

**PHY 320 Intermediate Laboratory Physics II**  
Spring 2013

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Office Hours: MWF: 10-11;  
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TEXT: An Introduction to Error Analysis, John R. Taylor, 2<sup>nd</sup> ed.

SPRING SEMESTER SCHEDULE

28 Jan	Mon	8 a.m.	University classes begin
30 Jan	Wed	3 p.m.	First class meeting of PHY 320
15 Mar	Fri	5 p.m.	Spring Break begins
25 Mar	Mon	8 a.m.	Spring Break ends
8 May	Wed	3 p.m.	Last class meeting of PHY 320
10 May	Fri	11 a.m.	Laboratory notebooks due
10 May	Fri		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

13 Feb      Report #1 due, 3:00 p.m.

27 Feb      Report #2 due, 3:00 p.m.

13 Mar      Report #3 due, 3:00 p.m.

### *Spring Break*

3 Apr      Report #4 due, 3:00 p.m.

10 Apr      Individual Presentations<sup>1</sup>: Borders, Brown, Cichalski

17 Apr      Individual Presentations<sup>1</sup>: Daniels, Frost, Frost

24 Apr      Individual Presentations<sup>1</sup>: Kneebone, Knight, LeGall, Lechner

1 May      Individual Presentations<sup>1</sup>: Lewis, Pearson, Ryan, Van Mol

8 May      Group Presentations<sup>2</sup>

10 May      Laboratory notebook due, 11:00 a.m.

<sup>1</sup> 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.

<sup>2</sup> Group presentations are assigned as follows:

1. Zeeman Effect: Borders, Brown, Cichalski, Daniels, Frost D.
2. Nuclear Spectroscopy: Frost G., Kneebone, Knight, LeGall, Lechner
3. Hall Effect: Lewis, 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. Each group presentation utilizes data gathered from all class members who conducted the assigned experiment.

## 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 interferometry 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<sup>⊥</sup>
9. Current balance and the measurement of  $\mu_0$
10. X-ray diffraction
11. Half-life of a radionuclide‡
12. Thermal radiation experiments and the Stefan-Boltzmann law
13. Gravitational constant
14. Avogadro's Number
15. Nuclear magnetic resonance and NMR spectra of materials \*
16. Hall effect\*
17. Zeeman Effect\*
18. Nuclear Spectroscopy\*‡
19. Measurement of Boltzmann constant

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.

**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. 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.

**Policies concerning granting of No Grade, violation of academic integrity, and violation of student code of conduct:** For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the Undergraduate Course Catalogue, the Rams Eye View, or the University Web Site. Please understand that improper conduct in any of these areas will not be tolerated and may result in immediate ejection from the class.