THE UNIVERSITY OF TEXAS AT EL PASO
COLLEGE OF SCIENCE
DEPARTMENT OF PHYSICS

Course #:	PHYS 3243, CRN 24123
Course Title:	Advanced Laboratory Practice
Credit Hrs:	2
Term:	Spring 2016
Course Meetings & Location:	PSCI 320, MW 1:30-4:20 PM
Prerequisite Courses:	PHYS 2420, 2421
Course Fee: (if applicable)	
Instructor:	Dr. Chunqiang Li
Office Location:	PSCI 221E
Contact Info:	Phone #: 7537 E-mail address: cli@utep.edu Fax # Emergency Contact
Office Hrs:	M 11-12 or by appointment
Textbook(s), Materials:	Required: **Electronics**: "The art of electronics", P. Horowitz and W. Hill, 2nd ed., Cambridge University Press "Student manual for the art of electronics", T. C. Hayes, and P. Horowitz, Cambridge University Press Lab handouts **Modern Physics:** Lab handouts Suggested:
Course Objectives (Learning Outcomes):	This course is divided into three sections, (1) electronics, (2) modern physics, and (3) small projects. Each student will enroll in one section indicated above. In each section, students in pairs or groups will perform anywhere from six to ten experiments each semester. The advanced lab attempts to help the student develop some practical working knowledge of basic electronic circuits and their applications. Also it provides an opportunity to review and "solidify" one's knowledge of the basic concepts of classical physics by using and observing them directly in experiments.
Course Activities/Assignments:	Each student enrolled in the course must read the lab materials for their specific sections before come to the lab sessions, which will be indicated prior to the actual performance of the lab. Each student will have with them a scientific calculator, a ruler, pens, pencils, and a notebook.
Assessment of Course Objectives:	Outcomes will be measured by lab reports.

Grading Policy:	Grades will be assigned on a standard scale. Every student will be an active participant in each laboratory session and will individually take experimental data sets. As soon as the data sets are taken, students on an individual basis will start their lab computations and analysis, and will show their results to their instructor. Formats and styles of writing these reports will be addressed by the instructor later. Students will submit their finished reports in the succeeding lab session and will be handed back the graded report a week later. Laboratory instructor will grade each report on a scale from 0 to 100 points, with points taken off for errors. Late lab reports will be fined 10 points for each day of late submission. A lab report late by over a week will receive a grade of 0. Independent thinking and work are highly encouraged and expected in all laboratory sessions and reports. Students are encouraged to discuss with lab partners how to divide the work during the experiment, but every student is expected to independently write up his/her own lab report, and to do independently analysis of the data and make independent conclusions. The grade of this course is the average of all reports turned in. If you perceive that an experiment has been graded unfairly, you could express your grievance to the laboratory instructor.
Make-up Policy:	All laboratory experiments as scheduled for a given section are mandatory and can not be missed nor rescheduled. Under NO condition can any laboratory session that is missed by a student be made up at any later time. Please do NOT seek a reclarification of the previous sentence. If you do have to miss a lab session for genuine academic, medical or a natural disaster reason, you must provide documentary and corroborative proof to the laboratory instructor before your absence, or in the case of a natural disaster after the event. Students with genuine reasons for absence do not have to write their laboratory reports for the missed sessions and will be given a grade of EA (Excused Absence) for the missed lab. Their final grade will be computed over the labs they have actually performed. Students who have not satisfactorily explained their absence from the lab sessions will by default received a grade of zero for those missed labs.
Attendance Policy:	Attendance in class is the responsibility of the students.
Academic Integrity Policy:	Acts of academic dishonesty will not be tolerated in this class. Lapses in academic integrity will be referred to the Dean of Students, as required at http://academics.utep.edu/Default.aspx?tabid=23785.
Civility Statement:	This course requires positive behaviors: Be on time and be focused on your work. Please do not distract yourself or others with telephones or music.
Disability Statement:	If a student has or suspects he/she has a disability and needs an accommodation, he/she should contact the Center for Accommodations and Support Services (747-5148 or cass@utep.edu). or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any CASS accommodation letters and instructions.
Military Statement:	If you are a military student with the potential of being called to military service and /or training during the course of the semester, you are encouraged to contact me as soon as it appears that your service will interfere with this course. The instructor will work with you to ensure that your service will not adversely affect your academic progress.

Safety and Health Issues:	Collisions with tables, benches and other furniture is a common laboratory hazard and exercising caution and cares and keeping a safe 6-inch distance from them. Always look to the ground when approaching furniture or narrow spaces to prevent from tripping over running or loose electrical wires and cables. Electrical shocks from equipments and faulty connected circuits can occur at any time with least warning. Always ground all electrical equipments before turning them ON If you are connecting an electrical circuit for the first time, always have it approved by the lab instructor before turning ON the electrical power. Your lab instructor will give separate instructions on this vast topic of electrical safety. Lasers, powerful arc lamps and discharge tube, can pose eye safety issues. Never look straight into a laser beam, nor its reflected components. Wear specially provided laser safety goggles when doing experiments involving laser light. You must ear appropriated eye goggles for any experiments in optics and moderns physics that involve intense light sours of any kind. X-ray can pose health problems if proper distances and care are not exercised. X-ray sources in the lab have been designed for low potency but caution should never be thrown to the winds. Nuclear radiation from radioactive sources used in our labs are at very low toxic levels yet must be handled with gloves and other tools. Always wear masks over your nose and mouth area, if you are near dusty spots or are likely to smell chemical fumes. Always wash your hands with water, soap and appropriate detergents if you have handled dusty, dirty, greasy, and oily chemicals.

Course Schedule: Tentative List of Topics

Electronics:

Most of the exercises in this portion of the advanced lab series follow the above *Student Manual*. The first part of such an assignment is designated as a "Class," which will consist of reading the appropriate material in the *Student Manual* and handing in solutions to any problems that are assigned. The second part will consist of a "Lab," which will be the experimental work to be performed. The write-up for each of these "Labs" will generally include diagrams of all circuits studied, written answers to all questions assigned, and graphs of the data obtained.

This part of the advanced lab attempts to help the student develop some practical working knowledge of basic electronic circuits and their applications. It is designed for those whose scientific studies up to this point have been exclusively theoretical, or, at least, heavily weighted in theoretical courses with very little laboratory experience. This experience will hopefully prove valuable to the student, not only in attempting to understand the instruments and methods of more advanced physics experiments, but also as an asset to the student's future career.

It is also important to realize that mathematics is an essential set of tools for applying the laws of physics to obtain meaningful or useful results. The success of our technology, for example, relies on the ability of scientists and engineers to be able to accurately and *quantitatively* predict how a given physical system will behave. Hidden in the brevity of many concisely stated physical principles is the fact that, coupled with the logical power of mathematical methods, these principles allow an unlimited variety of different systems to be investigated and understood in great detail. A major (and, hopefully, interesting and exciting) ingredient of your effort in this lab is therefore likely to be learning to use your mathematical skills to predict and understand, quantitatively, how the laws of physics will determine the outcome of an experiment or exercise.

Modern Physics:

In recognition of the fact that a prerequisite for this course is completion of PHYS 2421, *Fields and Waves*, this course will begin on the assumption that the student has a basic background in classical physics with calculus. However, many of the experiments in this lab emphasize concepts of *modern physics*. Modern physics is generally distinguished from classical physics for the following reasons.

Modern physics began developing as a body of knowledge near the beginning of the twentieth century. It came into being as people attempted to explain discrepancies between the expectations of the already well-established theories of classical physics on the one hand and a number of rather mysterious and exciting experimental results on the other. Important concepts of modern physics that were developed during this period include the quantum theory and its applications to atoms, molecules, and elementary particles. Existing classical concepts concerning the fundamental nature of space and time were also revised and extended by Einstein's theories of relativity and gravitation.

This advanced lab course attempts to help the student in at least two important ways. First, it provides an opportunity to review and "solidify" one's knowledge of the basic concepts of classical physics by using and observing them directly in experiments. Second, for those students who have not yet studied modern physics or who are just beginning, it provides an introduction or "preview" to some of the most important fundamental concepts by way of experimentation. Those students beginning this course who already have some knowledge of modern physics topics will have the opportunity to organize, review, and extend this knowledge in the laboratory environment.

A major point that is worthy of emphasis in the context of the laboratory is that although the physical principles studied in this course may be isolated and summarized separately in words and equations, each and every one of them will always be operating. Newton's third law does not wait politely for Newton's second law to finish acting before it comes into play. Electromagnetic fields do not assume only the properties given by Ampere's law one minute, then cease such behavior and conform only to Coulomb's law the next minute. On the contrary, all of the laws of physics are always "on duty," always acting together to produce the complex universe that we continually experience.