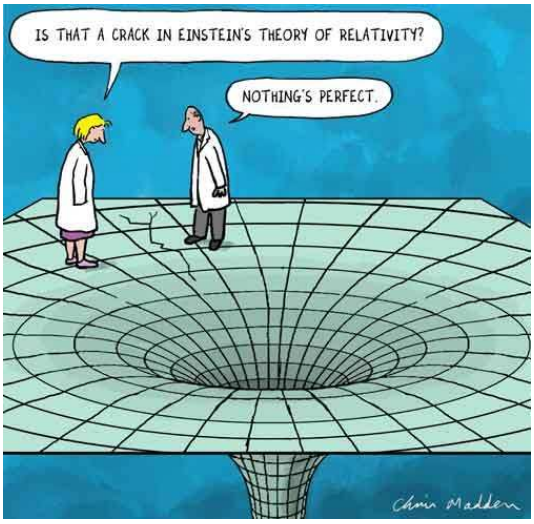
PHYS-201: FUNDAMENTALS OF PHYSICS III
Winter Quarter 4 January — 20 March 2010

Course Objective: The course *Fundamentals of Physics III* introduces the basic conceptual understanding of modern physics needed to keep up with rapidly developing frontiers of science and technology of the 21st century. The end of the 19th and beginning of the 20th century faced dramatic changes in understanding of basic physics principles. Prior to this time, physics dealt with Newton's laws of motion and gravitation, Maxwell's theory of electromagnetism, thermodynamics, and kinetic theory. However, new problems surfaced when scientists confronted very high velocities and very small lengthscales. These new puzzles led to new concepts and new theories: special and general relativity, quantum theory, modern models of atoms and molecules, lasers, superconductivity, and more. This course is a serious though relatively non-mathematical introduction to modern physics concepts. The course begins with a mathematical description of mechanical and electromagnetic wave propagation and proceeds to description of wave phenomena, such as interference and diffraction. In quantum mechanics which dominates physical world at small lengthscales the concepts of a particle and wave merge into one dual description. A particle (e.g. an electron) can be treated either as a particle or as a wave, depending on the experimental situation under consideration. Similarly, electromagnetic radiation can be mathematically described either as a wave or a particle (photon). When the relative velocity of an object with respect to the observer approaches the speed of light, special relativity phenomena have to be taken into account. The course covers some of special relativity phenomena such as length contraction, time dilation, relativistic momentum & energy, and mass-energy relationship.



Course Coordinator: Brigita Urbanc
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Course Website: For Weekly Updates Check:
http://www.physics.drexel.edu/~brigita/COURSES/PHYS-201_2009-2010

Lectures: Mon & Wed 9:00am—9:50am (CURTIS-341)
[Note: first lecture (Mon, 4 Jan) last lecture (Mon, 15 Mar)]

Recitations: Sam Kennerly & John Alamia
E-mails: stk29@drexel.edu & john.a.alamia@drexel.edu
Recitations/Discussions:
Tue 9:30am—10:50am
Tue 11:00am—12:20pm
Tue 2:00pm— 3:20pm

Labs: Nandita Ganesh
E-mail: ng97@drexel.edu
Labs: (DISQUE 820A)
Thu 9:00am—10:50am (2 parallel sessions)
Thu 11:00am—12:50pm (2 parallel sessions)

Help/Office hours: Address all questions related to (a) labs to Nandita Ganesh (b) homework and recitations to Sam Kennerly & John Alamia; and (c) lectures & exams to Brigita Urbanc. Please, contact all instructors by e-mail.

Course Material:

- Textbook 1: Serway & Jewett, Principles of Physics (A Calculus-Based Text), 4th Edition, Volumes 1 & 2, Thomson Brooks/Cole, 2006 (ISBN 0-534-41944-8; ISBN-13: 978-0-495-40711-9; ISBN-10: 0-495-40711-9)
- Textbook 2: Young & Freedman, University Physics, 12th Edition, Pearson/Addison Wesley, 2007 (ISBN-10: 080532187X; ISBN-13: 978-0805321876)
- Lab: Download and print the pdf file of each experiment and bring the hard copy to the lab session (http://www.physics.drexel.edu/~brigita/COURSES/PHYS-201_2009-2010).

Lectures:

(a) Read the relevant chapter(s) from the course textbook **before** each lecture.

(b) 100% lecture attendance is required. Failure to attend the lectures will result in reduction of your final grade at instructor's discretion.

(c) All cell phones should be turned off during the lecture.

(d) Active participation in the classroom is expected.

Labs:

(a) Attendance at all scheduled labs is required. Failure to attend and complete the labs will result in a non-completed course grade at the instructor's discretion. If you must miss a lab for legitimate reasons (i.e. illness, etc.), please inform your lab instructor as soon as you know. Time is alloted at the end of the quarter for students to make up labs missed for legitimate reasons, and make-up labs will be granted to students at the discretion of their lab instructor.

(b) Lab grades will be computed as follows:

(i) **Prelabs** : 25%

Prelabs for each lab are to be completed and submitted **before** the start of each lab session. Prelabs submitted after the first 20 minutes of the lab session will not receive more than half credit.

(ii) **Experiment** : 40%

You are expected to read the lab instructions before you arrive at the lab. Any lab member that appears to be unfamiliar with the lab material (i.e. expecting the lab instructor or other group members to complete the entire lab) will lose points. Each group must submit a copy of the data collected with **all** members signing it before leaving the lab. Each student should also keep a copy of the experimental data for use in his/her lab report. Lab material is available on the course web site (http://www.physics.drexel.edu/~brigita/COURSES/PHYS-201_2009-2010).

(iii) **Lab Report** : 35%

You need to prepare your report at home and submit it at the next regularly scheduled lab (submission procedures for the final lab will be discussed in lab by your lab instructor). Grades for late lab reports will be reduced by 10% per day late. Lab reports submitted one (1) week after the due date will receive **NO** credit.

Each report should consist of: (1) a brief summary of the purpose and procedures of the experiment; (2) one or more tables of raw data and results, including the graphs; (3) a description of your final results with an assessment of the factors affecting their accuracy; (4) answers to any questions posed in the lab; and (5) a discussion of what you personally learned from doing the experiment.

Recitations/Discussions:

(a) 100% attendance at all scheduled recitations is required. Failure to attend the recitations will result in reduction of your final grade at instructor's discretion.

(b) There will be six homework assignments which you will download from the course web site (http://www.physics.drexel.edu/~brigita/COURSES/PHYS-201_2009-2010). Each assignment will consist of standard homework problems which will count towards 100% of the homework grade and an additional bonus problem that will be more challenging and will allow you to gain extra points. You should NOT solve the bonus problem as a replacement for one of the standard problems. The solution of the bonus problem will not count unless solutions to all standard problems are provided.

(c) The homework assignments are due in your recitation TA's mailbox (in Disque 816) by 5:00 PM on each Tuesday (exceptions are Tuesdays after the two exams). For example, H1 will be due by 5:00 PM on Jan. 19th. All six homeworks must be completed, and late homeworks will not be accepted.

Academic Honesty: All work during the exams must be your own unaided effort. The homework that you submit must be your own final product, although discussion of strategies

and numerical results with others is acceptable. Each member of a lab group must take her/his own notes and write her/his own summarizing essay. In all other situations, active cooperation and peer teaching among students is strongly encouraged.

Tentative Course Schedule:

Note that on the Martin Luther King, Jr. Day (Monday, 18 Jan. 2010) there are NO classes scheduled. The last day to withdraw from the course is Friday, 12 Feb. 2010.

Grading Information:

Your letter grade will be based on your total score, obtained from the following components with the indicated weighting (contribution). Dates of all exams (Exam 1, Exam 2, and Final Exam) will be posted on the course web site (http://www.physics.drexel.edu/~brigita/COURSES/PHYS-201_2009-2010/). THERE WILL BE NO MAKE-UP EXAMS!

TABLE I: GRADING

Grade Components	Contribution
Exam 1 (1hr)	15%
Exam 2 (1hr)	15%
Final Exam (2hrs)	30%
Four Lab Reports	20%
Homework Assignments (H1-H5)	20%

TABLE II: TENTATIVE SYLLABUS

TIME-LINE	TOPICS	CHAPTERS	HOMEWORK	LABS	EXAMS
WEEK 1	Oscillatory Motion & Waves	Ch.12			
4 & 6 Jan.	Mechanical Waves	Ch.13			
WEEK 2	Superposition and Interference	Ch.14		Lab 1	
11 & 13 Jan	Maxwell's Eqs. & EM Waves	Ch.24		Lab 1	
WEEK 3: 20 Jan.	Interference & Diffraction	Ch.27		Lab 1	
			H1 (01/19)		
WEEK 4	Lasers & Holography	Ch.27		Lab 2	
25 & 27 Jan.	Quantum Physics & Planck's Theory	Ch.28	H2 (01/26)	Lab 2	
WEEK 5	Photoelectric Effect	Ch.28		Lab 2	
1 & 3 Feb.	Bohr Model of Hydrogen	Ch.11	H3 (02/02)	Lab 2	
4 Feb.					Exam 1
WEEK 6	Bohr Model of Hydrogen	Ch.11		Lab 3	
8 & 10 Feb.	Special Relativity	Ch.9		Lab 3	
WEEK 7	Special Relativity	Ch.9		Lab 3	
15 & 17 Feb.	Mass Energy Relationship	Ch.9		Lab 3	
WEEK 8	X-Rays & Compton Effect	Ch.28		Lab 4	
22 & 24 Feb.	Wave Particle Duality in QM	Ch.28	H4 (02/23)	Lab 4	
WEEK 9	Heisenberg's Uncertainty Principle	Ch.28		Lab 4	
1 & 3 Mar.	Schrodinger Equation	Ch.28	H5 (03/02)	Lab 4	
4 Mar.					Exam 2
WEEK 10:	Appls. of Schrodinger Equation	Ch.28			
8 & 10 Mar.	Atomic Physics	Ch.29			
WEEK 11: 15 Mar.	Hydrogen Atom	Ch.29	H6 (03/15)		
16-20 Mar.	N/A	N/A			Final