

**Physics 373 Spring 2011**  
**Intermediate Lab: Nucleons (Nuclear and Particle Physics Laboratory)**  
**Syllabus**

**Instructor** Dr. Justin Frantz  
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**Office Hrs** 1-2 pm Wed and by appointment  
**Class room** Edwards 208 (Conference Rm) and 101 (Lab)  
**Class Time:** T/Th 2:10-4pm      **First Class:** 3/29/11 2:35 pm

**Website:** <http://www.phy.ohiou.edu/~frantz/phys373/> This syllabus, homework, and additional information about the course can be found there.

**Overview:** This is a lab course, and most of the time will be spent in the lab, however, the course will also include a seminar portion, probably up to about an hour a week. Some of these seminars may be lead by students. The reason for this is that, in addition to the labs themselves which focus on a few examples of particle detectors, I will also be giving you an introduction to virtually all types of detectors, electronics, and basic physics used in both nuclear and (higher energy) particle physics experimentation.

**Groups and Schedule:** You will be working in groups on a total of three experiments during the quarter. For the first two, you will mostly group yourselves (but I reserve the right to alter group formations) in groups of at least 4 and do 2 out of 3 possible lab projects. Which lab projects will be determined by what I feel will work best, but I will try to give you some choice in the matter, to be sorted out in class. At the end of the quarter, the entire class will work together on the Rutherford Scattering lab project, which uses the Edwards Nuclear Accelerator, and is performed in the control room area of Edwards Lab.

**Material to be Covered:**

In addition to the above mentioned general introduction to nuclear and particle physics experimentation, there are at least 4 lab possible lab projects that can be explored in the course.

1. ) Measurement of Rutherford scattering using the OU accelerator
2. ) Radioactive decay of uranium isotopes using  $\gamma$  spectroscopy with a Ge detector.
3. )  $\alpha$  spectroscopy with silicon detectors
4. )  $\beta$  decay and  $\gamma$  spectroscopy with NaI detectors

**Technical Reports and Code:** For each lab project, you will be required to hand in a lab report. Each student will hand in their own lab report, which is completely original text, only sharing the same data, and possibly plots, as other “lab partner” students. Details of what should be in these reports will be discussed in class and separate documentation of guidelines and grading criteria will be provided. At least 2 separate drafts of the lab report will be graded separately. The first draft will generally be due as soon as one week after the final in lab session for the lab project, while the second draft will be generally due as soon as two weeks later.

A significant part of all the lab projects is production of plots and calculations which require computer programming (“code”). I will be teaching you a bit about one free analysis/programming tool called ROOT, but you are free to use any such tool, such as MATLAB, IDL, etc...even Microsoft Excel. In addition to the lab reports, I will require all “code” that was used to perform such calculations to also be included in electronic form.

**Lab Notebooks** YOU WILL NEED A LAB NOTEBOOK FOR THIS COURSE, and you will need to bring it to every class/lab session. The lab notebooks may be inspected at random, and portions thereof may be required

along with the final drafts of the technical reports. For a given lab project, the lab notebooks may count towards as much as 25% of the final grade for the lab project. All members of the experimental group should record the measurements in their own notebook, or tape xerox's of parts/plots there-in. Students will not receive credit for things appearing in the notebook of their partner(s) !

**Attendance and In Lab Performance:** . Attendance is crucial in this class. An official University Excuse (see O.U. Handbook) is required in order to miss without it affecting your grade. I may be able to accommodate a few exceptions to this rule with good reason, but in all cases make-up time will be required. Part of your grade in this course will be a partially subjective evaluation of your in-lab performance. This may include, but is not necessarily limited to, random questions to random group members during lab to make sure EVERYONE IN THE GROUP understands what is going on. If anyone fails such questions, it is likely to detract not only from the student who was asked, but probably also the other members of the group. This is because most lab work, including in this class, is collaborative work, and as such part of what I am trying to encourage and evaluate is the ability to work in a team, including the ability to effectively share information. And yes, often this means you need to take longer than you might have otherwise on your own.

**Text and Reading Assignments:** There is no required text for this course. There will be some required reading assignments, in addition to the lab manuals and materials, which will be provided.

**Misconduct** I am required to remind you that academic misconduct is a Code A violation of the Ohio University Code of Student Conduct. If you are found to be involved in academic misconduct regarding this course, you will receive F on the pertinent work and possibly for the entire course and/or a referral to the Director of Judicials. Procedures for judicial actions will be invoked as described in the Student and Faculty Handbooks. See O.U. Undergraduate Catalog for more information. **YOU MAY NOT COPY ANY MATERIAL, (ESPECIALLY TEXT) FROM ANOTHER STUDENT, ANY STUDENT'S THESIS OR FROM THE WEB WITHOUT PROPER CITATION.**

## Grading

There are no exams in this course. Your grade will be determined as follows:

First Lab Project	25%
Second Lab Project	30%
Third Lab Project	30%
In Class Work/Homework	15%
Total	100%

The individual numerical scores will be weighted as given above and added to give a total score out of 100. Letter grades will be awarded approximately as follows

**A- to A  $\geq$  90 or better**

**B- to B+ 80 to 89**

**C- to C+ 70 to 79**

**D- to D+ 60 to 70**

**F < 60.**