

### General Information

<b>Instructors:</b>	Dr. Mark Yuly	Rm. P106	567-9282
	Dr. Brandon Hoffman	Rm. P-107	567-9235
	Dr. Kurt Aikens	Rm. P-108	567-9373
<b>Schedule:</b>	Laboratory	T	12:30-1:20 PM Rm. P116, 109, 118
<b>Catalog:</b>	Participation with a faculty member in an individual research project. May be repeated for credit.		
<b>Overview:</b>	In this course you will be working on a research project with a faculty advisor. The project will stretch over a relatively long period of time (that is, you should sign up for this course every semester after you become a junior, if not sooner) and lead to your physics thesis and conference presentation your senior year.		
<b>Objectives:</b>	In the real world of laboratory research, there is no “answer book” that you can go to, and there isn’t a teacher ready to show you how to do it. It demands that you apply all of the skills and knowledge you have learned in your other courses, and may require you to learn new things, like machine shop techniques and even plumbing! The purpose for this course is to help you “put it all together” – that is, to see how what have learned in your academic physics career can be used to solve real-world problems.		
<b>Learning outcomes:</b>	The objectives listed above I hope will be evidenced by the following outcomes. Relevant departmental objectives, described on the web at <a href="http://www.houghton.edu/physics/mission-statement/">http://www.houghton.edu/physics/mission-statement/</a> , are in parenthesis. <ol style="list-style-type: none"><li>1. The ability to solve real-world research problems by designing well-thought-out experiments, including minimization and estimation of significant uncertainties. (Measurement, Problem Solving)</li><li>2. The ability to read a physics paper from a physics journal and analyze and apply its content to a new problem (Laboratory skills, Problem solving)</li><li>3. To be adept at manipulating the equipment and techniques used in physics research – i.e. to display skill in the laboratory. (Laboratory skills)</li><li>4. The development of practical new skills that are useful in physics research but not typically taught in the physics classroom, such as operating machine tools, welding, soldering, electronics or using new computer languages or operating systems. (Laboratory skills)</li><li>5. The ability to skillfully present scientific work both in written and oral formats. (Communication)</li></ol>		
<b>Text:</b>	Your advisor will provide copies of any required reading materials, i.e. journal articles, equipment manuals, and selections from books or reports.		
<b>Attendance and Minimum Time Required:</b>	Generally speaking, you may carry out the work for this course at any time that is convenient for you. However, you need to spend at least three hours a week working on the project (180 minutes/week), and at least once each week you will be expected to meet with your advisor (30 minutes) to give a report of your progress, and receive guidance. The minimum total time required for this course is therefore <b>3120 minutes</b> .		
<b>Lab Notes:</b>	You will need to keep careful notes of your work in the lab notebook for your particular experiment. This notebook will be for the experiment and hence will most likely have entries from many students in it. Think of the notebook as the "diary" of the experiment. You should write in it as much detail as possible. If you like, we can show you an example notebook. Do not erase or remove pages from the lab notebook – just label any mistakes and continue.  At the end of the semester you will also be asked for a record of the time you spent on the research project. It should clearly indicate the dates, times and activities you were engaged in, as well as give the total amount of time for the entire semester. This should be at least 45 hours. You may count time spent at the spring scientific meeting (e.g. RSPS) as 3-hours of project lab time.		
<b>Grades:</b>	The final grade for the course will be determined by the progress made in your research project, both in terms of understanding as displayed in informal discussions with your advisor (30%), quality of workmanship (20%), creativity in problem solving (20%) and the care taken with the lab notebook (30%). Grades are assigned according to the Physics Department grading rubric at <a href="http://www.houghton.edu/physics/physics-grading-rubric/">http://www.houghton.edu/physics/physics-grading-rubric/</a> .		

**Academic  
Honesty**

Honesty is the foundation on which all intellectual endeavors rest. To use the ideas of others without acknowledging the authors of those ideas belies the nature and purpose of academic life. At Houghton where we strive to live out Christian calling and commitment, personal integrity, including academic honesty, should be the hallmark of our all of our work and relationships.

For details about policy, see: <http://www.houghton.edu/am-site/media/2017-18-hc-catalog.pdf#page=30>

**College  
Support  
Services:**

I want you to be aware of some of the services that the college provides that may be helpful for you (more information can be found online or by talking to me).

CASA

Writing Center

Counseling Services

VOCA

**Self-Reporting  
of Disabilities:**

If you have an academic disability that requires special accommodations or modifications, it is up to you to self-report any such disability to the Center for Academic Success and Advising (CASA, 585-567-9262, Chamberlain 222). With appropriate documentation, you will be afforded the necessary accommodations and/or modifications. For more information about CASA, go to: <http://www.houghton.edu/academics/academic-resources/center-for-academic-success-and-advising/>.