Physics 420   Principles of Modern Physics   Fall 2012

Description: This 3 credits course is designed primarily for engineering students. The lectures will cover selected materials from the text on the fundamentals of modern physics, according to the schedule below.
Prerequisites: PHYS270 and PHYS271 (formerly: PHYS263) or PHYS273; and MATH246.

Lectures: Mondays and Wednesdays 4-5:15pm in Physics Building – Room 0405.
Lecturer: Prof. B. L. Hu   Office: Z-4209, Phone: 301-405-6029, Email: blhu@umd.edu
Office hours: M,W 5:15-6pm or email me hubeilok@gmail.com for additional individual appointments.
    TA: Office: Z-, Phone: 301-405-, Email:

Textbooks Required: "Modern Physics" by Serway, Moses and Moyer, 3rd Edition, Thomson, Brooks, Cole 2005. ISBN 0-534-49339-4. The book may be downloaded electronically from:
http://www.cengagebrain.com/tl1/en/US/storefront/ichapters?cmd=catProductDetail&ISBN=97805344933
94. (the first chapter is free)

Reading: The approximate progression of topics can be found in the Course Schedule for the planned topic(s) for each lecture. The schedule may lag or advance by one lecture if some topics take more or less time than expected. To enhance your comprehension of a particular subject to be covered, you *should try to read the material in the text before coming to the lecture*. This will enable you to ask questions about ideas you may not be able to grasp fully on the first reading and to gain a better overall perspective. Read it again after the lecture, study the examples and do the assigned problems. I encourage questions in class (to the extent time permitting, can follow up in addtional sessions) – this could stimulate thoughts and discussions.

Course webpage on the ELMS (Blackboard) system: Go to http://elms.umd.edu and log in with your username (your campus "Directory ID") and password, you should see the course listed in the "My Courses" panel. Check this regularly for assignments, due dates and up-to-the minute announcements.

Homework: 9 sets of homework problems are planned, counting 20% towards your course grade. They are to be worked out and handed in at the beginning of classes on the due dates -- check the course webpage for last minute changes. Solutions will be posted soon after thus no late homework will be accepted. I encourage group discussions but stress strongly the importance of thinking through and working out the problems on your own. *Don't rely on others' help or just passively read the solutions.* It makes a real difference in your grasp of the subject matter which shows clearly in your examination performance.

Mid-Term Exams: Two 75-minute closed book mid-term exams are scheduled on **October 15 (Mon) and Nov. 19th (Mon) during the lecture periods**. Each exam covers the material assigned since the previous one, and is likely to contain one or more problems based on the assigned homework problems. Each exam counts 25% towards your course grade. If you cannot take an exam (only for certified medical and duty-related reasons, as stipulated in the University Rules), please notify me well in advance, at the earliest possible time, to discuss alternatives. There will be no make-up exams.

The Final Exam, comprehensive, is worth 30% of the course grade. It is on **Wednesday, December 19, 2012, 1:30-3:30 pm**, likely in the classroom. You must take the final exam to receive a course grade.

Exams are meant to test your understanding and ability to apply concepts covered in the course, not how well you can memorize the materials. You may bring one 4x6" index card to the first exam, with equations written on it. Keep this card and prepare another one for the second exam. You are allowed a third card or a full sheet of paper (in lieu of the cards) to the final exam. The value of any constants will be provided. You will need a non-programmable calculator with standard trigonometry functions, etc.
Academic dishonesty is a serious violation and will be dealt with strictly, according to University policy.

Course Grade: Your course grade is made up with the composition of 20% homework, 25% for each of the two mid-term exams, and 30% from your final exam scores. We use 500 points max for total course score.

PHYSICS 420   CONTENTS and SCHEDULE   Fall 2012   Prof. B. L. Hu

Lectures: Week/Date	**Readings:** Chapters in *Serway, Moses and Moyer*, 3rd ed 2005	**Topics:** *schedule* [note updating]	**Homework #** (Chap**) Due Date**

1,2   8/29, 9/5   Chap **1**   Relativity, Lorentz Transformations, Spacetime   **#1**   9/12
3   9/10,12   Chap **2**   Relativistic Energy and Momentum, 4-vectors   **#2**   9/19

4   9/17,19   Chap **3**   Quantum theory of light, photoelectric effect,
                                       Particle nature of waves, Compton scattering,   **#3**   9/26
5   9/24,26   Chap **4**   Early Quantum physics,   Bohr Atom

6   10/1   Chap. **5**   Matter wave, Uncertainty Principle.   **#4** (Ch 4 & 5) 10/8
10/3   Chap. **6** Quantum Mechanics: Wave function, Born Rule.

7   10/8   Chap **6** Schrodinger Equation, Particle in a 1-d Box
10/10   Chap 6   Quantum Oscillators, Short Review for Exam 1

8   **10/15**   **(Monday)**   **Exam 1**   **Chapters 1-5**
        10/17   Chap 6 Quantum Oscillators, Properties of Wavefunction **#5** (Ch6)10/22

9   10/22   Chap **7** Particle Flux, Junction Condition, Step Potential

       10/24   Chap **7** Barrier Tunneling & Reflection, Finite-depth Well **#6**(Ch7)10/29

10   10/29   Chap **8** 2 & 3d Particle in a Box, 3D Quantum Mechanics

       10/31   Chap **8** Hydrogen Atom   **#7**(Ch8)11/5

11   11/5   Chap **9** Atomic Structure

       11/7   Chap **9** Atomic Structure   **#8**(Ch9)11/12

12   11/12   Chap **10** Statistical Mechanics   11/14 Stat Mech + Short Review for

13   **11/19**   **(Monday)**   **Exam II**   **Chapters 6-9**

       11/21   **No class** (We'll add 15min to each of the remaining 5 lectures)
                            Have a Warm Thanksgiving! Safe Travel

14   11/26, 28 Chap **10** Kinetic Theory; Quantum Statistics   **#9**(Ch10)12/3

15   12/3, 5   Chap **11** Molecular and Solid State Physics

16   12/10   Chap **12** Solid State Physics

           Final Exam – Comprehensive: **Dec 19 (Wed) 1:30-3:30** in Room 0405

                          *** *Happy Holidays*! ***