranging from popular level books, to books on the history of some important and influential ideas in science, to more serious books about the frontiers of physics today. The list is provided *for your enjoyment*! Nothing on it is required for this course.

- *The New Physics for the 21st Century*, edited by Gordon Fraser. A general treatise on many branches of modern physics, ranging from cosmology, to nanoscience, to biophysics, to chaos. Written at a level that (for the most part) should be accessible to any student in this course.

- *Cosmos*, by Carl Sagan. Perhaps one of the most influential public level science books written in the last quarter century. This book explores many aspects of science, not just physics, and illustrates the profound interconnectedness of everything in the natural world.

- *Mr. Thompkins*, by George Gamow. There several versions of this that go under various titles, all of which have "Mr. Thompkins" as part of the title. A gem of a book that takes mild mannered banker Mr. Thompkins on a journey through some of the great ideas of modern physics (atmos, relativity, quantum physics).

- *The Character of Physical Law*, by Richard Feynman. Written by arguably the most brilliant theoretical physicist of our age, this book explores the nature of how we as humans endeavour to understand and explain the Natural world around us.

[1] Here we use the common definition of proficient: *able to score well on exams!*