Physics 315, Advanced Laboratory / Experimental Analysis

Fall 2016

Meeting: Trexler 272
Instructor: Matthew C. Fleenor
email: fleenor@roanoke.edu

Time: TR 8.30-11.30AM
Office: Trexler 2660
Office Hours: W 2.15-4.00PM
R 1-2.30PM, by appt

webspace: http://http://www.roanoke.edu/mcsp/fleenor/

Required Textbook: An Introduction to Error Analysis, 2nd ed., J. Taylor (1997), University Science Books
Required Prerequisites: Physics 202

I. Components of Leaming

There are several factors that make a course "good" (by good, I mean a healthy combination of the intellectual and the affective). Good courses are also clear about their essential components. Below is an attempt to be clear about how will I operate within PHYS 315, as well as my expectations of a student who is enrolled in PHYS 315.

Descriptions

Aspiration: I am really excited about the opportunity that we both have this semester. It is an opportunity to explore new fields of research and to deepen in areas where you may already feel comfortable. It is an opportunity to teach your colleagues, and me, about some areas of physics. It is an opportunity to learn physics from experts in their own environment.

I have (sub-)titled the 315 course, Advanced Lab, because this course is a threshold to performing your own independent research project (here at Roanoke, or off-campus). As a result of the course, you should have a greater comfortability with discipline-specific instrumentation and software, creating research-quality figures, and publishing articles of journal-quality. It is my job to help guide you in these activities

Intended Learning Outcomes

The successful student will-

1. explore open-ended questions that highlight course-related phenomena.
2. challenge (and be challenged by) colleagues regarding their current understanding of physical concepts as they are implemented within the lab.
3. write reports that pertain to physical phenomena, graphical results, and error uncertainties in a meaningful way.
4. present graphical, quantitative, and qualitative results, both through written and oral communication.
5. deepen understanding and application of errors, both systematic and statistical, as they apply to physical results.

Attendance Policy

Students are expected to attend every class, unless otherwise announced. Attendance is checked at each meeting. If a student is going to be absent from class, the instructor must be notified. You are working in a collaboration for most of these labs, so you are letting down the member(s) of your group if you miss class. All of the work does not need to be completed within the hours of the class. After the second unexcused absence, you will be dropped (forcibly, with a "DF" or "DP," or willingly with a "W" before the ninth week) from the class. Students are accountable for all work missed because of an absence.

Academic Integrity

All freedoms imply responsibility, and your responsibility to the RC AI policy ensures your academic freedom. I want to foster a mutual respect for the classroom hours that we have together, and AI is primarily about mutual respect (because responsibility and accountability accord). In light of this, please silence cell phonesto vibrate before class and come prepared (e.g., book, paper, and pencil). Classroom computers are designed for academic learning and should be used in this manner during class; i.e., no email exchanges and/or surfing during class.

Reading, reflection, and research all involve the activity of recognizing the good thinking of others. Plagiarism exists when someone takes personal credit for another's creative (usually written) work. Hacker's A Writing Reference gives very clear examples for citing the work of others from a broad spectrum of sources (including the internet). Please use this guide when citing work during the writing that you will complete in the course.

Lastly, please be advised that the RC AI policy will be upheld within this course as detailed online at

http://roanoke.edu/A-Z..Index/Registrar/Policies ..and .Information/Academic .Integrity. htm
Included here is an explanation of how violations of the College's academic integrity policy are handled.

Grading

V\kitten lab reports for each exercise are due when noted on the Course Outline. Typed reports are required that generally follow in the order presented below. In the name of conserving paper, the course will (attempt to) conduct all-electronic submission in PDF only and grading via the NQR site.

Please note the following grading policy: 25% deduction for the first week past the due date, and a 50% deduction for the second week. After the second week, i.e., two weeks after the specified due date, NO work will be accepted.

VVe will discuss lab writing at length within the course itself, and you have a working knowledge of what is a "good" paper.

II. Modes of Leaming

Rubric

Your grade is determined according to the following distribution:

Mid-Term Exam	10%	Classwork/homework	10%	Notebook	10%
Final Oral Presentation	10%	Critque & Review	10%	Reports	50%

Descriptions

Written Reports

All physical science papers have a similar structure that includes the following: title & author information, abstract, introduction (background or overview), quantitative methodology (experimental approach & methods, data collection, modeling), results, discussion & conclusions. We will discuss the differences between different disciplines and the way each section can be altered or adjusted depending on the focus of the research.

Critique & Review

You will be required to observe and reflect on your colleague's work, both written and oral. You will be evaluated on your completion and your thoughtfulness in carrying out your review.

Class/Homework

Part of the course objectives relates to the proper understanding of uncertainty and its propagation when multiple variables are involved. The Taylor text will aid us in our development of understanding, and we will complete some work from that book (in class or at home).

Mid-Term Exam

The work from Taylor will include a mid-term exam related to error propagation and determination. It will only cover the topics that are discussed in class.

Notebook

All scientists keep a journal of their data, thoughts, reflections, and imaginative ideas. Creativity is part of the science process, and one cannot be certain when creativity will reveal itself. Therefore, it makes sense to carry with you a notebook of some sort. I want to facilitate the creative science process by requiring you to (at least) take data, notes, and some thoughts about the research you conduct.

Final Oral Presentation

One of the primary means of communicating scientific activity is through oral presentation, even more so than writing. We will focus some of our time on presenting science to others this semester. I look forward to learning from each of you about the research you conduct.

III. Lab Outline

There is an attached outline of the semester calendar. We will attempt to follow this schedule closely, since the professors are primarily avialable on THU mornings for consultation, troubleshooting, and orientation. For a detailed description of the specific assignments during each rotation, please consult a document entitled "Rotation Assignments".

PHYS 315 Course Outline Fall2016

Week	Date	Schedule	Topic	Submission
1	1-Sep		Introduction: What we are trying to do!	
2	6-Sep 8-Sep	Rotation 1	Taylor: Chapter 1	
3	13-Sep 15-Sep		Taylor: Chapter 2	
4	20-Sep 22-Sep	Rotation 2	Taylor: Chapters 2 & 3	Project 1
5	27-Sep 29-Sep		Taylor: Chapter 3	
6	4-0ct 6-0ct	Rotation 3	Taylor: Chapter 4	Project 2
7	11-0ct 13-0ct		Taylor: Chapter 5	
8	18-0ot 20-0ct	**No Classes – Fall Break**		
9	25-0ct 27-0ct		Taylor: Mid-Term	
10	1-Nov 3-Nov	Rotation 4	Taylor: Chapter 6	Project 3
11	8-Nov 10-Nov		Taylor: Chapter 7	
12	15-Nov 17-Nov	Rotation 5	Taylor: Chapter 9	Project 4
13	22-Nov 24-Nov		Taylor: Chapter 11	
14	29-Nov 1-Dec		Taylor: Chapter 12	Project 5
15	6-Dec 8-Dec		Taylor: Open-Book, Rotation 5 Quiz	
	9-Dec & 15-Dec	**Final Presentations, 8.30•11.30AM, TREX 272.**		