Meeting Times and Locations:
Class time: Select W 2:00 – 3:30 PM, HSC 113
Talk time: Select R 12:40 – 1:40 PM, HSC 116

Overview
The focus in this second semester of capstone is on (a) completing your research and (b) communicating your research to others. For the former, you should schedule regular times to both work and meet with your research advisor. For the former, you must communicate your research in four different formats:
- Thesis
- Oral presentation*
- Poster*
- Popular article

*Both oral and poster presentations are required for the Department, and one must also be presented at URAC (modified as appropriate for a general College-wide audience.)

Grade Allocation
Completion of research
- Research advisor’s evaluation 25.0 %
- Capstone instructor’s evaluation 25.0 %

Presentation of research
- Scientific article 12.5 %
- Popular article 12.5 %
- Oral presentation 12.5 %
- Poster presentation 12.5 %

Letter Grade Assignment
A 93 – 100 %
A- 90 – 93
B+ 87 – 90
B 83 – 87
B- 80 – 83
C+ 77 – 80
C 73 – 77
C- 70 – 73
D 60 – 70
F 0 – 60

Expectations & Outcomes
Your grades will depend on the following expectations and outcomes.

Completion of Research
1. **Adequate time spent each week on research.** This will vary by project and week, but I recommend spending at least 7 hours/week on research alone, not including class time, meetings, or work on your presentations. The biggest disappointment students have in Capstone is that they don’t finish collecting good data. While this can be due to the normal trials and tribulations of scientific experimentation (equipment hassles, false starts, etc.), the number one culprit is inadequate time spent. Conversely, the biggest reward students experience in Capstone is getting an experiment to work and collecting good data.
2. **Reasonable progress made towards the research goal.** This will largely be ensured by meeting the first expectation above. However, it is possible to spend time inappropriately or inefficiently. The best way to ensure that you don’t waste time unnecessarily is to communicate frequently with your research advisor.

3. **Demonstration of an advanced understanding of the research.** This is distinct from the first two expectations since it is possible to work long hours and make good progress on your project without fully understanding its context, subtleties, and implications. The level of understanding achieved should be appropriate to the advanced (senior) undergraduate level, bordering on the graduate level. This will best be facilitated by reading background literature and by frequent discussions with your research advisor.

**Presentation of Research**

1. **Thesis.** You must write a technical capstone thesis typeset in LaTeX and formatted to the specifications of a prominent professional journal in your research (sub)field. It will be graded based on timely completion of drafts, content, correctness, clarity and format. Theses are archived by the department for posterity.

2. **Oral Presentation.** You must deliver a 30+ minute talk to the Department. The presentation should be technical, but at the same time contain proper background (and avoid being overly technical) so that it can be partially understood by second semester physics freshmen. Presentations will be graded based on timely completion of drafts, content, correctness, clarity and format. One of your poster and oral presentation must also be presented at URAC, modified for a College-wide audience.

3. **Poster.** You must create a research poster for display in the hallways near the Department. The poster should be technical, but at the same time contain proper background (and avoid overly technical content) so that it can be partially understood by physics freshmen. Posters will be graded based on timely completion of drafts, content, correctness, clarity and format. One of your poster and oral presentation must also be presented at URAC, modified for a College-wide audience.

4. **Popular Article.** You must write an article describing your research to a broad, non-technical audience. The format should be similar to that of popular science articles found in the mass media, such as in newspapers, magazines, and online. The purpose is twofold: (1) Many professional scientists lack the ability to effectively communicate their research to non-scientists. This type of communication is important not only for improving the science literacy of the public and inspiring future scientists, but also for convincing others to value and fund your work. (2) Second, your family and (non-physics) friends will likely be interested in what you have accomplished, but probably won’t understand your other presentations. This popular article is something you can share with them. Popular articles will be graded based on timely completion of drafts, content, correctness, clarity and format.

**Participation in Peer Review**

Finally, you must participate in peer review of your fellow capstone students’ research. Peer review is an essential step in vetting and improving the quality of scientific results, and is utilized by all serious research journals and also typically demonstrated via questions asked after research presentations. You are required to attend all of your fellow capstone students’ presentations (both departmental and at URAC) and to read all of your fellow capstone students’ articles and posters. At each presentation, you should ask at least one question. You will also be given (anonymous) evaluation forms on which you will provide written reviews of each of your fellow capstone student’s presentations and articles. You should exercise constructive skepticism and criticism with the aim of helping others improve their work and presentations. Note that you will be graded only on your participation in peer-reviewing other students, not on other students’ peer reviews of you – i.e., your grade will only take into account the views of your capstone instructor and research advisor.