University of Maryland, College Park. Department of Physics, Spring 2009,
Prof. B. L. Hu

Physics 122: Fundamentals of Physics II

Course Description

Physics 122 is the second part of a two-semester introductory physics non-calculus based course designed primarily for bioscience students.
The major themes described in this course are *Waves and Optics, Electricity and Magnetism, Quantum and Atomic Physics.*

Prerequisites: Physics 121. Proficiency in algebra and trigonometry, plus essentials of vector algebra. Calculus is NOT required.
Laboratory: 10 experiments. You cannot pass this course unless you do every one and submit a report. See below.
Textbook: *College Physics – A Strategic Approach* by Knight, Jones, Field, (Pearson Addison-Wesley 2007).

Course Information

The course will stress both a conceptual understanding of physical phenomena and develop quantitative skills towards problem solving.
This is accomplished by the three parts -- **Lecture**, **Recitation/Tutorial** and **Lab.**

The course web page, http://www.physics.umd.edu/courses/Phys122/Hu/index.html., contains additional information along with links that
you will need during the semester. Important announcements regarding exams, changes to the schedule or other items will be posted there.
Please check the course web page regularly.

Lecturer: **Professor B. L. Hu**

Office: 4209 Physics Bldg **Phone:** 301 405 6029, **E-mail:** blhu@umd.edu, hubeilok@gmail.com (I read this acct more often, esp during travels)
Office Hours: Tu 2-3pm, or by appointments (for e.g, Mon 2-3 after JQI seminars, or Thur 4-5, except for days of faculty meetings)

Teaching Assistants:

Prateek Agrawal 0104 Physics Bldg, Phone: 301- 405- 8577, E-mail: apr@umd.edu

Dibyendu Mandal, 1120 Physics Bldg, Phone: 301-405-5982, E-mail: dibyendu@umd.edu

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Students in all 5 sections attend	**The same Lectures on** Tu Th 12:30-1:45 pm by	Professor B L Hu	in PHY 1412
0205(57122) Y. Wang	TuTh.....12:30pm- 1:45pm (PHY 1412)	Th 4:00pm- 5:50pm (PHY 3312) Lab	Th. 3:00pm- 3:50pm (PHY 0220) Dis
0201(57118) Y. Wang	TuTh.....12:30pm- 1:45pm (PHY 1412)	Tu. 10:00am-11:50am (PHY 3312) Lab	Tu. 9:00am- 9:50am (PHY 0220) Dis
0202(57119) D. Mandal	TuTh.....12:30pm- 1:45pm (PHY 1412)	W..... 4:00pm- 5:50pm (PHY 3312) Lab	W..... 3:00pm- 3:50pm (PHY 0220) Dis
0203(57120) D. Mandal	TuTh.....12:30pm- 1:45pm (PHY 1412)	M..... 4:00pm- 5:50pm (PHY 3312) Lab	M..... 3:00pm- 3:50pm (PHY 0220) Dis
0204(57121) P. Agrawal	TuTh.....12:30pm- 1:45pm (PHY 1412)	W.....9:00am-10:50am (PHY 3312) Lab	W..... 8:00am- 8:50am (PHY 0220) Dis

Organizational Details:

Lecture:

Attending the lectures, studying the text and working out the problems are necessary components to understand and gain proficiency of the course materials. The lectures will consist of explanation of concepts and derivations, worked examples along with demonstrations designed to enhance what you have read in the text. To extract the most from lecture, you should read the material in the text before the lecture. Although the lectures can only deal with a subset of topics in the book you are responsible for all the materials in each chapter in the assigned reading, except for those sections told specifically to be excluded. Although lecture time is pressed due to the huge amount of materials need to be covered in this course, do feel free to ask questions in class. It is better to get puzzling or sticky points cleared out or up right away than putting them aside and forgetting about them. Muddled things tend to get worse in time. Also if you don't understand something, very likely many other students don't either. I enjoy spur of the moment questions you may have outside of class too. For more structured or lengthy discussions please send me an email to make an appointment.

Most of the lecture time will be spent describing the physical ideas and principles that you must learn to understand the material, but equally important is developing quantitative and conceptual skills towards problem solving. **You cannot adequately learn the material by simply listening to the lectures and reading the textbook passively**. The knowledge that you gain that way via passive learning is often superficial and temporary compared with what you learn by confronting a challenge to solve problems actively. That is where concepts are embodied and ideas enliven. Active learning is gained by working out homework assignment problems consistently and diligently, and engaging in lively discussions with your TAs, professors and fellow students constantly.

Slawsky clinic: Free tutoring is provided for Physics 122 and other undergraduate courses daily in the in Rooms 1208 and 1214 on a walk-in basis. Check their time schedule.
http://www.physics.umd.edu/academics/ugrad/slawsky.html

Laboratory:

Lab counts 20% towards the course score. Experiments are a very important part of this course. *All* the labs *must* be completed in order to pass the course. There will be makeup sessions in which a missed experiment can be performed. Experiments must be completed during the two-hour laboratory session. Therefore, to assure efficient use of the limited time, it is essential that you read the lab manual beforehand. Lab reports must be turned in to your TA at the beginning of or before the next lab period. *Late reports will not be accepted.*. The Lab part of this course is taught and organized by Prof. Seo who has total jurisdiction over how it is conducted. For questions specific to the lab consult the course web page, or contact Prof..Seo: seo@umd.edu 3203 Computer & Space Sciences Building 301.405.4855

Homework:

First, some advice on basics: Study all the examples worked out in the lectures and in the book. This helps you to get acquainted with problem solving in realistic situations. Then do the assigned problems -- they should be considered the minimum, not the maximum, that you should perform. There are many more good problems in the textbook; do as many as you can find time for. *When working out problems*, **remember always to first think about the relevant ideas and best approaches, then formulate a good strategy before setting forth to calculate.** ***A****lways solve them algebraically*: i.e., derive an algebraic expression for your result, plug in the numbers only in the last step. This is of both practical and basic advantages: carrying numbers in every step as you solve the problem is more prone to generating mistakes. More importantly, with symbols denoting physical quantities you can see the physics concepts and rules applied and derived in every step of the way towards a solution, which you cannot with numbers. It is very important to adhere to this rule to establish the good habit of working out

problems in science, from smaller, isolated ones you are given here at this entry level to huge coordinated problems in PhD and more advanced research projects.

Refer to the table below for homework problem assignments and due dates (they may change according to the pace of lectures.). You will generally have a week to work on each problem set. **Late homework will receive no credit.** You are allowed and encouraged to study and discuss with your classmates. However, to lend yourself the opportunity to learn independently, you should initially make a serious attempt to solve the problems by yourself. Don't just copy the solutions from someone. Any homework problem handed in with identical answers will automatically be given zero credit. Remember: experience tells that the effort you put in homework correlates strongly with your performance in quizzes and exams. Only active learning can sustain.

Grading: Because of their heavy load your TA will grade only one specified problem per set in detail with feedbacks, with scores of up to 5 points. The rest of the problems will be scanned quickly for performance and reasonableness and given a grade of 0, 1, or 2.

Tutorials / Recitations:

This course will utilize tutorials developed by the physics education research group at UMD rather than traditional discussion sections. Tutorials will include active learning in groups and will be devoted to treating difficult concepts in more depth. There will usually be one or two special homework problems concerning the Tutorial due the following week. In the recitation session the TA's foremost task is to assist you to get a firmer grasp of the key concepts developed and the quantitative skills presented in lectures. Your TA will take attendance. Your participation in discussions in the sections will be noted by the professor through consultations with your TA, which can make a crucial difference in borderline grade considerations. Because of the adoption of the tutorial system regular homework problems will not be routinely discussed at the tutorials. You should **make use of the TA's office hours to consult them on homework and quizzes** given in lectures or seek homework help from Slawky Clinic.

Quizzes:

A quiz of 15 minutes will be given every week in class based on the previous week's lectures, readings and homework assignments. The purpose of the quizzes is to monitor your understanding of the subject and the development of skills in problem solving, from the fundamental concepts to practical applications. A course like this is so compact and fast-paced that weekly monitoring of your own progress is highly recommended to avoid an accumulated backlash prone to total collapse. Your quizzes will be graded by your TA discussed and returned in the recitations. There are 11 quizzes (no quiz during the weeks of the three mid-term

exams), the one with the lowest score is dropped in making up the course grade. **The quizzes will be closed book**, no formula sheets are allowed – I expect you to be able to remember materials discussed in the prior week, if not the whole semester.

Exams:

There will be three midterm exams given on lecture days and one final exam. **You must take the final exam to pass the course.** The third midterm exam is optional, only the two best scores are counted. The dates the exams will be given are listed in the schedule. **There will be no make-up exams.** All exams will be closed book.

Formula Sheet You will be allowed one 4x6" index card (front and back) for each midterm exam, thus totaling 3 cards you can bring for the final exam.

Calculators: You can use a standard scientific calculator to all exams, but not programmable ones. Your calculator should provide arithmetic, trigonometric, exponential, logarithmic functions, and arbitrary roots and powers.

Fire Alarm If there is a fire alarm or bomb threat, the exam will be held at the scheduled time in another room. If the University is closed because of weather, the exam will be held the next class day.

Student ID Numbers:

The university will no longer use your social security number as your SID No. All students will now be provided with a U ID No. If you don't know yours, you can obtain it by logging into Testudo and viewing your class schedule. (Visit here for more information.) Photo ID cards issued since June 2003 should have the U ID No. displayed on the front.

Academic Integrity: It is assumed that all students understand the academic integrity policy of the university and will neither give nor accept any unauthorized assistance on any assignment in this course. It is further assumed that each student has taken the honor pledge

TIPS for improved performance in this course:

1) Read the material in the textbook *before* and *after* the material is discussed in lecture. Remember that you are responsible for material discussed in class, including demonstrations, even if it does not appear in the textbook. 2) Ask questions in lectures and actively participate in tutorials. 3) Work out all of the homework problems. It is an essential part of active learning. 4) Seek help immediately if you do not understand the material or feel left behind. a) If you have difficulties with the homework or get low grades in quizzes, see your TA who can help you with your way of reasoning and the approaches. b) If you have difficulty following the course material make an appointment to see me and I will try to help you identify what could be causing you such problems and

suggest remedial measures. Don't wait until just before exams to act or after the exam to panic.

Grade Composition:

Homework:	15%
Quizzes: Best 10 out of 11	10%
Mid-term Exams: best 2 out of 3	30%
Final Exam	25%
Lab (Physics 271)	20%
Total	**100%**

Letter Grades Final letter grades are based upon the distribution of class scores and will not be known until the end of the semester. Recognizing that the actual divisions will most likely be different, you may use the following as an *approximate* guide, but not view it a promise or projection of a specific grade:

A:	80-100%
B:	70 - 80%
C:	50 - 70%
D:	40 - 50%
F:	0 - 40%

We usually find gaps in the distribution to make the grade divisions, so the borders can deviate from the above by quite some percentage points.

Regardless of your point accumulation, if you do not take the final and pass the lab you will get an F!

Lecture, Exam and Quiz Schedule:

This course will cover Chapters 14-25 and Chapter 28-29 of Knight, Jones, Field, *College Physics – A Strategic Approach* (Pearson Addison-Wesley 2007). The Exam dates and targeted schedule of lectures and are listed below:

Wk Lec. Date Topics Reading: Chapters Quiz

1	0	Jan 27	NO LECTURE	14		
	1	Jan 29	Introduction. Oscillations	14		
2	**2**	Feb 3	Oscillations, Waves	15		1
	3	Feb 5	Waves, Sound	15		
3	4	Feb 10	Superposition	16		2
	5	Feb 12	Standing Waves	16		
4	**6**	Feb 17	Physical (Wave) Optics	17		3
	7	Feb 19	Physical (Wave) Optics	17		
5	**8**	Feb 24	Geometric (Ray) Optics	18		4
	9	Feb 26	Ray Optics and Op. Instr.	18,19		
6	**10**	Mar 3	Optical Instruments	19		5
	11	Mar 5	Electric Forces and Fields	20		
7	**12**	Mar. 10	Electric Forces and Fields	20		

March 12 First Exam on materials covered from Lecture 1-10, Chapter 14-19

8	March 16 -20		**Spring Break**			
9	**13**	Mar 24	Electric Potential	21		6
	14	Mar 26	Electric Potential	21		
10	**15**	Mar 31	Current and Resistance		22	7
	16	Apr 2	Current and Resistance		22	
11	**17**	Apr 7	DC Circuits	23		8

18 Apr 9 DC Circuits 23

12 **19** Apr 14 Magnetic Fields and Forces 24

9

20 Apr 16 Magnetic Fields and Forces 24

13 **April 21 Second Exam on materials covered from Lecture 11-18, Chapter 20-23**

21 Apr 23 EM Induction 25

14 **22** Apr 28 EM Induction 25

10

23 Apr 30 Modern Physics: Quantum Physics 28

15 **24** May 5 Quantum Physics 28

11

25 May 7 Atomic Physics 29

16 **26** May 12 **Third Exam (Optional) : Chapter 24-28.** (Best 2 of 3 exams are counted)

May 19 Tue 1:30 pm - 3:30 pm Final Exam (Comprehensive)

Please mark on your calendar this date and time

Please Note Again: You will get an F if you don't take the final exam or complete all the labs.

Homework Assignments

Week	HW #	Due Date	Problems from *College Physics – A Strategic Approach* by Knight et al
1, 2			
3	1	Feb 10	Chap 14: # 12, 13, 15, 17, 28, 29, 36, 38
4	2	Feb 17	Chap 15:
5	3	Feb 24	Chap 16:
6	4	Mar 3	Chap 17:
7	5	Mar 10	Chap 18: Chap. 19:
8	6	Mar 24	Chap 20:
9	7	Apr 2	Chap 21:
10	8	Apr 9	Chap 22
11	9	Apr 16	Chap 23:
12	10	Apr 28	Chap 24

13	11	May 5	Chap 25
14	12	May 8 (fri)	Chap 28
15, 16			

Useful links

University of Maryland Physics Department
University of Maryland College Park
Physics is Phun
Question of the week