

Research in Physics I
50:750:491

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Course Description:

Research in Physics is a writing intensive course; therefore, the goal is to learn how to communicate scientific ideas and information through writing. This course will vary for each student depending on their interests and prior involvement with the Physics Department. There will be two main groups of students. Students who are already active or wish to be active on a project in a research lab and those who wish to do an online survey of scientific work. Students that are currently involved in a research project can continue this project and will be the backbone of the writing done in this course. The students who wish to do an online survey of a scientific field of study will focus on understanding the current progress of the field and ultimately write a short review paper. At the end of the semester, the students will write a paper in ACS format on all of the work they have done.

Learning Goals:

- Communicate scientific information through writing
- Become familiar with ACS format
- Use referencing software (e.g. RefWorks)
- Reading and understanding scientific articles
- Become familiar with a particular scientific field of study
- Presentation skills

Track 1: Experimental Research Track (Research Article)

In this track, you will learn the necessary skills to participate in a research project and write an experimental research article by learning the necessary scientific background, forming a clear objective, designing an experiment, conducting the experiment, interpreting the results, and finally communicating those results in the form of a research article. This process will be broken up in 2-week chunks in which each student will present a short 10-minute presentations on their progress.

- Week 1 & 2 – Scientific Background – During this 2-week period you will be given a research project and will begin researching their topic online. During our class meeting, you will give a short 10-to-15-minute presentation on their topic.
 - During these two weeks, students will learn to use Rutgers Library, Google Scholar, and Web of Science for online research
 - Also, the students will begin to become familiar with the necessary equipment
- Week 3 & 4 – Defining Experimental Objective – Given the topic of research, each student will outline the specific questions that will be set out to answer. Recent peer

reviewed scientific articles will be used to support the objective. Each student will give a short 10-to-15-minute presentation outlining their objective

- You will continue to learn experimental techniques in the lab
- We will begin to discuss data analysis software packages such as Origin and MATLAB
- By the end of week 4 you should have a rough draft of the Introduction
- Week 5 & 6 – Experimental Design – During this two-week period you will form an experimental plan. You will give a 10-to-15-minute presentation outlining your experimental plan and discussing the inner workings of the equipment being used.
 - A rough draft of the methods and materials section should be complete
 - Feedback on the rough draft of the introductions will be discussed
- Week 7 & 8 – Discuss Research Progress – 10- to 15-minute presentation on your progress
 - Creating publication ready figures
 - Feedback on methods and materials will be discussed
- Week 9 & 10 – Discuss Research Progress– 10- to 15-minute presentation on your progress
 - Creating publication ready figures
 - Rough draft of the results and conclusion sections should be complete (It is okay to not have all the results at this time)
- Week 11 & 12 – Discuss Research Progress– 10- to 15-minute presentation on your progress
 - Rough draft of the results section should be complete
- Week 13 & 14 – Final Discussion
 - This meeting will be held on the scheduled final date
 - Final presentations will be given
 - Final papers will be due

Track 2: Non-Experimental Research Track (Review Article)

In this track, you will learn the skills necessary to learn the current understanding of a scientific field and neatly summarize its current progress into a well formatted review paper. Your progress will be broken into 2-week chunks as follows:

- Week 1 & 2 – Choose a scientific field. During our class meeting, you will give a 10-to-15-minute presentation describing your scientific field
 - During these two weeks, students will learn to use Rutgers Library, Google Scholar, and Web of Science for online research
- Week 3 & 4 – Determine the corner of the field that you would like to explore and summarize
 - Find 3 paper that seem to be important on this subject
 - Give a 10-to-15-minute presentation on 1 of these three papers
- Week 5 & 6 – Find 8 to 15 articles that capture your particular field of interest. These will be the foundation of your short review paper.
 - Start to brainstorm ways of organizing the results of these articles into a well-constructed “story”

- Week 7 & 8 – Discuss Research Progress – 10- to 15-minute presentation on your progress
 - A rough draft of your methods and materials section should be complete
- Week 9 & 10 – Discuss Research Progress– 10- to 15-minute presentation on your progress
- Week 11 & 12 – Discuss Research Progress– 10- to 15-minute presentation on your progress
- Week 13 & 14 – Final Discussion

Grading Breakdown

- Discussion Participation – 10%
- Bi-weekly Presentations – 30%
 - 6 presentations 10 to 15 minutes
- Drafts of sections of final paper – 30%
 - 3 parts (5% each)
 - 1st round of edits (5% each)
- Final Paper – 20%
- Final Presentation – 10%
 - 20 to 25 minute presentation