Syllabus for PHY 361 Spring 2008

Principles of Modern Physics

Class schedule:	M W F 11:00–1l:50, CP 183
Instructor:	Christopher B. Crawford
	CP 373, 257-2504, crawford@pa.uky.edu
Office hours:	Mon. 1:00–2:00, Thurs. 10:00–11:00
Homepage:	http://www.pa.uky.edu/∼crawford/phy361_sp08
Textbook:	Paul A. Tipler & Ralph A. Llewellyn, "Modern Physics" 5th Ed.

Course Description

This class is an introduction to revolutionary ideas of quantum mechanics, developed in the early 20th century. We will explore experimental discoveries and the resulting theoretical framework. Because quantum phenomena occur at the microscopic level and are unobservable in normal life, we do not have a natural intuition of quantum principles. However, resulting technologies permeate our modern world: for example semiconductors, lasers, superconductors, X-rays, MRI, and nuclear power.

The course closely follows the required textbook (Tipler & Llewellyn) and is divided into three sections:

1. Chapters 3–5. Experimental developments dictating the need for quantum mechanics. Key principles such as quantization and wave-particle duality, and probability, and uncertainty are covered in detail.
2. Chapters 6-8. Wave mechanics, one method of quantum mechanical calculations, and a successor to Newtonian dynamics. Applications of the Schrödinger equation to various systems, including the hydrogen atom. Implications of quantum mechanics in systems with many particles (statistical or thermodynamic properties).
3. Chapters 9-13. We briefly introduce the application of quantum mechanics to various fields in modern physics. Only selected topics in each chapter will be covered. Some results from the theory of relativity will be used.

The goal of this course is gain a qualitative and quantitative understanding of what happens when things get really small. You will learn the basic concepts and how to do basic calculations. You will be prepared to learn more advanced formalisms of quantum mechanics taught in upper level courses. You will also gain an overview of active fields of research in modern physics.

Grading

The three keys to success in this (or any) course are: a) reading the textbook material ahead of class, b) actively participating in class, and c) working significant problem sets to genuinely understand

the material. The grading system is designed to encourage each of these.

Homework problem sets will be due each Friday at the beginning of class except for the week of an exam. Students are encouraged to work together on problem sets, but each person must turn in their own independent solution. No credit will be given for past due assignments. Students are encouraged to take advantage of the Physics Resource Room and the instructor's office hours.

There will be three 1-hour in-class exams as listed in the schedule. You are responsible for all of the material in the sections covered in the textbook. Only official university excused absences will be eligible for a make-up exam. A comprehensive final exam will be written on **Monday, April 28, 2008 10:30 AM–12:30 PM** in the lecture classroom. All exams are closed book, but a summary sheet of formulas will be provided ahead of time.

Five percent of the grade will be awarded for independent creativity. Because each person learns differently, this is flexible credit, but it must represent a substantial effort. Examples include active participation in class, online submission of questions before class, keeping a reading journal (with notes, questions, and derivations), or exploration of a topic of interest in modern physics. Documentation of your effort should submitted during the final week of class.

grade breakdown		**letter grade**	
homework	35%	A	80–100%
in-class exams	3×10%	B	65–79%
final exam	30%	C	50–64%
creative	5%	D	40–49%
TOTAL	100%	E	00–39%

Additional bonus credit of 1% will be awarded for completion of the online course evaluation, and bonus credit of 0.2% will be awarded per error discovered in the textbook up to a maximum of 1%. Only one person will receive credit for each error reported.

Students with a certified disability should provide this information to the instructor no later than the last day for adding a class so that beneficial arrangements can be made (see http://www.uky.edu/-StudentAffairs/DisabilityResourceCenter).

Course evaluation

Course evaluations are an important (and mandatory!) component of our Department's instructional program. An on-line course evaluation system was developed to allow each student ample time to evaluate each component of the course and instructor, thus providing the Department with meaningful numerical scores and detailed commentary while minimizing the loss of instructional time in the classroom. The evaluation window for Spring 2008 will open on Monday, April 07, 2008 and close on Monday, April 23, 2008. To access the system during this time, simply go the Department of Physics Web page (http://www.pa.uky.edu) and click on the link for Course Evaluations; then follow the instructions. You will need to use your student ID# to log into the system, and this will also allow us to monitor who has filled out evaluations. However, when you log-in you will be assigned a random number that will keep all your comments and scores anonymous.

Schedule

Date	Section	HW
Jan. 09	Intro	
Jan. 11	3-1	
Jan. 14	3-2	
Jan. 16	3-3	
Jan. 18	3-4	HW1
Jan. 21	MLK day	
Jan. 23	4-1	
Jan. 25	4-2	HW2
Jan. 28	4-3,4,5	
Jan. 30	5-1,2	
Feb. 01	5-3,4	HW3
Feb. 04	5-5,6	
Feb. 06	5-7	
Feb. 08	**Exam 1**	
Feb. 11	6-1	
Feb. 13	6-2,3	
Feb. 15	6-4,5	HW4
Feb. 18	6-6	
Feb. 20	7-1,2	
Feb. 22	7-3	HW5
Feb. 25	7-4,5	
Feb. 27	7-6,7	
Feb. 29	**Exam 2**	

Date	Section	HW
Mar. 03	8-1 (midterm)	
Mar. 05	8-2	
Mar. 07	8-3,4	HW6
Mar. 10	Spring Break	
Mar. 12	Spring Break	
Mar. 14	Spring Break	
Mar. 17	8-5	
Mar. 19	9-1,2	
Mar. 21	9-4	HW7
Mar. 24	9-5,6	
Mar. 26	10-1	
Mar. 28	10-6	HW8
Mar. 31	10-7,8	
Apr. 02	10-9	
Apr. 04	**Exam 3**	
Apr. 07	11-3,4	
Apr. 09	11-8	
Apr. 11	12-1,2	HW9
Apr. 14	12-3	
Apr. 16	12-4	
Apr. 18	13-2,3	HW10
Apr. 21	13-4,5	
Apr. 23	13-7	
Apr. 25	Review	creative
Apr. 28	**Final Exam**	