PHY 310 Intermediate Laboratory Physics I
Fall 2012

A. J. Nicastro
108 Merion Lab
610.436.2540
anicastro@wcupa.edu
Office Hours: MWF: 10-11;
MR: 1:30-2:30
Other hours by appointment

TEXT: An Introduction to Error Analysis, John R. Taylor, 2nd ed.

FALL SEMESTER SCHEDULE

27 Aug	Mon	8 a.m.	University classes begin
29 Aug	Wed	3 p.m.	First class meeting of PHY 320
8-9 Oct	Mon-Tues		Fall Break
21-23 Nov	Wed-Fri		Thanksgiving Break
5 Dec	Wed	3 p.m.	Last class meeting of PHY 320
7 Dec	Fri	11 a.m.	Laboratory notebooks due
10 Dec	Mon		University classes end

COURSE GOALS, DIRECTION, AND OBJECTIVES

Experiments are at the heart of modern Physics. If the results of an experiment are consistent with the predictions of a theory or model of the physical phenomenon studied in the experiment, then we say we have a measure of understanding of the phenomenon in question. If no agreement is apparent, then either the theory or the experiment is in error. In this course you will carry out five experiments dealing with fundamental physical phenomena. The experiments will involve differing techniques of measurement and analysis. You will be assembling the requisite apparatus, running the experiment, and analyzing the data in an effort to thoroughly understand how good the results of your experiment are. In a general way, this course will allow you to quantitatively assess the quality of experimental data and how well the data correspond to theory, an important function in the practice of physical science. Indeed, without an analysis of the errors and uncertainties involved in an experiment, no answer is possible to the question, Do the results of my experiment agree with the theoretical prediction?

In science, the *clarity* of the *presentation* of data, results, and conclusions are almost as important as these factors themselves. In this course you will continue to progress in refining your presentation skills. This Physics laboratory course is a writing emphasis course. During the semester you will produce technical reports describing in your own words an experiment you have personally completed. Data and error analysis will be an integral part of each report. The report's organization and presentation strive for clarity. You will also be scheduled for oral presentations.

SCHEDULE OF EXPERIMENTS AND ASSIGNMENTS

5 Sep	*Optional:* Introduction to Error Analysis, Chapter 1
12 Sep	*Optional:* Introduction to Error Analysis, Chapter 2
19 Sep	Report #1 due, 3:00 p.m.; *Optional:* Ch. 2 Problems 2-5,7,9,11,15,20,22,27,28,31. *Optional:* Introduction to Error Analysis, Chapter 3
26 Sep	*Optional:* Introduction to Error Analysis, Chapter 4. *Optional:* Ch. 3 Problems 1-3,5,10,11,17,27,28,30.
3 Oct	Report #2 due, 3:00 p.m.; *Optional:* Introduction to Error Analysis, Chapter 5, Sections 5-1 to 5-6
	Fall Break
17 Oct	Report #3 due, 3:00 p.m.
31 Oct	Report #4 due, 3:00 p.m.
7 Nov	Individual Presentations[1]: Borders, Craft, DiTrolio, Frost
14 Nov	Individual Presentations[1]: Kneebone, Knight, Lewis. Molu
	Thanksgiving Break
28 Nov	Individual Presentations[1]: Pearson, Ryan, Van Mol
5 Dec	Group Presentations[2]
7 Dec	Laboratory notebook due, 11:00 a.m.
10 Dec	University classes end

[1] Individual presentations are presentations to the class with some faculty attending. They are oral summaries of an experiment for which a written report was previously submitted. Oral presentations can include ancillary support such as Power Point slides, transparencies, and demonstrations, and are 10 to 15 minutes in length.

[2] Group presentations are assigned as follows:

1. Speed of light: Borders, Craft, DiTrolio, Frost
2. Fundamental unit of electric charge: Kneebone, Knight, Lewis, Molu
3. Wavelength of visible light: Pearson, Ryan, Van Mol

The format for the group presentation is the same as the individual presentations except that the relevant data is analyzed and presented by the group. Each member of the group receives the same grade for the presentation.

AVAILABLE EXPERIMENTS

1. Electron spin resonance and the measurement of the g factor*
2. Franck-Hertz experiment (mercury)
3. Speed of light†
4. e/m for an electron†
5. Michelson interferometery and the measurement of the wavelength of light
6. Millikan experiment and the fundamental unit of electric charge
7. Planck's constant†
8. Measurement of the wavelengths in the spectra of hydrogen and deuterium⊥
9. Current balance and the measurement of μ_o
10. X-ray diffraction
11. Half-life of a radionuclide‡
12. Thermal radiation experiments and the Stefan-Boltzmann law
13. Gravitational constant
14. Avagadro's Number#
15. Nuclear magnetic resonance and NMR spectra of materials *
16. Hall effect*
17. Zeeman Effect*
18. Nuclear Spectroscopy*‡

Experiments can be conducted in any order, but the ones marked by a (†) are best conducted in the Fall semester and those indicated by a (*) are best conducted in the Spring. Unmarked experiments can be conducted in either semester. I recommend that you conduct Experiments 10 and 12 at some point in PHY 310-320. For experiments marked (‡), you will need to speak with the instructor prior to undertaking them for important safety instructions and practical tips for conducting the experiment. (⊥) See Dr. Nicastro (#) See Dr. Aptowicz before undertaking these experiments.

Laboratory Notebook: You are expected to keep a record of your laboratory activities, both for the individual experiments and the group experiments. You must use the same notebook for PHY 310 and PHY 320. Use a bound, quadrille-ruled laboratory notebook for this purpose. This notebook will be submitted and evaluated at the end of the semester.

Laboratory Reports: All reports must be typewritten and use a technical writing style. This writing style is described in the AIP Style Manual. Analysis should follow the guidelines described in that document. You may wish (and are encouraged) to discuss the contents of your reports with other class members and the instructor. Of course, the submitted report must be the work of the individual(s) submitting it, with proper acknowledgments and references.

Attendance policy, due dates, and deadlines: You are expected to complete all of the reports by the date and time due. These deadlines will be strictly enforced – to the second. Please do not ask for an exception. Because unforeseen circumstance befalls us all, you ought to complete the work and submit it as far in advance of the deadline as is practical. Reports not meeting the deadline receive a grade of zero.

Grade: Your grade will be determined by the quality of your written work, the oral presentations, your participation, and the degree of independence you show in conducting the course requirements. Your final grade is based primarily on the following partition: 4 lab reports @ 15% each; 1 individual presentation, 15%; 1 group presentation, 15%; participation, 5%; and independence, 5%.

Disability:
We at West Chester wish to make accommodations for persons with disabilities. Please make your needs known by contacting the Office of Services for Students with Disabilities at extension 3217 as well as myself. Bring the resulting documentation to the instructor. Sufficient notice is needed in order to make the accommodations possible. The University and I desire to comply with the ADA of 1990.

Public Safety:
The Emergency Communication Committee has made the recommendation that the emergency phone number for WCU's Department of Public Safety be listed on all course syllabi. That number is **610-436-3311**. This specific recommendation is made to help the campus be prepared in case of an emergency situation.

Intellectual Property Statement:
The instructor for this course utilizes copyrighted materials under the "Freedom and Innovation Revitalizing United States Entrepreneurship Act of 2007" (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyright protected by the instructor, including, but not limited to, lectures, course discussions, course notes and supplementary materials posted or provided to students authored by the instructor, assessment instruments such as quizzes and exams, and Power Point presentations. No recording, copying, storage in a retrieval system, or dissemination in any form, whether electronic or other format, by any means of the intellectual property of the instructor, either in whole or in part, is permitted without the prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals in the semester in which this course is held.

Links and references to on-line resources provided by the instructor may lead to other sites. The instructor does not sponsor, endorse or otherwise approve of any information appearing in those sites, nor is responsible for the availability of, or the content located on or through, external sites. Apart from materials used in accordance with the Fair Use Act, the instructor takes no responsibility for material that is otherwise offered at web sites and makes no warranty that such material does not infringe any third party rights. However, should any of this type of material be present and this fact is brought to the attention of the instructor, they will remove references to it from course materials.