Physics 15a Advanced Introductory Physics

General Information

1 Overview

This course is the first semester of an advanced introductory course in physics, intended primarily for science majors. It is taught at a rapid pace, and is best suited for students who have had a high school physics course and already had an introduction to calculus. Students without this preparation should consider taking PHYS 10a, which meets at the same hour. The course content includes topics in classical mechanics and thermal physics. It is calculus based, and students who have not yet had calculus must be taking MATH 10a concurrently. The calculus concepts used in the course will be introduced briefly as needed.

2 Pre-requisites

Although this is an advanced introductory course, and is best suited to students who have had physics and calculus in high school or previously in college, you need not have taken any previous physics course. All concepts will be introduced and explained. As for mathematics, if you have not had calculus before, MATH 10a is a co-requisite for this course. Calculus concepts will be introduced briefly in class as needed.

3 Instructor: Robert Meyer

You can speak with me and get help in my **office hours in Abelson room 314: Monday, Wednesday, and Thursday, after class, as well as Tuesday, 11am to noon**. I am usually available at many other times, by appointment, in case you can't come to scheduled office hours. It is strongly advised that you make an appointment whenever you want to see me outside of office hours; **e-mail is the best way (meyer@brandeis.edu) and my phone is x62870**.

4 Teaching Fellows

The Teaching Fellows and their schedules will be determined during the first week of the term and further information will be posted on Latte. Weekly supplementary sessions will be scheduled by the Teaching Fellows, for review of concepts, and for working out example problems. The Teaching Fellows will have regular office hours. I will also be available for help. The Teaching Fellows will also run review sessions before the exams.

5 Text Book, Reading Assignments, and Lectures

The text book for this course is *University Physics* (12^{th} edition) by Young and Freedman, which is bundled with the on-line package called "Mastering Physics.". We will cover roughly half of the book, namely, chapters 1 through 20. The syllabus below shows what topic we will be covering in each class. It also gives the reading assignment for each class. You are responsible for doing the assigned readings, which is how you will learn the bulk of the material. You will benefit most from lectures by doing the reading before class. There may be occasional quizzes at the start of class on that day's reading assignment, to help enforce this habit. The lectures will cover what I consider to be key and/or difficult points and supplementary material. You are responsible for everything in the assigned readings and the lectures.

6 Latte

I will be using Latte and an e-mail list to communicate with the class. I will post general information, problem assignments, problem solutions, and exam solutions to the Latte page for this course. You will also be able to check your grades. Every registered student should be able to access the Physics 15a Latte page. If you have any problems or want to access this site even though you are not registered (auditing, going to register, or whatever), let me know.

7 Grading

There will be weekly problem assignments. The homework will count for about 30% of your grade. There will be 2 mid-term exams (each counting about 20%) and a final (counting for about 30% of your grade). The final will be cumulative covering all the material in the course. Your grades on occasional quizzes will also be included in your total score for the course. Your letter grade in the course will be based on your numeric score and how I think the class performed as a whole.

8 Problem Assignments

It is necessary to keep up with the problem assignments as they illustrate principles covered in your reading and in class and sometimes introduce new ideas. **Assigned problems will be posted on the Physics 15a Latte page. Problems will be due at the beginning of Wednesday's class each week**. Unless there is a valid excuse, late homework will receive half credit if submitted before the Teaching Fellow grades that week's assignment. It will receive no credit after that. If you will be missing a Wednesday class, then arrange to hand in your homework early.

9 Exams

There will be two midterm exams and a final. The midterm exams are on **Monday, October 15, and Monday, November 12, both at 6:30pm in Abelson 131, the class lecture hall**. The first midterm covers chapters 1 to 8, and the second covers chapters 9 to 15. There will be a final exam during the regular final exam period. Physics 15a is block B, the final for which is currently scheduled for **Monday, December 17, 1:30pm to 4:30pm**. The final exam will cover all the material in the course.

10 Disabilities

If you have a documented learning disability and wish to have an accommodation in this class, please see me as soon as possible. If you have a learning disability, but have not had it documented at Brandeis and wish to do so, please speak to Beth Rodgers-Kay in the Office of Student Financial and Academic Services.

11 Academic Integrity

You must follow all rules concerning academic integrity in the *Rights and Responsibilities* booklet. There are two basic clarifications for this course. First, you may work together on homework assignments, but each student must write up their own solutions, not simply copy what is arrived at by a group discussion. Second, you may bring one 8-1/2 by 11 inch sheet of paper to each exam with anything you wish written on it. No books, people (except myself and the teaching fellows), electronic devices, or other papers may be used during an exam.

12 Syllabus

Class	Date	Reading	Content
1 Th	Aug 30	1.1 to 1.6	Introduction and units; estimates
2 W	Sep 5	1.7 to 1.10	Vectors
3 Th	Sep 6	2.1 to 2.6	x, v, a in 1D
4 M	Sep 10	3.1 to 3.3	x, v, a in 2D and 3D
5 W	Sep 12	3.4 to 3.5	Circular motion; relative motion
6 M	Sep 17	4.1 to 4.6	Force, Newton's laws
7 W	Sep 19	5.1	Applications of Newton's Laws: static equilibrium
8 Th	Sep 20	5.2 to 5.5	Applications of Newton's laws: dynamics
9 M	Sep 24	6.1 to 6.4	Work, Kinetic Energy, Power
10 W	Sep 26	7.1 to 7.2	Potential energy
11 M	Oct 1	7.3 to 7.5	Conservation of energy
12 W	Oct 2	8.1 to 8.3	Momentum, impulse
13 M	Oct 8	8.4 to 8.6	Center of mass
14 **Tu**	Oct 9	9.1 to 9.3	Rigid body rotation
15 W	Oct 10	9.4 to 9.6	Rotational kinetic energy
16 Th	Oct 11	10.1 to 10.4	Rotational dynamics, torque
17 M	Oct 16	10.5 to 10.7	Angular momentum
Exam M	Oct 16	6:30pm	Chapters 1-8
18 W	Oct 17	11.1 to 11.3	Equilibrium of rigid bodies
19 Th	Oct 18	11.4 to 11.5	Elasticity
20 M	Oct 22	12.1 to 12.4	Gravity
21 W	Oct 24	12.5 to 12.8	Gravity
22 Th	Oct 25	13.1 to 13.4	Periodic motion
23 M	Oct 31	13.5 to 13.8	Periodic motion
24 W	Oct 26	14.1 to 14.3	Fluid statics
25 Th	Nov 1	14.4 to 14.5	Fluid Flow
26 M	Nov 5	14.6	Viscosity and Turbulence
27 W	Nov 7	15.1 to 15.4	Mechanical Waves; speed
28 Th	Nov 8	15.5 to 15.7	Mechanical Waves; energy and impedance
29 M	Nov 12	15.8	Mechanical Waves; superposition and normal modes
Exam M	Nov 12	6:30pm	Chapters 9-14
30 W	Nov 14	16.1 to 16.3	Sound
31 Th	Nov 15	16.4 to 16.9	Sound
32 M	Nov 19	17.1 to 17.7	Temperature and heat
33 W	Nov 21	18.1 to 18.3	Ideal gas
34 M	Nov 26	18.4 to 18.6	Thermal properties
35 W	Nov 28	19.1 to 19.4	1^{st} law of thermodynamics
36 Th	Nov 29	19.5 to 19.8	1^{st} law of thermodynamics
37 M	Dec 3	20.1 to 20.3	2^{nd} law of thermodynamics
38 W	Dec 5	20.4 to 20.6	2^{nd} law of thermodynamics
39 Th	Dec 6	20.7 to 20.8	Entropy
Final M	Dec 17	1:30 – 4:30pm	Chapters 1-20