Advanced Laboratory

PSC 4103-P01 Spring 2009

Instructor:	Dr. Kevin Storr
Office:	330H New Science Building
Contact:	**(936) 261-3132** **kastorr@pvamu.edu**
Classroom:	New Classroom Building,
Text (**recommended**):	The Art of Experimental Physics, by Daryl W. Preston and Eric R. Dietz, John Wiley and Sons (1991)
Other Useful Books:	Experiments in Modern Physics, by A. C. Melissinos, Academic Press (1966). Statistics for nuclear and particle physicists, by Louis Lyons, Cambridge University Press (1989) An Introduction to Error Analysis , by John R. Taylor, Oxford University Press (1982). Introduction to the Theory of Error, by Yardley Beers, Addison-Wesley (1957). Experimental Physics -- Modern Methods, by R.A. Dunlap, Oxford University Press (1988). Building Scientific Apparatus, 3d ed., by J.H. Moore, C.C. Davis, M.A.Coplan, Perseus Books (2003).
Course Website:	http://www.pvamu.edu/pages/2812.asp

Time	Office Hours
3pm – 5:50am **W**	MWF 11pm – 1:30pm
	Tues & Thursday By Appointment

COURSE DESCRIPTION

3 Credit semester hours. The goal of this course is to teach students the art of independent experimentation. Students will as a group (2) investigate and build designated, build and acquire data and tune the stations with the intent that others may use their lab write-ups to duplicate their procedures and results. Emphasis will be placed on student's ability to think, apply previously acquired information and problem solving.

COURSE OBJECTIVES

1. To gain hands-on laboratory experience and gain familiarity with equipment used in physics laboratories.
2. To learn how to search and remedy problems in experimental setups.
3. To deepen your understanding of physics through personal experimental investigation.
4. To be able to judge what type of data should be taken and what quantity of data is needed for the purpose at hand.
5. To learn to evaluate the validity of data during the data-taking process.
6. To gain an understanding of the concept of experimental uncertainties and their importance in the design and analysis of experiments.
7. To learn how to determine experimental uncertainties.
8. To communicate experimental results through clear scientific/technical writing.
9. To become proficient in the use of computers and software tools for generating reports, analyzing and representing data, communication, etc.

COURSE REQUIREMENTS

1. Students in the Advanced Laboratory (PHYS 4103) must complete five experiments and prepare a report on each. Before engaging an experiment, you are required to notify the lab instructor. This will help in scheduling the experiments if more than one group wishes to do the same experiment.
2. The experiments in the Advanced Laboratory have some instructions, but you are strongly encouraged to learn more about the experiments by studying textbooks or by consulting other sources. Normally you will be expected to set up the experiment. The instructor will explain the equipment and any safety precautions of an experiment before you start. This explanation will be given during the regular laboratory hours. You are required to consult the instructor before beginning an experiment. The experiment must be completed during the normal class hours.
3. Do not expect the experiment to work the first time. There will often be a piece of equipment that malfunctions making it necessary to repeat the measurements. Since physics involves solving problems you should try to find out the cause of the malfunction. Sometimes it may be as simple as a blown fuse. Often, a bit of everyday experience and common sense is all you need to solve the problem.
4. Lab assignments are due on the specified due dates and times.
5. Please turn off all cell phones when entering the classroom.
6. **Academic Dishonesty/Cheating:** You are responsible to know the elements of academic dishonesty, plagiarism, cheating etc., as set forth in PVAMU *Student Handbook*. PVAMU allows no form of collaboration in the preparation of papers or in the taking of quizzes or exams. Work on paper, quizzes, and exams must be totally your own. You should neither request nor give help. The penalty for violating the PVAMU Academic Honor Code in this class is a score of zero for the quiz, exam, or paper in which the violation occurs.
7. Even though you are encouraged to work in small groups (two), ***each report must represent an individual effort. Reports must have all the required ingredients. The only accepted method of submitting reports is in the form of a computer file,*** *in a standard format (e.g. plain text, MSWord, TeX, pdf, postscript, html), as part of or an attachment to an e-mail message to the instructor, or by posting on a Website.* ***Paper***

copies will not be accepted. You must submit your report before you will be permitted to do another experiment, unless permission from the instructor is obtained.

8. The instructor will go over your reports in detail and explain what was done correctly and things you should have taken into account, and will assign a grade. Reports have to be submitted by the **deadlines** given below (before 17:00 (5pm) on the date given):

Report #	Due date
1	13 Feb.
2	6 Mar.
3	27 Mar.
4	10 Apr.
5	30 Apr.

Note: You have 12 grace days that you may use in any way you desire, except that not more than 5 grace days may be applied to any one experiment, and all reports (including all resubmissions) must be turned in by the last day of classes. Grace days already used may be redeemed by turning reports in early.

4. Course Grading:

Every student has to hand in five reports about experiments he/she has performed. If fewer than the minimum number of reports is handed in, a grade of F will be assigned to the course. If a report is more than one week late, a grade of "F" will be assigned for the report. This means that you failed the course.

For each report a numerical grade of a maximum of ten points will be assigned. The course grade will be mainly determined by the grades on the reports, but the instructor may consider other factors such as the student's attitude toward laboratory work, care exercised in handling equipment, leaving the work area clean after use, etc. The reports should represent a consistent effort throughout the semester, and the degree of consistency will also influence your final grade.

Grade	Scale (% of total points)
A	90 – 100
B	80 – 89.99
C	70 – 79.99
D	60 – 69.99
F	Below 60

List of Experiments

Modern Physics

1. Millikan OilDrop Experiment
2. Charge to Mass Ratio
3. ESR Measurements
4. Franck Hertz
5. Bragg Reflection
6. Determination of "h" Planck's Constant
7. Electron Properties
8. Zeeman Effect

Mechanics

1. Cavendish Experiment
2. Blackboard Mechanics

Optics

1. BlackBoard Optics
2. Michelson Interferometer
3. Speed of Light
4. Holography
5. Spectroscopy

Material Science

1. Low Temperature Resistivity
2. Magnetic Properties of Materials
3. X-Ray Diffraction

Computer

1. LabView
2. Simulations