PHYSICS 244 Fall 2001

GENERAL INFORMATION

Instructors: **Professor Inder P Batra – Weeks 1-3 and 14-15.**
Professor Nikos Varelas – Weeks 4-13.

Classes:	**Lectures**	**MW LC E1 11:00 – 11:50 am**
	Discussion	**Th 2284 SEL 2:00 - 2:50 pm**
Laboratory:		**Th 2293 SEL 3:30 - 5:20 pm**
		F 2293 SEL 9:00 - 10:50 am
		2283 SEL 9:00 - 10:50 am

Texts: **Modern Physics for Scientists and Engineers (Prentice-Hall, 1991) J.R.Taylor and C.D.Zafiratos**

Physics 244 Laboratory Instruction Manual

Office Hours: **Noon – 1 pm Mondays and Wednesdays**
Professor Batra 2246 SES (3-2797) ipbatra@uic.edu
Professor Varelas 2134 SES (6-3415) varelas@uic.edu

1. Course Calendar and Assignments

The course calendar and assignments are attached. We strongly suggest that you read the appropriate material before it is discussed in class. That way you will be able to focus on the things you do not understand at first and ask relevant questions. Remember that learning is an interactive process, the instructors will be only too happy to answer your questions in class, in the discussion sections or during office hours.

The material in this course is an introduction to "Modern Physics" which means the physics of the last 100 years. It contains a description of phenomena far removed from our everyday experience such as relativity and quantum physics. Nevertheless, these are essential components of our overall picture of the universe we live in and, through modern technology, play an ever-increasing role in our daily lives.

The new material in this course relies on a solid knowledge of the basic concepts presented in Physics 141 and 142 such as force, energy, fields etc. which must be understood in order to be comfortable with the content of Physics 244. As before, we emphasize that physics cannot be mastered simply by rote learning of facts or equations. You must concentrate on understanding the underlying principles and their application. Mathematics is the language by which the ideas of physics are expressed. If you are not at ease with the basics of calculus and vectors you should review them at the earliest possible time and/or ask for help.

2. Homework

The homework is an integral and essential part of the course. It is the method by which you get feedback on your comprehension of the material. It is therefore very important that you spend time working on understanding the problems. In case of difficulty, please contact the instructor, grader or laboratory TA for help. Working together in a group is often a useful way of tackling difficult problems.

The homework assignments are due on the Wednesday of the week following the assignment. They may either be handed in at the end of class (preferred way) or at the Physics Department office by the end of the day. They should be clearly identified with your name and social security number, the course number, and the name of the instructor and grader. Homework handed in to the Physics Department office should have a cover sheet attached.

To obtain the maximum credit, please arrange your work neatly with carefully drawn diagrams and clear definitions of quantities. Answers should, of course, include units where appropriate.

Solutions to the homework problems will be posted in the library and/or in the course web page at the end of the week following the due date.

3. Laboratory

The laboratory is also an integral part of the course. Physics is an experimental science and the laboratory work will give you insight into the phenomena that are discussed in class. Attendance at all laboratory meetings and submission of completed laboratory reports is mandatory. It will not be possible to pass the course without completion of the laboratory requirement.

4. Examinations

Two examinations will be given during the course of the semester. The Mid-Term Examination is tentatively scheduled during the 8^{th}.week. The date and the time will be confirmed later. The second examination will be given during finals week at a time to be scheduled later. It is your responsibility to be available for all examinations.

5. Grades

The final score for the course will be determined according to the following proportions:

Mid-Term Examination	30%
Final Examination	40%
Laboratory	20%
Homework	10%

6. Withdrawal

According to the University Regulations, the last day to drop a course without penalty is Friday Aug 31st.

PHYSICS 244
Fall 2001 – Course Outline

WEEK	CHAPTER SECTION	TOPICS	HOMEWORK PROBLEMS	LABORATORY
1 Aug 20st	**1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4**	**RELATIVITY** Michelson-Morley Experiment Postulates of Relativity Time Dilation Particle Lifetimes	1.14, 1.15,1.16, 2.8, 2.9	**No Experiment**
2 Aug 27th	**2.5, 2.6, 2.7, 2.8, 2.9**	Length Contraction Lorentz Transformation Velocity Addition Doppler Effect	2.14, 2.20, 2.23, 2.27, 2.31	**No Experiment** *Time Dilation Movie during Discussion*
3 Sep 3rd	**3.2, 3.3, 3.4, 3.5, 3.6, 3.8**	**Sep 3rd LABOR DAY** Relativistic Mass Relativistic Momentum Relativistic Energy Massless Particles	3.6, 3.23, 3.27, 3.31, 3.37	**No Experiment**
4 Sep 10th	**4.1, 4.2, 4.3, 4.4, 4.7, 4.9, 5.1, 5.2, 5.3, 5.4**	**BASIC ATOMIC PHYSICS** The Electron Rutherford and the Nuclear Atom Quantization of Light Black Body Radiation Photoelectric Effect X-Rays and Bragg Diffraction		**Bragg Diffraction**
5 Sep 17th	**5.6, 5.7, 6.1, 6.2, 6.3, 6.5, 6.6, 6.7, 6.9**	Compton Effect Atomic Spectra Balmer-Rydberg Formula Bohr Model of the Atom X-Ray Spectra		**Photo-Electric Effect**
6 Sep 24th	**7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9**	**QUANTUM MECHANICS** de Broglie Waves Wave/Particle Duality The Wave Function Two Slit Experiment Waves Uncertainty Principle		**Atomic Spectra**
7 Oct 1st	**8.2, 8.3, 8.4, 8.5, 8.6, 8.7**	Standing Waves Particle in Box Schroedinger Equation and its Solutions		**Lab Makeup,** *Radiation Safety Lecture in Discussion*

8 Oct 8th	**9.2, 9.5, 9.6**	**QUANTUM MECHANICAL DESCRIPTION OF ATOMS** Schroedinger Equation in 3D Central Force Problem Quantized Angular Momentum		***MID-TERM EXAM*** **TBA**
9 Oct 15th	**9.7, 9.8, 9.9, 9.10**	Hydrogenic Energy Levels and Wave Functions Shells and Ions		**Counting Statistics**
10 Oct 22nd	**10.2, 10.3, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7**	Electron Spin, Magnetic Moments Independent Particle Model Pauli Exclusion Principle Low Z Elements Periodic Table of Elements		**Interaction of Electrons with Matter**
11 Oct 29th	**11.8, 15.3, 15.4, 15.5, 15.6, 15.7**	Excited States of Atoms Stationary States Absorption/Emission Lifetimes/ Selection Rules Lasers		**Interaction of Gamma Rays with Matter**
12 Nov 5th	**12.2, 12.3, 12.6, 12.7, 13.2, 13.3, 13.4, 13.6, 13.7, 13.8**	**NUCLEAR and PARTICLE PHYSICS** Nuclear Force Mass Formula Radio-Active Decays Nuclear Reactions, Fission, Fusion		**Lifetimes of Nuclei**
13 Nov 12nd	**14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7, 14.8, 14.9**	Elementary Particles Antiparticles, muons and pions Fundamental Forces Leptons and Hadrons Quarks and Gluons Electroweak Interactions		**Beta Decay**
14 Nov 19th	**16.3, 16.4, 16.5, 17.1, 17.2, 17.3, 17.4**	**CONDENSED MATTER** Chemical Bonds Solid Matter, Crystals Electrons in Solids		***Thanksgiving Holiday***
15 Nov 26th	**17.5,17.6, 17.8**	Conductors and Insulators Semiconductors Superconductors Electron Microscopy		**Lab Makeup**
16 Dec 3rd		**Week of Finals**		**FINAL EXAM** **TBA**