**PHYS 440** **Fall (12) 2020**

# Physics Advanced Laboratory
## Course Information

**Instructor:** Mark Taylor **Office:** Gerstacker 118 **Phone:** (330) 569-5241 (office)
**Email:** taylormp (330) 342-1145 (home)

**Office Hours:** MWF 4:15-6:00, Tues. 2:00-6:00, Thurs. 6:30-9:30, Sunday 3:00-6:00.
Also, feel free to stop by at other times, call me, or send me email.

**Meeting Times:** R 1:00-4:00, Colton Physics Labs (rms. 8, 14, 18, 21) or Colton 2.
[Mask & Face-Shield Required in Lab]

**Text:** None, however, you should be making use of the library.

**General References:** Experiments in Modern Physics by Melissinos and Napolitano; An Introduction to Error Analysis by Taylor; Data Reduction and Error Analysis by Bevington

**Course WebPage:** http://www.hiram.edu/academics/majors-minors/physics/program/courses/advanced-lab

**Course Overview:** In this course you will carry out a series of experimental investigations in the areas of atomic physics, optics, solid state physics, and nuclear physics. Specific experiments include inelastic electron-atom collision, optical interferometry, X-ray scattering, and gamma-ray spectroscopy. A complete understanding of each experiment requires a synthesis of knowledge from several different fields of physics. This course stresses basic experimental techniques and data and uncertainty analysis along with oral and written presentation of experimental results.

**Class Preparation and Format:** This is an experimental course so most of your time will be spent in the laboratory either working with an apparatus and taking data or doing data analysis. For some of the topics covered there will be one or more introductory lectures. However, **it is your responsibility to research and learn the theoretical background for each experiment. The library is the preferred source of information and at least one published reference must be used for each experiment.** The goal is to both understand each of the experiments and to obtain the best data possible with the given apparatus. Thus, in general, you should plan to retake some data after your initial data analysis.

**Oral Exams:** There will be an "oral exam" for each experiment. These exams are actually presentations, but you must be prepared to answer any questions about the experiment. Your presentation should be divided into three parts: 1) Theoretical background; 2) Experimental methods; 3) Results and analysis. One person will be responsible for each part of the presentation and exactly who does which part will rotate through the sequence of exams. At these exams you will submit copies of your final data analysis and results and a list of references consulted. See the syllabus for the exact exam schedule. Exams will be held in Colton 2.

**Lab Notebook:** Your notebook is the primary record for all of your experimental work. It must contain your procedure (including pictures or sketches of the experimental set up), all data collected in the lab, and your data analysis and results. There should be a dated entry in this notebook documenting each time you work in the lab. The notebook will be graded after each oral exam.

**Lab Paper:** **You will prepare a write-up, in the form of a scientific research paper, for experiment 2 (multi-slit diffraction).** See the syllabus for due dates.

**Grading:**

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| Oral Exams | 50% |
| Lab Notebook | 30% |
| Lab Paper | 20% |

Final grades are based on a fixed scale: ≥88%=A, ≥76%=B, ≥64%=C, ≥52%=D.
(For each letter grade, a "+" or "–" corresponds to the upper and lower 4% of the range.)

**General Hiram College Course Policies:** http://www.hiram.edu/wp-content/uploads/2017/08/HiramCoursePolicy.pdf