Fall 2019 PY211 Syllabus - General Physics I Professor Jariwala

Week	Date	Lec #	Lecture Topic	Reading Assignment	FlipItPhysics Prelecture	Homework Assignments	Discussion Topics	Laboratory Assignments
1	Tuesday Sep. 3	01	Introduction to Motion	Chap. 1		Pre-tests (email link) Due Sep. 6	No Discussion This Week	No Labs This Week
	Thursday Sep. 7	02	Motion Along a Straight Line	Chap. 2	1			
2	Tuesday Sep. 10	03	Motion Along a Straight Line	Chap. 2		Problem Set #1 Due Sep. 13	Chap. 2	1. Position, Velocity, and Acceleration
	Thursday Sep. 12	04	Motion in Two or Three Dimensions	Chap. 3	2			
3	Tuesday Sep. 17	05	Motion in Two or Three Dimensions	Chap. 3	3	Problem Set #2 Due Sep. 20	Chap. 3	2. Forces Between Carts
	Thursday Sep. 19	06	Newton's Laws of Motion	Chap. 4	4			
4	Tuesday Sep. 24	07	Applying Newton's Laws	Chap. 5	5	Problem Set #3 Due Sep. 27	Chaps. 4, 5	No Labs This Week
	Thursday Sep. 26	08	Applying Newton's Laws	Chap. 5	6			
5	Tuesday Oct. 1	09	Introduction to Energy	Chap. 6	7	Problem Set #4 Due Oct. 4	Chap. 5	3. Constant Acceleration
	Thursday Oct. 3	10	Work and Kinetic Energy	Chap. 6	8			
6	Monday Oct. 7		Midterm Exam #1 8:00 - 9:30 PM	Chaps. 1-5			Chap. 6	No Labs This Week
	Tuesday Oct. 8	11	Potential Energy and Energy Conservation	Chap. 7	9'			
	Thursday Oct. 10	12	Momentum, Impulse, and Collisions	Chap. 8	11			
7	Tuesday Oct. 15		No Lecture - Monday Schedule			Problem Set #5 Due Oct. 18	Chaps. 7, 8	No Labs This Week
	Thursday Oct. 17	13	Momentum, Impulse, and Collisions	Chap. 8	13			
8	Tuesday Oct. 22	14	Rotation of Rigid Bodies	Chap. 9	14	Problem Set #6 Due Oct. 25	Chap. 9	4. Collisions
	Thursday Oct. 24	15	Dynamics of Rotational Motion	Chap. 10	15			
9	Tuesday Oct. 29	16	Dynamics of Rotational Motion	Chap. 10	16', 17	Problem Set #7 Due Nov. 1	Chaps. 10, 11	5. Torque and Moments of Inertia
	Thursday Oct. 31	17	Equilibrium and Elasticity	Chap. 11	19			
10	Monday Nov. 4		Midterm Exam #2 8:00 - 9:30 PM	Chaps. 6-11			Chap. 13	No Labs This Week
	Tuesday Nov. 5	18	Gravitation	Chap. 13				
	Thursday Nov. 7	19	Fluid Mechanics	Chap. 12	25			
11	Tuesday Nov. 12	20	Fluid Mechanics	Chap. 12	26	Problem Set #8 Due Nov. 15	Chap. 12	6. Fluids
	Thursday Nov. 14	21	Periodic Motion	Chap. 14	21			
12	Tuesday Nov. 19	22	Periodic Motion	Chap. 14	22	Problem Set #9 Due Nov. 22	Chap. 14	No Labs This Week
	Tuesday Nov. 21	23	Temperature and Heat	Chap. 17	28			
13	Tuesday Nov. 26	24	Thermal Properties of Matter	Chap. 18	29		No Discussion This Week	No Labs This Week
	Thursday Nov. 28		No Lecture - Thanksgiving Holiday					
14	Tuesday Dec. 3	25	The First Law of Thermodynamics	Chap. 19	30		Chaps. 18, 19, 20	7. Conversion of Mechanical Energy to Heat
	Thursday Dec. 5	26	The Second Law of Thermodynamics	Chap. 20	31			
15	Tuesday Dec. 10	27	The Second Law of Thermodynamics	Chap. 20	27	Problem Set #10 Due Dec. 11	No Discussion This Week	No Labs This Week
	Tuesday Dec. 17		Final Exam 6:00 - 8:00 PM	Chaps. 1-14, 17-20		Post-tests (email link) Due Dec. 16		

PY211 Course Guide

Hello and welcome to PY211! We are looking forward to an exciting semester of physics with all of you, studying a range of topics in mechanics and thermodynamics.

1. Course Philosophy and Objectives

Before we begin, we would like to describe the philosophy of teaching and learning in this course. Simply put, teaching and learning in our physics class is non-traditional, focused on student-centered, interactive engagement. "Lecturing", i.e. with a professor at the front talking and you listening and taking notes, will happen less than 50% of the time. The rest of the time in lecture, as well as in discussion section, in lab, and even at home, you will be engaged in active learning. Research shows that when students are active in the learning process, when they engage in the construction of new knowledge, they learn more in the short-term and retain the knowledge longer. In our own physics classes, we have measured a 25% increase on average in students' learning using active learning, as compared to the traditional approaches we used to use.

The design of the course is shown here. Lecture, discussion, and lab have been restructured to emphasize "hands-on" and "minds-on" learning through collaboration with your classmates, working in small groups. To support these in-class activities, there are also pre-lecture exercises to do before class and homework to complete afterwards. We also seek to provide many opportunities for assistance outside of class, from office hours in the Physics Resource Room (SCI-121) to an online class discussion forum on Piazza. More information on these pedagogical tools is given below.

Many students find PY211 to be challenging yet rewarding, and we encourage you to think about your own expectations and goals for this course, as relates to your own major and career path. From our perspective, our objective is for you to be able to:

- Recall and describe the themes, laws, and principles of kinematics, dynamics, energy, momentum, applied mechanics, and thermodynamics
- Implement these laws & principles to solve problems
- Compare and contrast between different tools and techniques required to solve a problem
- Visualize, diagram, and/or graph a physical situation as a step in problem-solving
- Connect and apply mathematics (trigonometry, algebra, and calculus) to solving physical problems
- Communicate knowledge and explain one's thinking in oral or written form

Overall, our strong belief is that anyone can learn physics, and we are here to help.

2. Teaching Staff
Our teaching staff this semester consists of both Teaching Fellows (TF's) and Learning Assistants (LA's). The TF's are physics graduate students who coordinate and run the discussion or lab sections, and who also grade your homework, labs, and exams. The LA's are primarily undergraduates like you who took this class before and now work closely with the TF's and professors to assist in discussion and in lecture. Please do not hesitate to ask any member of the teaching staff for assistance.

3. Piazza
Our main course website is on Piazza, which will be using for class discussion, as well as for disseminating information (such as this email):
http://piazza.com/bu/fall2019/py211/home

For those new to Piazza, this system is highly catered to getting you help fast and efficiently from classmates, the Teaching Fellows, the Learning Assistants and myself. Rather than emailing questions to the teaching staff, we encourage you to post your questions on Piazza – you can even do so anonymously. You should have received email from Piazza about how to sign up for a (free) account.

4. Blackboard Learn
We also have a course website on Blackboard Learn:
http://learn.bu.edu
We will use this website exclusively for your grades. All other information will be posted on Piazza (see above).

5. Discussion and Lab Sections
In discussion, you will work together in small groups on a series of worksheet problems that reinforce concepts from lecture while preparing you for the upcoming homework. There are no discussion or lab sections the first week of class. Discussion sections begin the second week in your assigned classroom. Discussion is a required part of the course during which there will be a weekly quiz. No quizzes are "dropped".

Labs are designed to provide an empirical foundation to the topics presented theoretically in lecture and in discussion. Labs also begin the second week and will be held in different rooms in the SCI building throughout the semester. There are 7 labs total for the semester and all are required for the course. No labs are "dropped".

6. Textbook and Mastering Physics
As with many other classes, our textbook is an important, foundational element of our course. The physics department has standardized on a book for the PY211/2 sequence: Young and Freedman, University Physics, 15th edition (Pearson, 2019). For PY211, we will be using Vol. 1, available in softbound form at the BU Bookstore, as well as in eText format directly from Pearson online. We have also placed a copy of the textbook on reserve in the Science & Engineering Library (38 Cummington St.) but strongly encourage you to have your own copy, even if it is an older version of the textbook. Please contact me if you are having trouble finding a reasonably priced used edition.

For homework, we are using MasteringPhysics, the online homework service from Pearson. MasteringPhysics is designed to provide multiple tries and immediate feedback, as well as hints and visual simulations to help guide you. In addition to completing the homework set online, you will also be asked to answer additional questions on a subset of the problems (to be specified each week) and to turn them in on paper to the homework boxes located next to room SCI-121. Moreover, two of the written problem sets will be team-based: you will complete these in a team of 2-4 students; for each of these problem sets all members of a team will receive a common grade. No late homeworks are accepted, and none are "dropped".

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 next semester.

Please sign in/register at the MasteringPhysics site using your @bu.edu email address.
http://masteringphysics.com
course code: PY211FALL19
There is an introductory assignment "MP0: Introduction to MasteringPhysics" already posted. This is an assignment designed to familiarize you with the MasteringPhysics system. Please complete this by 11:59pm on Friday, Sep. 6.

7. Clicker
A clicker (either a TurningPoint ResponseCard or using the ResponseWare app) is required for this course. 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.

Please ask for the clicker at the BU bookstore at the clicker desk (they are not on the shelf). If you purchase a used clicker, please be sure it is a 3rd or 4th generation clicker, as indicated by the "-03" or "-04" at the end of the model number (listed on the back). Alternatively, you can download and use the ResponseWare app on a smartphone after purchasing a license. Please direct any questions to the clicker thread on Piazza.

8. FlipItPhysics (formerly SmartPhysics) Pre-lectures and Checkpoint quizzes
Starting four years ago with PY211/212, we have implemented the use of a series of physics pre-lectures and checkpoint quizzes, to introduce and clarify some of the material before you come to class. Please sign up for an account at
http://flipitphysics.com
course code: PY211FALL19
After registering and providing payment information (there is no printed access card available), please sign up using the course code PY211FALL19 and again with your BU login name (not U-number) as your student ID. Please note that unlike MasteringPhysics (which is good for two semesters), you will need to purchase a new FlipItPhysics code each semester.

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 1D-Kinematics pre-lecture and checkpoint quiz by 9:00am on Thursday, Sep. 5.

9. Pre-Test Surveys

In your email, you will be receiving two emails from me with links to two different pre-test surveys (a "concept" survey and a "nature of physics" survey), which are part of your first homework assignment (along with the Intro to MasteringPhysics tutorial). We ask you to answer these pre-test questions in order to give us a better idea of your understanding of physics before the class begins. Please try your best to answer the questions without help from any textbooks or anyone else. The pre-tests will be graded, but you will receive full credit (equal to one-half of a homework assignment) just for answering all the questions, right or wrong. Please complete the two pre-tests by 11:59pm on Friday, Sep. 6.

10. Exam dates

Two midterm exams will be given out of class on the following dates:
Midterm #1 – Monday, October 7, 8:00 – 9:30 PM
Midterm #2 – Monday, November 4, 8:00 – 9:30 PM

The combined section final exam date, as set by the Registrar's Office, is:
Final Exam – Tuesday, December 17, 6:00 – 8:00 PM
Please reserve these dates on your calendar since there will be no makeup exams.

11. Course Grading

Final grades are computed as follows:

2% in-class clickers + 3% pre-lectures and checkpoints (FlipItPhysics)
5% written homework + 5% online homework (MasteringPhysics)
5% discussion quizzes
15% labs
20% midterm1 + 20% midterm2 + 25% final exam

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.

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 be more generous than this.

12. BU Hub

PY211 satisfies two BU Hub areas, Scientific Inquiry I and Quantitative Reasoning I, and two areas of the Intellectual Toolkit, Critical Thinking and Teamwork/Collaboration.

Scientific Inquiry I:
Because mathematics is essential throughout the natural sciences and engineering, quantitative reasoning is a thread woven throughout the entire course: in lecture, laboratories and on homework assignments and exams. Students will use algebra, trigonometry, vectors, and integral and differential calculus to help model and analyze physical systems. Students who complete PY211 will gain confidence in their mathematical skills, which will prove critical to their success in subsequent courses.

Students will employ equations and graphs to gain insight into the way the world works. Students will be expected to demonstrate expertise in setting up and solving equations to predict the outcomes in physical situations; to interpret and draw graphs representing changes in physical quantities with changes in time and position. Students will master the use of free-body diagrams in analyzing physical systems. Although the physical models used in PY211 are very powerful, students will also learn about the limitations of those models: when and when not to apply a particular analysis method.

Students will discuss their ideas with one another and with the course staff, and they must demonstrate their understanding through graphical and symbolic representations. They must also be able to display their understanding through the manipulation of equations.

Quantitative Reasoning I:
Students will learn about simple models of physical situations, using these models to understand the world. Through PY211, students will acquire a toolbox of skills they can use to analyze the physical world and will get plenty of practice in applying these skills and learning which tools to apply in which situations. Two prominent examples are the use of free-body diagrams for working with Newton's Laws and the set of conservation laws that are valid and useful in a wide variety of physical systems.

Intellectual Toolkit – Critical Thinking:
Critical thinking is required for the effective use of technical skills, and for the development of citizen scientists who will help shape public policy in coming years. This is a fundamental goal of PY211, in which students 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 and to avoid common mistakes in reasoning.

In laboratory exercises, students will collect data, weigh evidence, and construct explanatory models. Models will be tested against new evidence and, if necessary,

refined or replaced by new models. Students will be challenged to think about limitations on physical laws in the pre-class videos, the in-class activities, and in the worksheets and the homework as well. Group work in class is a key component, 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.

13. Other questions
If you have any additional questions, please do not hesitate to post them on Piazza, so that all of the staff can respond, and also so others can also benefit from the answers.

Thanks for reading and see you in class!

Prof. Manher Jariwala <manher@bu.edu>