PY212 – GENERAL PHYSICS II
Fall 2019

Instructors

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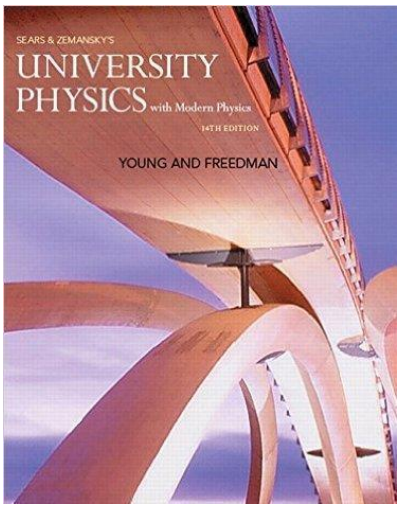
Course Overview

An introduction to the basic principles of physics emphasizing electricity, magnetism, light and optics.

Course Prerequisites

Completion of PY211 or equivalent. Completion of MA123 or equivalent is a prerequisite that may be satisfied by taking either MA124 or MA127 concurrently with this course. You MUST see your lecturer if you do not fulfill these conditions or are taking MA123 concurrently.

Required Text



"University Physics", Vol. 2, by Hugh D. Young and Roger A. Freedman, 14th Edition (Addison Wesley).
ISBN: 10: 0-13-397800-1;
ISBN: 13: 978-0-13-397800-1

If you have MasteringPhysics code from last semester, you should be able to download an electronic version of the book for free.

Solving physics problems is a critically important of this course. To give you more problem-solving practice, there are some exercises inside of MasteringPhysics, an online service from Pearson. MasteringPhysics is designed to provide multiple attempts and immediate feedback, as well as hints and visual simulations to help guide you through the exercises. **The MasteringPhysics problems ARE NOT mandatory and they will not be graded.** However, they often resemble problems on quizzes or exams, so it is in your best interest to attempt them for your own benefit.

An access code for MasteringPhysics is included with the textbook bundle from the BU bookstore. If you have purchased the book separately, you can also register (and pay for) this service separately online. The MasteringPhysics code is good for two semesters, e.g. if you take PY212 this semester after having already taken PY211.

Please sign in/register at the MasteringPhysics site using your @bu.edu email address.

> http://masteringphysics.com
> course code: PY212F2019

There is an introductory exercise "MP0: Introduction to MasteringPhysics" that designed to familiarize you with the MasteringPhysics system.

Additional Required Material

1. **TopHat** (https://tophat.com/) registration on a mobile device. Each instructor has their own unique join code that they will give to their section on the first day of class. **You must register under your own section to receive participation credit – no exceptions**. Instructions for registering for TopHat are on the company web site and they provide 24-hr support for troubleshooting.

In class, we will routinely ask questions that allow you to engage in discussions with fellow classmates before recording your individual votes. Please note that your responses are graded only for participation, not for completeness.

2. **FlipIt Physics** (https://www.flipitphysics.com/) – please register for an account and provide the necessary payment information. After registering, please enroll using the **course code py212fall2019** and again with your **BU login name for Blackboard** as your student ID.

The pre-lecture is a series of short narrated, animated movies describing a set of physics concepts. There are also questions to answer interspersed in the pre-lecture. After finishing the pre-lecture (and only after), the checkpoint quiz will be available to you. You will earn credit just for completing the pre-lecture and checkpoint quiz, not for getting the right answers, but importantly, we will review your answers and responses and try to address these directly in that day's lecture. So please try your best.

There is an online pre-lecture and checkpoint quiz due before almost every lecture this semester, starting with the second lecture. Please complete the Coulomb's Law pre-lecture and checkpoint quiz by 8:00am on Thursday, September 5.

3. Scientific calculator which has sine, cosine, exponential and their inverse functions. This will mainly be used for homework assignments and labs.

Course Web Sites

Blackboard: Start at **learn.bu.edu** and click on the link for PY212. The PY212 web site will contain all the grade information. You will also be able to check your grades (labs, homework, quizzes, etc.) during the semester. **It will be your responsibility to check the accuracy of your grades.**

Piazza: The homepage will contain all the course information and a variety of useful physics resources. On-line help through Piazza: Unless you have a personal question for your professor, please ask questions about the course through the PY212 site on Piazza. You can also feel free to answer any questions posted by other students – but you should be careful to be helpful without simply giving away answers to homework questions. With all PY212 students, Learning Assistants, Teaching Fellows, and professors monitoring the Piazza site, this should be the best way to get questions answered quickly.
Sign up at https://piazza.com/bu/fall2019/py212

Course Grade

Your letter grade for the course will be assigned on the basis of the total score you accumulate throughout the course. Each factor will contribute as follows:

Prelecture (FlipIt Physics) 5%
Class Participation (TopHat) 3%
Homework 7%
Quizzes 5%
Lab Reports 15%
Midterm Exam #1 20%
Midterm Exam #2 20%
Final Exam 25%

Your grade is based on these factors alone; no extra credit assignments will be given. It is your responsibility to take all quizzes/exams and do all homework and labs according to the advertised schedules; late work will not receive any grade. Missing a midterm or the final exam will lead to a failing grade.

We will use an absolute grading scale, so you are not competing with your classmates. This is designed to encourage you to help each other learn. The scale is as follows:

90.00 – 100 for A- and A
75 – 89.99 for B-, B, and B+
55 – 74.99 for C-, C, and C+

45 – 54.99 for D
< 45 for F

We reserve the right to use a more generous scale if we deem it necessary.

Discussion Sections

Attendance at discussion sections is expected and will be monitored. **You must attend the section number that you are registered for**. You should be signed up for a discussion section that meets once per week for one hour. If you have a course conflict with your assigned discussion section, and you are an ENG student, then you must contact Dan Tyburski (dht@bu.edu) and he'll work with you to find a solution. If you are a CAS student with a conflict, then you need to contact Kelly Capri (kcapri@bu.edu). Discussion sections begin the second week of class.

Homework

Written homework problems will be assigned on a regular basis, and will be graded. The homework assignment schedule for the entire semester is given in the course schedule. The problems for each assignment will be posted on the PY212 web site (click on the "Assignments" link). We encourage collaborative effort but it is your responsibility to work all of the homework problems yourself. You may obtain help from your TF during discussion sections and/or office hours. Homework must be handed in by 5:00 PM on Friday of the week the homework is due. ***Drop off your homework assignment in the appropriately marked drop-box next to room SCI-121.***

Quizzes

Quizzes will be given during discussion sections. It is your responsibility to attend all discussion sections; **there are no make-up quizzes**.

Laboratory Sessions

Attendance at laboratory sections is expected and will be monitored. You should be signed up for a laboratory section that meets in one three-hour slot per week. **You must attend the section number that you are registered for**. If you have a course conflict with your assigned lab section, and you are an ENG student, then you must contact Dan Tyburski (dht@bu.edu) and he'll work with you to find a solution. If you are a CAS student with a conflict, then you need to contact Kelly Capri (kcapri@bu.edu). Laboratory sections begin the second week of class. Two spiral binding notebooks are required for lab, as they will be handed in for grading on a regular basis. It is your responsibility to attend all scheduled lab sessions; **there are no make-up labs**. A complete schedule of lab sessions is included in the course schedule. The lab write-ups can be found at http://physics.bu.edu/ulab/all_labs.html.

Pre-Lab Assignments

Every lab has an associated Pre-Lab assignment that must be completed and handed in at the beginning of that week's lab session. The Pre-Lab assignments can be found at http://physics.bu.edu/ulab/all_labs.html.

Lab Reports

Completed reports will be due at the end of the lab session. We strongly recommend you prepare ahead of time and complete as much of the report as possible before doing the lab.

Exams

Two closed-book midterm exams will be given on the following dates:

Midterm #1 – 8-9:30 PM, September 30, 2019
Midterm #2 – 8-9:30 PM, November 04, 2019

The closed-book final exam will be given at the following date and time:

Final Exam – TBD in December 2019
(this information is determined by the Registrar and is released to students and faculty at the same time – instructors don't know any more than the students!)

Only in case of a documented illness, a religious holiday, or an extraordinary personal emergency, can an arrangement may be made to take a make-up exam.

Important Dates

October 7, 2019 Last day to drop classes without a "W" grade
November 8, 2019 Last day to drop classes with a "W" grade

Ethics Policy

You are expected to be familiar with and adhere to the College of Arts and Sciences Academic Conduct Code (http://www.bu.edu/academics/cas/policies/academic-conduct/). In particular, cheating on exams and quizzes or unauthorized collaboration on lab work will not be tolerated. Evidence of cheating will be reported immediately to the Academic Conduct Committee.

BU Hub (1st year students as of Fall 2018 only)

PY212 satisfies two BU Hub areas, Scientific Inquiry II and Quantitative Reasoning II, and two areas of the Intellectual Toolkit, Critical Thinking and Teamwork/Collaboration.

Scientific Inquiry II:
PY212 students will learn about the nature of evidence employed in the natural sciences. In the PY212 laboratory exercises (both hands-on and simulated) they will how natural scientists formulate hypotheses, gather empirical evidence of multiple sorts, and analyze and interpret this

evidence. While issues of public policy are not a main focus of the course, students will learn much of the physics that is required to judge scientific claims made in support of those policies.

Quantitative Reasoning II:
PY212 builds on knowledge from PY211, but the situations we analyze now are often more abstract and complex. Students continue learning when to apply particular analytical methods as we solve problems in electricity and magnetism, circuits, waves, and optics. Examples include analyzing forces between charged particles, or using energy conservation methods to solve for a speed knowing something about initial and final positions and how a system evolves from one position to the other.

Students apply the tools of math and physics in many settings to solve physics problems. They work at home on pre-class quizzes and homework assignments. They work together in class, sometimes at the boards in the studio classroom, applying the laws of physics to understand physical situations. In the lab, they combine physical models and quantitative measurements to test physical theories.

A key component of PY212 is the use of hands-on lab exercises and simulations in which the students acquire and analyze data. Students build simple models of how the world works, and test their models against their observations, refining their models or creating new models as appropriate. Throughout this process, the students are continually weighing the evidence provided by their observations against the predictions of various models, and trying to explain any deviations from expected behavior.

Students discuss their ideas with one another and with the course staff, and they must also demonstrate their understanding through graphical and symbolic representations as well as display their understanding through the manipulation of equations.

As in PY211, students communicate quantitative information in the form of graphs, drawings, tables, and equations with one another and with the course staff. Communication is emphasized in the course lab activities and in-class questions. In the lab and classroom environments, students work together in teams of three or four, and they are continually working together as they discuss how to solve problems that are both conceptual and quantitative.

Finally, the limitations of mathematical models will be a recurring theme of the course - not just the risks of using them improperly but also the opportunities that "misuse" presents for deepening our understanding of physics.

Intellectual Toolkit – Critical Thinking:
Critical thinking is required for the effective use of technical skills, and for the development of citizens who will help shape public policy in the future. In PY211, students will learn how to identify, construct and evaluate arguments that deal with physical phenomena. They will receive extensive training in both deductive and inductive reasoning. Students will learn how to solve problems systematically, check their answers, and to avoid common reasoning mistakes.

Moreover, in laboratory exercises, students collect data, weigh evidence, and construct explanatory models. Models are tested against new evidence and, if necessary, refined or replaced by new models. Students are challenged to think about limitations on physical laws in the pre-class videos, the in-class activities, and in the worksheets and the homework. Group work in class is a key component as well, where students need to explain their thinking to their group members and work together to answer questions.

Intellectual Toolkit: Teamwork/Collaboration:
Training in and the practical experience of teamwork teaches the process of innovation, develops leadership, and fosters knowledge of one's own strengths and appreciation for those of others. Students will receive teamwork training in the laboratory and discussion sections throughout the semester, teaching them the tools for working successfully with a diverse group, such as assigning roles and responsibilities, giving and receiving feedback, and engaging in meaningful group reflection that inspires collective ownership of results. Students will receive guidance on how to identify the characteristics of a well-functioning team. The labs will be done in partnership with a lab mate, and two of the homework problem sets will be done in teams, with each member of the team receiving the same grade for the corresponding problem set. Teamwork assessment surveys will be administered at the start and end of the semester to assess the students' teamwork attitudes and capabilities.

Week	Date	Class #	Topic	Chap.	Discussion/HW	Lab
1	3-Sep	1	Electric Charge and Coulomb's law	21	No homework	No lab
	5-Sep	2	Electric Field	21		
2	10-Sep	3	Gauss's Law	22	Homework #1	No lab
	12-Sep	4	Gauss's Law	22		
3	17-Sep	5	Electric Potential	23	Homework #2	1. Electric Fields and Potentials
	19-Sep	6	Electric Potential	23		
4	24-Sep	7	Capacitance and Dielectrics	24	Homework #3	2. Capacitors - MBL
	26-Sep	8	Capacitance and Dielectrics	24		
	30-Sep		**Midterm #1 8:00 - 9:30 pm**			
5	1-Oct	9	Current, Resistance, and Electromotive Force	25	Homework #4	No lab
	3-Oct	10	Direct-Current Circuits	26		
6	8-Oct	11	Direct-Current Circuits	26	Homework #5	3. Ohm's Law - MBL
	10-Oct	12	Magnetic Field and Magnetic Forces	27		
7	15-Oct		No Class - Substitute Monday		Homework #6	No lab
	17-Oct	13	Magnetic Field and Magnetic Forces	27		
8	22-Oct	14	Sources of Magnetic Field	28	Homework #7	4. e/m ratio of the electron
	24-Oct	15	Sources of Magnetic Field	28		
9	29-Oct	16	Electromagnetic Induction: Faraday's Law	29	Homework #8	5. Faraday's Law - MBL
	31-Oct	17	Inductance	30		
10	**4-Nov**		**Midterm #2: 8:00 - 9:30 pm**			
	5-Nov	18	Inductance	30	Homework #9	No lab
	7-Nov	19	Alternating Current	31		
11	12-Nov	20	Alternating Current	31	Homework #10	6. Electromagnetic Induction
	14-Nov	21	Electromagnetic Waves	32		
12	19-Nov	22	Electromagnetic Waves	32	Homework #11	7. RLC Circuits
	21-Nov	23	The Nature and Propagation of Light	33		
13	26-Nov	24	The Nature and Propagation of Light	33		
	28-Nov		No Class - Thanksgiving			
14	3-Dec	25	Interference	35	Homework #12	
	5-Dec	26	Interference	35		
15	10-Dec	27	Diffraction	36		
	TBD		**Final Exam: Time TBD**			