West Chester University

PHY 140-03: General Physics II
Fall 2017

Course Overview: PHY 140 is a continuation of PHY 130. Over the course of the semester, we will study the topics of electricity, magnetism, electrical circuits, light, optics, and basic quantum physics. Our goals in doing so are to investigate and analyze physical phenomena in the world around us in order to gain a better understanding of how and why they occur. In our study of these phenomena, we will use mathematical tools to aid us in gaining not only a quantitative understanding of them, but also to provide a conceptual, qualitative perspective of them. We will begin our studies in PHY 140 by developing the electric charge model, and learning about the forces resulting from electric charges. Then, we will turn our attention to the conceptual core of the course: developing an understanding of field theory, and in particular an understanding of electric and magnetic fields. We will then apply our knowledge of field theory to a variety of topics, including electric circuits, electromagnetic waves, light, and optics. Finally, we will discuss blackbody radiation and basic phenomena in quantum mechanics.

Course Credit: PHY 140 is a 4-credit class.

Course Prerequisite: PHY 130 is the prerequisite for PHY 140.

Meeting Times: Tuesdays and Thursdays from 3:00 PM to 4:15 PM
Discussion (140-93) on Tuesdays from 4:15 PM to 5:15 PM
All in Merion Science Center, room 112

Required Course Materials:

Textbook: *Physics*, by James S. Walker, 5th edition (ISBN 9780321976444)*
Other Required Materials: The Modified Mastering Physics access code for the textbook*
Laboratory Notebook (see lab syllabus for details)
The PHY 140 lab manual (see lab syllabus for details)
**An online copy of the textbook is available with the Modified Mastering Physics code*.

Instructor Information:

Dr. Michelle A. Caler
office: 135 Merion Science Center
office hours: Tuesdays from 11:00AM to 1:00PM
Wednesdays from 1:00PM to 3:00PM
Thursdays from 12:00PM to 1:00PM
Fridays from 1:00PM to 3:00PM
Office hours are available by appointment for students with an ongoing conflict with my scheduled hours.
email: mcaler@wcupa.edu
office phone: 610-436-2320
D2L/Modified Mastering: We will be using two online platforms for this course: Modified Mastering Physics (the publisher's homework system) and D2L. Homework assignments are to be performed on Modified Mastering Physics. Please note that **prompt enrollment in Modified Mastering Physics is a course requirement**. As for D2L, to allow for *structured note taking*, I will post ***modified*** lecture slides prior to class. These slides intentionally leave out some information, including but not limited to solutions to example problems, and provide space to fill that material in during lecture. **It is your responsibility to check BOTH of these online resources (Modified Mastering Physics and D2L) periodically for any updates and announcements.** You may want to set D2L to notify you when new content is posted.

Course Goals: In PHY 140, we will develop and exercise quantitative reasoning skills, and develop problem solving skills in the specific context of the physical theories studied in class. In terms of specific learning outcomes arising from the discussion of the topics covered by the course schedule, students completing this course will be able to:

- analyze problems involving electrical forces and fields
- analyze problems involving electrical potential energy and electric potential
- categorize and analyze electrical circuits
- analyze problems involving magnetic forces and fields
- summarize and interpret Faraday's and Lenz's laws
- synthesize their understanding of mechanical wave interference with interference of electromagnetic waves
- analyze problems involving geometric optics, and specifically the geometrical optics of thin lenses and mirrors
- analyze basic problems in modern physics

In-class example problems and practice problems, as well as assigned homework problems and exams, will contribute to students' achievement of the above Course Goals.

Course General Education Goals: PHY 140 is an approved general education course in the Sciences, and as such meets the following general education goals:

***General Education Goal #2: Ability to employ quantitative concepts and mathematical methods*. (Secondary Goal of Science General Education Courses)**

Students will apply quantitative and mathematical methods to solve problems from introductory electromagnetism and modern physics.

Virtually every topic discussed in the class will have a quantitative aspect that will require algebraic reasoning. These methods will be employed during class examples, practice problems, homework problems, midterm exams, and laboratory sessions.

***General Education Goal #3: Ability to think critically and analytically.* (Primary Goal of Science General Education Courses)**

Students will analyze physical situations and identify what aspects are fundamental to physical modeling.

Electromagnetism and modern physics, the primary subject matter of this course, involve the complex interplay of such concepts as electric fields, magnetic fields, and energy. Critical and analytical thinking are essential for applying these concepts to efficiently solve homework and exam problems. One of the many examples might be making assumptions and inferences necessary to analyze the operation of a mass-spectroscopy system.

Expectations: If you take a look at the schedule at the end of this syllabus, you will see that we cover approximately one chapter every 1.5 to 2 weeks. Thus, the pace of this course moves fairly quickly. Such a quick pace is necessary in order to cover the required course material and topics within the space of a semester. It is in your best interest to keep up to speed by **reading the sections in the text indicated in the schedule before you get to class**. Since PHY 140 is a continuation of PHY 130, we will also be using concepts from PHY 130 on a daily (or near-daily) basis, as well as a good deal of algebra. If you feel that your skills are weak in either of these two areas, please feel free to come and see me during office hours or by appointment. I am willing to work with you and help you catch up. Also feel free to come by during my office hours with questions about the lecture, laboratory, reading, homework, exams, grading, or anything else of concern or interest.

Grading: Labs: 15%
Quizzes: 5%
Homework: 15%
Exams: 45% (3 at 15% each)
Cumulative Final Exam: 20%

I will be using the official WCU scale for grades. Please note that the scale has a one percentage point gap between letter grades. I will round your final scores to the closest percentage. I do reserve the right to adjust grade cutoffs, and in extreme circumstances weights, to account for unforeseen circumstances. The official WCU scale for grades is (see next page):

Letter	Grade Points	Percentage	
A	4.000	93 - 100	Excellent
A-	3.670	90 - 92	
B+	3.330	87 - 89	Superior
B	3.000	83 - 86	
B-	2.670	80 - 82	
C+	2.330	77 - 79	Average
C	2.000	73 - 76	
C-	1.670	70 - 72	
D+	1.330	67 - 69	Below Average
D	1.000	63 - 66	
D-	0.670	60 - 62	
F	0.000	59 or lower	Failure

Course Schedule: Please see the Course Schedule enclosed at the end of this document. Please note that if the course schedule is adjusted due to unforeseen circumstances, a revised course schedule will be posted to D2L and there will be an announcement made in class. An announcement will also be placed on D2L indicating that the course schedule has been updated. This syllabus will also be updated with the revised course schedule.

Attendance: I am expecting you to attend every scheduled class period. Doing so will benefit your understanding of course material and therefore your grade. At times during the semester, I will take attendance to emphasize the importance of attending class. However, I will NOT give an attendance grade. Students will be held responsible for all course materials missed due to class absences. Please see the topic "Excused Absences Policy" below.
Rather than having a traditional recitation, we will discuss example and practice problems, as well as broad questions about homework problems, as several of many integrated activities in the classroom portion of the course. I will make every effort to ensure that class time is productive and beneficial for your learning; in large part, this means making sure that you are engaging interactively with the course material during class time. In-class activities may include, but are not necessarily limited to, conceptual questions to be discussed with a neighbour, practice problems, "Voting Opportunities," "Prediction Opportunities," interactive problem-solving sessions, and interactive lecture demonstrations. I hope that these activities both enhance your learning and help make class a little more exciting for you.
Please note that this course does have a laboratory component, and that I **am** expecting you to attend all labs. See the lab syllabus for more details.

Quizzes: There will be a total of six quizzes this term. A tentative list of days on which quizzes will be given can be found in the course schedule at the end of this syllabus. Please note that I reserve the right to modify the dates on which quizzes are given, as well as the total number of quizzes given, to reflect unforeseen circumstances. Quizzes will take approximately ten to fifteen minutes to complete, and will be given at the start of class on the days they have been scheduled. They will consist of four or five concept-based multiple-choice questions that are based on the topics indicated in the class schedule. ***YOUR LOWEST QUIZ GRADE WILL BE DROPPED***. If you miss a quiz, you will receive a ZERO for it. ***No make-up quizzes.*** The only exception is for Excused Absences, as outlined in the Excused Absences Policy contained in the WCU Undergraduate Catalog. Appropriate documentation must be provided.

Homework: This course will utilize an online homework system via Modified Mastering Physics. Please note that prompt enrollment in Modified Mastering Physics is a course requirement. Typically, you will have two homework assignments per week, starting from the first week of classes. The first homework will almost always be assigned on Sunday at 8:00AM and due Wednesday by 11:00pm. The second homework will almost always be assigned Thursday at 8:00AM, and due Sunday at 11:00pm. Note that some weeks may only have one homework assignment, and that on occasion a homework may be posted on a day other than Sunday/Thursday and/or due on a day other than Wednesday/Sunday. **PLEASE** note in addition that I reserve the right to modify homework frequency, assign-dates, and

due-dates to reflect unforeseen circumstances. I will ensure that ALL assignments have a clearly labeled due date on Modified Mastering Physics. **It is your responsibility to check Modified Mastering Physics periodically for assignments.** The number of problems in each assignment will vary somewhat depending on the week and difficulty of the questions asked. You will have *unlimited* attempts at each problem. Note that solutions to all homework problems will be available on Modified Mastering Physics immediately after the assignment is due. It is for this reason that ***NO LATE HOMEWORK SUBMISSIONS WILL BE ACCEPTED***. At the end of the term, I ***will drop your three lowest homework grades***. So, if you miss a couple of assignments, it's not going to affect your grade drastically. But, note that homework amounts to 15% of your total grade. Even if you get 100% on all exams, labs, and the final, **you cannot get an A without doing your homework assignments!**
Please remember that **YOU ARE RESPONSIBLE** for completing homework assignments in a timely manner and informing me of problems, if any, in accessing the homework. Failure to complete an assignment because you could not access the homework an hour before it is due is not an excuse.

Laboratory: This course has a laboratory component. Your lab grade will be factored into your final grade for this course. You are expected to attend all labs. Please see the lab syllabus for more details.

Exams: There will be three in-class exams given over the course of the semester. The dates of these exams are:

October 5
November 9
December 5

I make every effort to keep exam dates as listed, but please be aware that they may shift to reflect unforeseen events. ***NO EXAM GRADES WILL BE DROPPED.*** In the event that you are unable to take an exam as scheduled, discussion of the exam with those that have taken the exam **is forbidden**. If you miss an exam for a University Sanctioned Event, you must notify me in advance so that we can arrange for you to take the exam in a manner consistent with its integrity. You must also provide some form of documentation (performing arts program, competition schedule, etc.). In the event that you are unable to make an exam due to some other Excused Absence, as outlined in the Excused Absences Policy contained in the WCU Undergraduate Catalog, you must contact me before the exam, you must provide some form of documentation, and we will arrange for you to take the exam in a manner consistent with its integrity. If you have a letter of accommodation from the OSSD, it is ***your responsibility*** to contact me with the letter prior to any exams where it will be used. You are also responsible for arranging accommodation at least a week prior to any exam date.
All exams will be *closed book* and *closed notebook*. They will consist of a combination of multiple choice questions (conceptual and numerical) and open-ended numerical problems for which you will be expected to show all the work (math steps). You are permitted to use 1 stand-alone calculator (i.e., a calculator that is ***not*** part of an iPod/iPad, cell phone, tablet PC, Kindle, etc.) during exams. If I catch you using an internet-accessible personal electronic device as a calculator during an exam, I will take your exam and you will get a zero on it. No exceptions. I will NOT bring extra calculators for you to use during exams. It is ***your responsibility*** to make sure you have a working stand-alone calculator for exams.

Final Exam: The University registrar will be providing me with instructions regarding our final exam at some point during the first few weeks of the semester. When I receive that information from the registrar, I will update this syllabus accordingly. An announcement will be made in class that the syllabus has been updated, and an updated copy of the syllabus will be posted to D2L. An announcement will also be placed on D2L indicating that the syllabus has been updated. Please note the following policies related to final exams: (1) Individual faculty members may not change published final examination times and (2) No final examination may be given outside of the scheduled final examination time. ***You should plan to be available for the entire finals week.***
The final will be ***closed book*** and ***closed notebook***, ***it will be cumulative***, and ***it is mandatory.*** It will consist of multiple choice questions (conceptual and numerical) and a few open-ended questions. Missing the final exam will result in a zero for the exam unless EXTREME circumstances apply.

Teaching Style: I will be using Microsoft PowerPoint slides a great deal when going over course material in class; when example problems come up, I will use the white board to work through them. I will try to write big enough so that everyone can see, but if you do have trouble seeing what I write please move to the front of the room. At some point before lecture, I will post to D2L **modified copies** of the PowerPoint slides I will use in class, in the so-called "structured note-taking" style. The slides I put up on D2L are **NOT** meant to take the place of your own personal note-taking. ***YOU*** will be responsible for that. I provide these modified slide copies to give you the text for in-class activities that we will do, so that you do not need to worry about copying them down and can instead concentrate on the activities themselves. I will also leave plenty of room on the modified slides for you to write down key equations, words, and other ideas so that you'll remember them later. Please note carefully that the modified slides I post will NOT contain solutions to example problems done in class, nor will they contain each and every word seen on the in-class slides. If you want notes on these things, you'll need to take them for yourself as we go through the material in class.
Rather than having a traditional recitation, we will discuss example and practice problems, as well as broad questions about homework problems, as several of many integrated activities in the classroom portion of the course. During class time, I will do my best to make sure that you are engaging interactively with the course material. In-class activities may include, but are not necessarily limited to, conceptual questions to be discussed with a neighbour, practice problems, "Voting Opportunities," "Prediction Opportunities," interactive problem-solving sessions, and interactive lecture demonstrations. I hope that these activities both enhance your learning and help make class a little more exciting for you.

Excused Absences Policy: Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

Intellectual Property Statement: The instructor for this course utilizes copyrighted materials under the "Freedom and Innovation Revitalizing United States Entrepreneurship Act of 2007" (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyright protected by the instructor, including, but not limited to, lectures, course discussions, course notes and supplementary materials posted or provided to students authored by the instructor, assessment instruments such as quizzes and exams, and PowerPoint presentations. No recording, copying, storage in a retrieval system, or dissemination in any form, whether electronic or other format, by any means of the intellectual property of the instructor, either in whole or in part, is permitted without the prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals in the semester in which this course is held.
Links and references to on-line resources provided by the instructor may lead to other sites. The instructor does not sponsor, endorse or otherwise approve of any information appearing in those sites, nor is responsible for the availability of, or the content located on or through, external sites. Apart from materials used in accordance with the Fair Use Act, the instructor takes no responsibility for material that is otherwise offered at web sites and makes no warranty that such material does not infringe any third party rights. However, should any of this type of material be present and this fact is brought to the attention of the instructor, they will remove references to it from course materials.

Electronic Mail Policy: It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

Ye Olde Technology Policy: Please turn off all cell phones, iPods/iPads/iPhones, tablet PCs, Kindles, laptops, etc. before class. If you are expecting an emergency call, change your phone to vibrate mode and answer the call outside of our classroom. ***You are not allowed to use cell phones for texting or gaming during class***. Doing so is distracting to your classmates and instructor. If you feel the temptation will be too great, be on the safe side and leave your device stored in your bag.
I do not allow the use of laptops in my class. However, I am willing to make an exception for those who bought an e-copy of the textbook, provided that I see proof of the e-copy on your computer. I do understand that use of a laptop, or other personal electronic devices, may be required to accommodate certain disabilities. Terms of use in both of these cases can be discussed with me on an individual basis.

Academic & Personal Integrity: It is the responsibility of each student to adhere to the University's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in automatic failure and removal from this course.
For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the West Chester University Undergraduate Catalog, the Rams Eye View, or the University Web Site. Please understand that improper conduct in any of these areas will not be tolerated and may result in immediate ejection from the class.

Reporting Incidents Of Sexual Violence: West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator, Ms. Lynn Klingensmith. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University protection of minors policy. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at the webpage for the Office of Social Equity at http://www.wcupa.edu/_admin/social.equity/.

Students With Disabilities: If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please contact the OSSD which is located at 223 Lawrence Center. The OSSD hours of Operation are Monday – Friday 8:30 a.m. – 4:00 p.m. Their phone number is 610-436-2564, their fax number is 610-436-2600, and their email address is ossd@wcupa.edu. See the following website for more information: http://www.wcupa.edu/ussss/ossd/default.aspx.

Tutoring: Tutoring for PHY 140 is offered by the Learning Assistance Resource Center (LARC), 224 Lawrence Center, phone number 610-436-2535. LARC tutoring is free of charge, but you must sign up at the beginning of the semester. See the following website for more information: http://www.wcupa.edu/ussss/larc/. A list of physics majors offering tutoring will also be made available on the physics department website.

Withdrawal Notice: A syllabus constitutes a contract between student and instructor. Your continued enrollment after the **September 5th drop deadline** indicates that you accept all instructional practices, requirements, and policies. If you find the standards to which you will be held accountable too rigorous, if you are unable to *reliably* access the internet to log on to D2L, or if an ongoing scheduling conflict prevents you from attending class regularly and punctually, you must officially withdraw (grade "W") through the Registrar's Office by the **October 27th course withdrawal deadline**. You are responsible for checking your grades before this withdrawal deadline so you aren't surprised by your standing as the end of the course approaches. You can contact me anytime to get an estimate of your grade as it stands at the moment.

Emergency Preparedness: All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information and to sign up, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

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CLASS SCHEDULE

This is the tentative schedule; I will try to follow it as closely as possible. I will post any changes to this schedule to D2L, and announce in class that an updated schedule has been posted. ***IT IS YOUR RESPONSIBILITY*** to make sure that you have an up-to-date class schedule.
It is also ***your responsibility*** to read the assigned selections from the text before you arrive in class. I will not always cover in class everything that is contained in the readings. Note that in the "Readings Due" column, entries for Tuesdays indicate readings due for **BOTH** the scheduled lecture **and** discussion periods, unless otherwise indicated.

Week	Lab	Class Meeting*	Quiz	Topic	Readings Due
1	Introduction	Aug. 29		Introduction, the Charge Model	19.1—19.3
		Aug. 29 (D)		The Charge Model, Coulomb's Law	
		Aug. 31		Coulomb's Law, The Electric Field	19.3—19.4
2	**NO LAB**	Sept. 5		The Electric Field, Electric Field Lines	19.4—19.6
		Sept. 5 (D)		Electric Field Lines, Conductors	
		Sept. 7		Electric Flux, Gauss's Law	19.7
3	Electric Charges	Sept. 12	Quiz Sept. 12 19.3—19.5	Electric Potential and Electric Potential Energy	20.1—20.3
		Sept. 12 (D)		Voltage and Energy of an Arrangement of Charges	
		Sept. 14		Equipotential Surfaces and the Electric Field	20.4
4	Equipotential Lines	Sept. 19		Capacitors and Electrical Energy Storage	20.5—20.6, 21.1
		Sept. 19 (D)		Electrical Energy Storage, Electric Current	
		Sept. 21		Resistance and Ohm's Law, Ammeters and Voltmeters	21.2, 21.3, 21.8
5	Resistors & Ohm's Law	Sept. 26	Quiz Sept. 26 20.1, 20.3, 20.4	Resistors in Series and Parallel	21.4—21.5
		Sept. 26 (D)		Resistors in Series and Parallel, Kirchhoff's Laws	

*: (D) stands for discussion section

5		Sept. 28		RC Circuits	21.6—21.7
6	Resistors in Series	Oct. 3		The Magnetic Field and Magnetic Force	22.1—22.3
		Oct. 3 (D)		The Magnetic Field and Magnetic Force	
		Oct. 5		**EXAM I: CHAPTERS 19, 20, 21**	
7	**NO LAB**	Oct. 10		**FALL BREAK ☺**	
		Oct. 10 (D)		**FALL BREAK ☺**	
		Oct. 12		Magnetic Force and Currents	22.4—22.5
8	Resistors in Parallel	Oct. 17	Quiz Oct. 17 22.1—22.3	Ampere's Law, Solenoids	22.6—22.8
		Oct. 17 (D)		Magnetism in Matter	
		Oct. 19		Induced EMF, Magnetic Flux	23.1—23.2
9	RC Circuits	Oct. 24		Faraday's Law and Lenz's Law	23.3—23.4
		Oct. 24 (D)		Induction and Energy Storage	23.7, 23.9
		Oct. 26		The Production and Propagation of Electromagnetic Waves	25.1—25.2
10	**NO LAB**	Oct. 31	Quiz Oct. 30 22.6, 23.2, 23.4	Electromagnetic Waves	25.2—25.4
		Oct. 31 (D)		Electromagnetic Waves	
		Nov. 2		Polarization	25.5

*: (D) stands for discussion section

11	EM Induction	Nov. 7		Reflection and Plane Mirrors	26.1—26.4
		Nov. 7 (D)		Spherical Mirrors	
		Nov. 9		**EXAM II: CHAPTERS 22, 23, 25**	
12	**NO LAB**	Nov. 14		The Refraction of Light	26.5—26.6
		Nov. 14 (D)		Lenses	
		Nov. 16		Lenses and Dispersion	26.6—26.8
13	Snell's Law	Nov. 21	Quiz Nov. 21 26.2. 26.4, 26.6	Lenses in Combination and the Human Eye	27.1—27.2
		Nov. 21 (D)		Superposition and Interference	28.1
		Nov. 23		**THANKSGIVING BREAK ☺**	
14	Thin Lenses	Nov. 28	Quiz Nov. 28 26.8, 27.2, 28.1	Interference and Diffraction	28.2—28.4, 28.6
		Nov. 28 (D)		Diffraction Gratings	
		Nov. 30		Quantized Energy and Photons	30.1—30.2
15	Interference & Diffraction	Dec. 5		**EXAM III: CHAPTERS 26, 27, 28**	
		Dec. 5 (D)		Mass and Momentum of a Photon	30.2—30.3
		Dec. 7		Wave-Particle Duality	30.4—30.5
16		Dec. ??		**FINAL EXAM – DAY AND TIME TBD**	

*: (D) stands for discussion section