West Chester University
Department of Physics
Physics 180 – Physics II
Section 01 – Lecture
Section 91 - Discussion

Meeting Times:	MWF 10:00 - 10:50 am (lecture)
	R 2:00 - 2:55 pm (discussion)
Meeting Place:	Merion Science Center 112 (lecture)
	Merion Science Center 113 (discussion)
Instructor:	Jeffrey J. Sudol (Dr. Jeff)
Office:	Merion Science Center 130
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Office email:	jsudol@wcupa.edu
Office Hours:	W1-3, R3-4, F1-3

Course Description

Physics II is the second of two courses that serve as an introduction to the principles of physics. The content areas of this course are electrostatics, electronics, magnetism, and optics. A passing grade in Physics I is the only pre-requisite for this course.

Required Course Materials

- ✓ *Fundamentals of Physics*, 9th edition, Volume 2, (Halliday & Resnick) Walker
- ✓ *An Introduction to Error Analysis*, 2nd edition, Taylor
- ✓ *The Physics 180 Laboratory Workbook, Spring 2013*, Waite
- ✓ *The Physics 180 Laboratory Supplemental, Spring 2013*, Sudol
- ✓ a "Laboratory Notebook" from The BookFactory (same as PHY 170)
- ✓ a scientific calculator

Attendance Policy

Attendance is required.

Website

This course has a D2L website associated with it. I will post all of the course documents and announcements on the D2L website on a regular basis. Please check D2L at least once a day for updates.

Physics Tutoring

Additional help with physics is available through three different forums: the Learning Assistance & Resource Center (LARC), the Society of Physics Students in the Department of Physics, and private tutors. More information about tutoring will become available during the second week of the semester.

Course Goals*

1. Exercise and develop language skills (reading, writing, and discourse).
2. Exercise and develop reasoning skills.
3. Exercise and develop metacognitive skills.
4. Improve those mental models needed to solve qualitative and quantitative problems in the content areas of the course.

Electronic Equipment in the Classroom (Unplug)

I do not permit the use of cell phones, cameras, voice recorders, computers, or similar electronic equipment in the classroom unless you need to use such a device to accommodate for a disability, in which case you should schedule a meeting with me to discuss the use of the device as soon as possible. Calculators are allowed, of course, and it is acceptable to use a cell phone as a calculator. The spirit of the rule is that the classroom should be an electronic free zone where we tune out the distractions of the world and focus on learning physics. The classroom is a place of dialogue, and the electronic gadgets of our modern culture are not necessary for that dialogue to take place.

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*The course goals include but are not limited to the following University goals for a general education science course:

1. Ability to communicate effectively.
2. Ability to employ quantitative concepts and mathematical models.
3. Ability to think critically and analytically.

Pedagogical Notes

Let's talk about door knobs.

Consider the door knob. If you go to a hardware store looking for a door knob, you are likely to find a hundred different varieties. Door knobs come in different shapes and sizes and colors and styles, but you expect all of them to work the same way. You have in your head a "mental model" about how doorknobs work. You grab the door knob, turn the knob to the right (clockwise), the latch moves free of the catch, and the door is free to open. Despite all of the varieties of doorknobs out there, all of them function in the same way, more or less. So, instead of having to learn to recognize all of the varieties of doorknobs in the world and how each particular doorknob works, you need only this one mental model of how a doorknob works in order to open doors without having to stop and think about how to open a door each time you encounter one. That is, until you go to Japan. You reach for the handle, you turn to the right, and nothing happens. That's because doorknobs in Japan turn to the left.

I will admit that I do not actually know if door knobs turn to the left in Japan, but I want to illustrate the point that sometimes your expectation of how things should work is inconsistent with how things do in fact work because your mental model is either incomplete or broken. That particular moment, when your expectation (the door is open) and reality (the door is not open) are in conflict, is quite powerful. It is in that moment that your brain is prepared to change its mental model of the world.

This whole thing about door knobs is highly simplified, but the point is this. You have in your head "mental models" about how things work that are often broken or incomplete. You have many "misconceptions" about how things work, especially when it comes to "physics." It's ok. It's expected. It's "human nature."

I have designed this course to expose and challenge your existing mental models and to help you change them and build more robust and accurate mental models. I want you to know right now that there is no "natural talent" for physics. Anyone who is good at doing physics has had to go through the same process that you will go through: challenging and advancing their mental models about how the world works.

For a cogent discussion about "mental models," I recommend *The Implications of Cognitive Studies for Teaching Physics* by E.F. Redish, available at the following website: http://www.physics.umd.edu/perg/papers/redish/cogsci.html.

Assessment

Your "grade" in this course will be based on your performance in the following categories of assessment with the following weights.

Homework	8%
Lab	20%
Regular Exams	54%
Final Exam	18%

I assign letter grades according to the following scale, rounding appropriately.

93 - 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-

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and so on...

I do not norm-reference (or scale) grades.

I also reserve the right to introduce different forms of assessment as needed and to alter the weight of each of the categories of assessment in the event of some unforeseen circumstance.

Categories of Assessment

Homework

The D2L website for this course contains at least two files associated with each lecture. The "Assignments" file describes the Pre- and Post-Lecture Homework associated with each lecture as well as the content of each lecture. The "Lecture" file contains the content of each lecture presentation.

At the start of each lecture, I will check to see that you have completed the pre-lecture assignment. The scoring is quite simple. You receive one point for completing the assignment, zero points otherwise.

At the start of lecture every Friday, I will collect your solutions to the Post-Lecture Homework assignments for the previous week. I will choose three problems at random and score them on the following scale.

- **Score 2:** Your solution to the homework problem is complete, correct, and well organized. Any omissions, errors, or lapses in organization do not require a careful review of your solution for me to make sense of it. Your work meets my expectations.

- **Score 1:** Your solution contains significant errors or omissions, or your solution is poorly organized to the point that I cannot make sense of your solution to the problem without careful review. Your work does not meet my expectations. Visit me during my office hours or schedule an appointment as soon as possible to develop strategies to improve.

- **Score 0:** It appears that you made no meaningful attempt to solve this problem.

- **Score 3:** Your work is exemplary and exceeds my expectations.

Note that a score of a "2" does not represent a grade of 67%. Similarly, a score of a "1" does not represent a grade of 33%. With regard to the Pre-Lecture and Post-Lecture Homework scores, you accumulate points. If you receive one point for every Pre-Lecture assignment, and two points for the solution to every Post-Lecture Homework problem, you can expect to receive 100% of the points assigned to the "Homework" category toward your final grade for the course. Likewise, if you receive a total of zero points on the Pre-Lecture and Post-Lecture Homework Assignments, you can expect to receive 0% of the points assigned to "Homework" toward your final grade for the course. Your Homework score is based on how many points you accumulate with respect to a target score, which is based on one point for each Pre-Lecture Homework assignment and two points for each Post-Lecture Homework problem.

The following criteria apply to your solutions to Post-Lecture Homework problems.

1. Your solution to any problem must be legible and well organized.

2. Your solution must be logically complete. You must state all assumptions that are not explicitly stated in the problem statement but required to solve the problem. You must start the solution to a problem with the most abstract and general rule(s) applicable to the problem. You must also include narrative to support your mathematical arguments.

3. When solving for an unknown, you must (1) state the equation you are using to solve for the unknown, (2) show the substitution of the known values into the equation, and (3) show all of the significant steps in the solution for the unknown (that's at least three lines). You must use subscripts to distinguish variables from one another, and the subscripts should connect to the problem in meaningful ways.

4. You must be honest. If you are "stuck" on a problem, consult with me or your classmates. In your solution, note precisely where you got stuck and how you got unstuck, who helped you, and what you learned in the process.

5. Your solution must be yours. I have no objection to you working with your classmates on a problem, in fact, I encourage it, but your solution should be distinguishable from those of your classmates. If you do work with your classmates on a problem, make a note of it on your solution. Give credit where credit is due.

Lab

This course has a laboratory component. Your lab grade is factored into your final grade for this course. You will not receive a separate lab grade on your transcript. Consult the lab syllabus for your particular lab section for more information. **Satisfactory completion of all labs is required to pass the course.**

Exams

Regular exams are those exams that occur in lecture during the course of the semester. **At the end of the semester, I will drop your lowest regular exam score and average the remaining exam scores.** The final exam is cumulative, and it counts.

It sounds nice, but here's the catch!

Except for University sanctioned events (see below), there are no excused absences. There are no makeup exams, and you cannot take an exam early or late.

What does this mean? It means that if you miss a regular exam, you receive a score of a zero on that exam, regardless of the reason for missing the exam. I drop the lowest exam score, so you can miss one regular exam, and it will not affect your final grade. I recommend, however, that if you miss an exam, you make arrangements with me to take the exam as it will serve to test your knowledge of physics and prepare you for the final exam, which is cumulative, and it counts.

I do this for the following reason. It takes me about eight hours to write an exam. The exams are exquisitely crafted to test the objectives of the course. The exam scores therefore represent an accurate assessment of how well the students (and I) have met the objectives of the course (we are a team). If I were to allow students to take exams at different times, I would have to write multiple exams to preserve the integrity of each exam (this follows from a professional code of ethics; it's nothing personal), and I would have to do so in a way that all of the exams test the same objectives equally well. So, "makeup exams" represent a huge time sink, and the education system does not afford me the luxury of time to sink.

Finally, exams are not a learning tool. Exams represent summative assessment. (If you are unfamiliar with the concept, an internet search for "formative vs. summative assessment" will enlighten you.) I keep all exams in my office, and exams are only available for review up until the next exam. In other words, after each exam, all previous exams will no longer be accessible to you for review. The reproduction of any exam question in any manner represents a violation of academic integrity.

Disability Statement

If you require special accommodations because of a disability, please meet with me as soon as possible to discuss your needs. Supporting documentation is required.

Academic Integrity Statement

If you commit a violation of academic integrity, you will receive zero credit for the entire course. This is not negotiable. For more information regarding violations of academic integrity, consult the Undergraduate Catalog.

University Sanctioned Events

If you will be participating in a University-sanctioned event that occurs at the same time as an exam (the exam dates on the schedule will not change), you must notify me prior to the exam. Documentation supporting your participation in this event is required. We will then make arrangements for you to take the exam either prior to or at the scheduled exam time through a proctor. For more information on University Sanctioned Events, consult the Undergraduate Catalog.

Intellectual Property

All of the course materials, such as the PowerPoint lectures, worksheets, and exams, are the intellectual property of either the instructor or another author. Your use of these materials is restricted to your own studies for the duration of this course. It is illegal for you to distribute copies of these materials to anyone in any format.

		Date	Topic	Chapter	Lab
-	M	Jan. 28	Introduction	-	Data Analysis I
1	W	Jan. 30	The Charge Model	21	
2	F	Feb. 01	The Charge Model	21	
3	M	Feb. 04	Forces Part I	21	Data Analysis II
4	W	Feb. 06	Forces Part II	21	
5	F	Feb. 08	Fields	22	
6	M	Feb. 11	Field Lines, Force-Field Connection	22	Training Lab
7	W	Feb. 13	Potential Energy, Potential Part I	24	
8	F	Feb. 15	Potential Part II, Field-Potential Connection	24	
9A	M	Feb. 18	Field Theory	23	Determination of Electron Charge
9B	W	Feb. 20	Gauss' Law	21-24	
-	F	Feb. 22	**Exam I**	21-24	
10	M	Feb. 25	Batteries and Current	26	Resistance and Ohm's Law
11	W	Feb. 27	Ohm's Law and Power	26	
12	F	Mar. 01	Resistance, Resistors in Series & Parallel	26	
13	M	Mar. 04	Circuit Analysis Part I	27	DC Circuit Analysis
14	W	Mar. 06	Circuit Analysis Part II	27	
15	F	Mar. 08	Switches and Shorts	27	
16	M	Mar. 11	Capacitance, Capacitors in Series & Parallel	25	RC Circuits
17	W	Mar. 13	RC Circuits	27	
-	F	Mar. 15	**Exam II**	25-27	
-	M	Mar. 18	*No Classes - Spring Break*		*No Lab*
-	W	Mar. 20	*No Classes - Spring Break*		
-	F	Mar. 22	*No Classes - Spring Break*		

		Date	Topic	Chapter	Lab
18	M	Mar. 25	Magnetism	28, 32	
19	W	Mar. 27	Magnetic Forces on Charges	28	**Lab Mid-Term**
20	F	Mar. 29	Hall Effect, Magnetic Forces on Wires	28	
21	M	Apr. 01	Magnetic Fields Generated by Currents	29	
22	W	Apr. 03	Ampere's Law	29	Earth's Magnetic Field
23	F	Apr. 05	Magnetic Flux, Faraday's Law, Lenz's Law	30	
24	M	Apr. 08	Magnetic Flux, Faraday's Law, Lenz's Law	30	
25	W	Apr. 10	Inductance, RL circuits	30	AC Circuits
26	F	Apr. 12	AC Circuits, Transformers	31	
-	M	Apr. 15	**Exam III**	28-32	
27	W	Apr. 17	The Electromagnetic Spectrum	33	Spectra
28	F	Apr. 19	Ray Optics	33	
29	M	Apr. 22	Refraction	33	Refraction and
30	W	Apr. 24	Mirrors	34	Lenses
31	F	Apr. 26	Lenses	34	
32	M	Apr. 29	Interference	35	
33	W	May 01	Double Slit Interference	35	Diffraction
34	F	May 03	Thin Film Interference	35	
35	M	May 06	Diffraction	36	
-	W	May 08	**Exam IV**	33-36	**Lab Final**
36	F	May 10	Polarization	33	
-	M	May 13	**10:30 - 12:30 Final Exam**	21-36	