

West Chester University

PHY 140-02: General Physics II Spring 2018

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 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: Mondays, Wednesdays, and Fridays from 1:00 PM to 1:50 PM, in Merion Sci. Ctr. 112
Discussion (140-92) on Thursdays from 12:30 PM to 1:30 PM, in Schmucker Sci. Ctr. North 190

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: Mondays from 2:30PM to 4:30PM

Thursdays from 10:00AM to 12:00PM (i.e., noon)

Fridays from 2:30PM to 4:30PM

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%

Homework: 15%

Exams: 48% (3 at 16% each)

Cumulative Final Exam: 22%

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: Regular attendance in lecture and discussion is an important part of this course and I highly recommend it. This is your chance to ask questions, see examples, and get help in solving problems. Attendance will benefit your understanding of the 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 note that this course does have a laboratory component, and that the course's lab component has a different attendance policy. **Please see the lab syllabus for the lab attendance policy.**

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.** Homework will be assigned almost every week, starting from the first week of classes. Typically, the assignment will post at 8:00 AM on Sunday, and be due by **11:00 PM on Friday.** Occasionally, a homework will be posted at 8:00AM on a Monday rather than on a Sunday. Each time I post a graded homework assignment, I will post an **ungraded**, completely optional, set of practice problems. This **ungraded** set of practice problems, which will be clearly labeled as "practice," is meant to give you additional, optional practice with the material. I will ensure that ALL graded (i.e., for credit) assignments have a clearly labeled due date on Modified Mastering Physics. **It is your responsibility to check Modified Mastering Physics periodically for assignments.** PLEASE note that I reserve the right to modify homework frequency, assign-dates, and due-dates to reflect unforeseen circumstances.

The number of problems in each assignment will vary somewhat depending on the week and difficulty of the questions asked. You will have **six** attempts at each problem.

Note that numerical answers to homework problems will be available on Modified Mastering Physics shortly after the assignment deadline. Solutions are available to students during office hours, or by appointment if you cannot make my office hours. **NO LATE HOMEWORK SUBMISSIONS WILL BE ACCEPTED.** At the end of the term, I ***will drop your lowest homework grade.*** So, if you miss an assignment, 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.

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

February 19
March 19
April 6
April 30

I make every effort to keep exam dates as listed, but please be aware that they may shift to reflect unforeseen events. The range of chapters each exam covers is given in the course schedule, which can be found at the end of this syllabus. If the course schedule is adjusted from what appears at the end of this document, it will be posted to D2L and there will be an announcement made in class. Make sure to check D2L regularly to ensure that you have an up-to-date class schedule. **You** will be responsible for knowing what chapters will be covered on an exam, and when that exam is.

YOUR LOWEST EXAM GRADE WILL BE DROPPED. Only your three highest exam grades will be counted. A missed exam will be treated as your dropped exam. You cannot take an exam early. **I WILL NOT GIVE MAKE-UP EXAMS.** The exceptions to the no make-up exams policy are limited to absences related to University Sanctioned Events and Excused Absences as outlined in the [Excused Absences Policy](#) contained in the [WCU Undergraduate Catalog](#). If you miss an exam for a University Sanctioned Event, or 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 one 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 final exam for this course will be given on Friday, May 11th from 10:30 AM–12:30 PM. This is the time scheduled by the University Registrar for our final exam. The final exam will be held in Merion Science Center 112. **You should plan to be available for the entire finals week.** We have in past semesters had to reschedule finals due to weather related events.

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. Your final exam grade **cannot** be counted as your dropped exam score.

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.

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.

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.

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>.

Withdrawal Notice: A syllabus constitutes a contract between student and instructor. Your continued enrollment after the **January 29th 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 and/or Modified Mastering Physics, 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 **March 30th 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.

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.

Week	Laboratory	Class Meeting	Topic	Readings Due
1	Introduction	January 22	Introduction, the Charge Model	19.1–19.2
		January 24	The Charge Model, Coulomb's Law	19.2–19.3
		January 25 (D)	Problem Solving	
		January 26	The Electric Field	19.4
2	Electric Charges	January 29	Electric Field Lines and Conductors	19.5–19.6
		January 31	Electric Flux, Electric Potential	19.7, 20.1
		February 1 (D)	Problem Solving	
		February 2	Electric Potential and Electric Potential Energy	20.1–20.2
3	Equipotential Lines	February 5	Equipotential Surfaces and the Electric Field	20.4
		February 7	Voltage and Energy of an Arrangement of Charges	20.3
		February 8 (D)	Problem Solving	
		February 9	Capacitors and Dielectrics	20.5

*: (D) stands for discussion

Week	Laboratory	Class Meeting	Topic	Readings Due
4	NO LAB	February 12	Electrical Energy Storage, Electric Current	20.6, 21.1
		February 14	Resistance and Ohm's Law, Energy and Power	21.2–21.3
		February 15	Resistors in Series and Parallel	21.4
		February 16 (D)	Test Questions	19.1–20.6
5	Resistors & Ohm's Law	February 19	EXAM #1	Chapters 19 and 20
		February 21 (D)	Problem Solving	
		February 22	Kirchhoff's Laws, Capacitors in Series and Parallel	21.5–21.6
		February 23	Capacitors in Series and Parallel, RC Circuits	21.6–21.7
6	Resistors in Series	February 26 (D)	Problem Solving	
		February 28	The Magnetic Field and Magnetic Force	22.1–22.2
		March 1	Magnetic Force and Currents	22.3–22.4
		March 2	Magnetic Torque and Ampere's Law	22.5–22.6
7	Resistors in Parallel	March 5 (D)	Problem Solving	
		March 7	Solenoids, Magnetism in Matter	22.7–22.8
		March 8	Induced EMF, Magnetic Flux	23.1–23.2
		March 9 (D)	Test Questions	21.1–22.8

*: (D) stands for discussion

Week	Laboratory	Class Meeting	Topic	Readings Due
8	NO LAB	March 12	Spring Break! ☺	None! Have some fun!
		March 14		
		March 15		
		March 16		
9	RC Circuits	March 19	EXAM #2	Chapters 21 and 22
		March 21	Faraday's Law and Lenz's Law	23.3–23.4
		March 22 (D)	Problem Solving	
		March 23	Energy Storage in a Magnetic Field	23.7, 23.9
10	EM Induction	March 26	The Production and Propagation of Electromagnetic Waves	25.1–25.2
		March 28	Electromagnetic Waves and The Electromagnetic Spectrum	25.2–25.3
		March 29 (D)	Problem Solving	
		March 30	Intensity and Polarization	25.4–25.5
11	NO LAB	April 2	The Reflection of Light, Plane Mirrors	26.1–26.2
		April 4	Spherical Mirrors	26.3–26.4
		April 5 (D)	Test Questions	23.1–25.5
		April 6	EXAM #3	CHAPTERS 23, 25

*: (D) stands for discussion

Week	Laboratory	Class Meeting	Topic	Readings Due
12	Snell's Law	April 9 (D)	Problem Solving and Ray Tracing	
		April 11	The Refraction of Light	26.5
		April 12	Lenses	26.6–26.7
		April 13	Dispersion, the Human Eye	26.8, 27.1
13	Thin Lenses	April 16	Lenses in Combination and Corrective Optics	27.2
		April 18 (D)	Problem Solving and Ray Tracing	
		April 19	Superposition	28.1
		April 20	Double Slit Interference	28.2
14	Interference & Diffraction	April 23	Diffraction and Diffraction Gratings	28.4, 28.6
		April 25 (D)	Problem Solving	
		April 26	Quantized Energy and Photons	30.1–30.2
		April 27 (D)	Test Questions	26.1–27.2
15	NO LAB	April 30	EXAM #4	CHAPTERS 26, 27
		May 2	Mass and Momentum of a Photon	30.2–30.3
		May 3	Wave-Particle Duality	30.4–30.5
		May 4 (D)	Problem Solving	
Finals Week		May 11	FINAL EXAM	10:30 AM–12:30PM

*: (D) stands for discussion