



Physics 397, 398, 497, 498: Junior Seminar and Senior Seminar 2026-2027 Academic Year *Course Syllabus*

Sessions: Wednesdays, 4:35-5:35 PM
D209, Gottwald Science Center

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Website: Canvas

Presentation Instructions

To ensure a smooth and professional presentation experience, please adhere to the following guidelines:

Presentation Setup

- **Equipment:** The classroom is equipped with a Windows-based computer running Microsoft Office, connected to a projector and projection screen.
- **No Personal Laptops:** Speakers must use the provided classroom computer and are not permitted to use their own laptops for presentations.
- **File Format:** Presentations must be in Microsoft PowerPoint (.ppt or .pptx) with a 16:9 aspect ratio to ensure compatibility with the widescreen projector.
- **Loading Presentations:** Upload your presentation to the classroom computer using a USB flash drive, available from the Department of Physics and to be found in the same drawer where you need to return it after use.
 - Presentations should be loaded **before the first session of the day**. You may do this well in advance for example during a break.
 - It is the speaker's responsibility to ensure the presentation is ready at the start of the class, which also means that the presentation has been checked for viability.
- **Responsibility:** Preparing and setting up your presentation on time is a key component of this course, reflecting your ability to take responsibility for your talk.
- **Test Your Presentation:** Verify that your slides display correctly on the classroom computer to avoid formatting issues.

- **Backup:** Bring a backup copy of your presentation on a separate USB drive in case of technical issues.

About the course:

Students are asked to research and present physics topics. The class time focuses on oral presentations. However, Seniors are also required to prepare a manuscript of their research.

Purpose: Junior and Senior Seminar in the Department of Physics serve three main purposes:

1. To help you learn how to present and practice presenting physics research and materials before an audience of your peers and faculty.
2. To expose you to topics in physics research through talks and discussions that follow. As a member of the Physics Department your job is to show up, pay attention, and ask interesting questions.
3. To build and strengthen the physics community through interactions, announcements, and discussions.

For All Students:

Students are expected to present high quality presentations, and support their peers with their attention, questions, and respect. More specific expectations for presentation are presented in detail below under For Senior Seminar Students and For Junior Seminar Students.

Here are the essentials of high quality presentations:

“Level of understanding” When preparing and giving a talk, you have to know what you are taking about.

“Logical organization of the talk” Once you thoroughly understand the subject, you need to format it in a logical fashion for the audience to get your message. When your talk is limited to 15 to 20 min you can optimally use these minutes only if the talk is well organized.

“Clarity, Engagement and passion for the subject” Your engagement with and passion for the subject easily shows during the presentation and is an element that makes a good talk great.

Advanced preparation and practice are essential for good presenting. Therefore, we require:

- a. Each of your talks must be practiced in the Speech Center or with a University of Richmond physics major no later than the Monday before your seminar.
- b. A report on the practice talk will be forwarded to me by the Speech Center or by the student observer.
- c. You must make your own appointment with the speech center well in advance of your talk. Appointments can be made from the web by visiting <http://speech.richmond.edu/>

d. Final versions of talks must be emailed to me at least one hour before seminar begins.

e. You are responsible for making your presentation function properly. Use care with animations, transitions between slides, etc. If you plan to use your own computer, then you are responsible for testing your machine more than 1.5 hours before seminar.

This course satisfies the requirements for the “Embodied Communication” Integrated Focus Area. It’s Learning Outcomes are:

1. Students will develop and deliver a clear and organized message drawing on supporting materials as appropriate to the message and the field.
2. Students will respectfully engage with and respond to audience using appropriate vocal, verbal, or nonverbal techniques.
3. Students will adapt communication approach and content choice to specific contexts, situations, audiences, and interactions (actual or hypothetical).
4. Students will use live and/or non-written multimedia communication.

* Disclaimer: all of the information in this syllabus is subject to change. I reserve the right to change any items listed here in respond to the course throughout the semester, including, but not limited to: grading policies, number and scheduling of exams, and homework policies. In addition, the preliminary schedule of topics and labs, is also subject to change. Any changes will be made with the goal of maximizing student learning, and I will notify students of any changes. (I don’t expect to make any major changes, though.)

For Junior Seminar Students:

Students in Junior Seminar must make 2 oral presentations over two semesters. One presentation will cover a Physics problem, the other is dedicated to a topic.

Physics Problem Oral Presentations (15 to 20 minutes): You will select a physics problem from either a textbook or in-class activity from a 200- or 300-level physics course that you have had and present a 15-20 minute presentation explaining the solution to that problem. For example, you could select a homework problem on Hamiltonian mechanics and explain to the audience the solution.

Topic Oral Presentations (20 minutes): You will select a physics topic with the approval of the seminar instructor and give a 20-minute presentation on the topic. The presentation must include some quantitative considerations.

Grading:

Speech Center Practice: 20%

Regular Attendance: 20%

Talk: 60%

Level of understanding: 30%

Quality of presentation and engagement: 30%

For Senior Seminar Students:

Seniors are expected to participate in an individual research project supervised by a faculty member. Such research can involve work on a research project with a faculty member, or in one of our laboratories, or a significant library research project on a physics topic of current interest.

During the first weeks of the semester students choose a topic and submit their topic to the instructor for approval. Seniors are required to give one oral presentation in the first semester, as well as one oral presentation and one written paper in the second semester. The requirements for these are outlined below.

A. First-Semester Oral Presentation (15-20 mins): The purpose of the first-semester talk is to introduce and motivate your research. This talk should:

- Explain your goal
- Explain why is your research interesting
- Explain how and where your research fits with other research? What is already known? What is unknown? You can liken this to a literature review.
- Describe what you hope to achieve?
- Describe in general the methods you plan to use to achieve your results? How do they work?

In general, this talk should be of a broader scope than the more specific talk given in the spring semester. The broader scope in the fall will serve both to help put your spring presentation in context, and to prevent your spring presentation from being a repeat performance of the fall. Some repetition is inevitable, but should not be excessive.

B. Second-Semester Oral Presentation (15-20 mins): The purpose of the second-semester talk is to present your findings. This talk should:

- Briefly refresh the audience of the motivation for your work. What was your goal and why?
- Detail the exact methods used
- Detail your results. (charts, figures, error bars) slowly explain any graph
- Summarize your results
- Look forward (if applicable) Did you achieve your goal? What could be done next? Are there any new questions arising from your work?

This talk should be a detailed summary of your entire project.

C. Written Paper: The final written paper is to be a more or less a complete record of the research that you have done. It should include detailed explanations of the work you did the results obtained, and what they mean. It should be at a level of detail equal to or greater than that in a typical journal article. The target audience is a physics faculty in a different subfield. The written paper should be:

- approximately 7-15 pages single spaced
- include appropriate sections (see appendix)
- include appropriate figures, tables, and appendices as necessitated
- include references to published work in the field.

D. Major Field Test: All graduating seniors must take the Major Field Test. It is an ungraded exit test and covers all areas of physics. The test takes about 2 hours to complete. We use the aggregate data from all students to determine the departments strengths, weaknesses, and areas to focus for improvement.

Deadlines:

September 19: (Phys 497) Provide (via e-mail to the instructor) the proposed title and a two-sentence description of your senior seminar project, and the name of your faculty supervisor.

November 28: (Phys 497) Provide (via e-mail to the instructor) a half-page review of your progress to date on your research project addressing what advances have you made and what do you have remaining.

February 27: (Phys 498) An outline of your paper is due by Wednesday of the 7th week.

March 25: (Phys 498) The final written paper is due by Wednesday of the 11th week.

Friday April 24 @4:30 pm: (Phys 498) Major Field Test – All graduating seniors must take. It is ungraded and takes about 2 hours to complete. We use the aggregate data from all students to determine the departments strengths and weaknesses and areas to focus for improvement.

Grading:

Speech Center Practice: 10%

Regular Attendance: 20%

Talk 1: 20%

Level of understanding: 10%

Quality of presentation and engagement: 10%

Talk 2: 20%

Level of understanding: 10%

Quality of presentation and engagement: 10%

Final Paper 30%

Draft 7 %

Final Paper 23 %

Responsible AI Use Policy: Learning to use AI in productive, responsible, and ethical ways is an emerging skill. Working with AI should enhance---not replace---your thinking and learning. Use it as a tool, not a crutch. All AI use must be transparent, acknowledged, and aligned with academic integrity. (see Required Documentation for AI use below).

PERMITTED AI Uses in this course:

- Coding for data analysis (*i.e.*, *Mathematica* script).
- Background research, *i.e.*, what is interference?
- Prompting AI to solve homework problems is acceptable, but complicated. You can't just type in the problem and ask for a solution. Consult your instructor for details.
- Other uses ONLY when explicitly assigned by instructor.

REQUIRED Documentation for AI Use:

- When you use AI tools, you must include an 'AI Use Statement' at the end of your work.
- Include which tool(s) you used and how you used them (prompts, revision).
- What you learned or gained.

Appendix: Writing a Scientific Paper:

Please structure your paper following the guide below. I've tried to indicate where items are suggestions by using nonspecific language such as, around or suggested. In these cases, you should follow the suggestion unless you have a very good reason to do otherwise.

Page Length: approximately 7-15 pages single spaced. Paper size must be the standard US letter paper size (8 ½ by 11”).

Margins: must be one inch

Font suggestion: Arial or Courier New font size 11 points; Times New Roman font size 12 points
A font size of 10 points may be used for mathematical formulas or equations, figures, tables or diagram captions...

Embed Figures and tables: Place them at the bottom or top of the page where they are referenced instead of placing them in an appendix (suggestion)

In-Text citation: Format is your preference but references should be cited in the text.

- ***Any reference cited in the text must be included in the bibliography.***
- ***No works may be listed in the bibliography unless they are cited in the text.***

Sections: Your paper should include the following sections:

Title

- Informative Catchy and Concise

Abstract

- Concise, Direct, and Informative
- Around 300 words
- Has a punch line
- Abstracts should state major findings, possibly some specifics such as numbers or trends.
- After reading your abstract professionals not acquainted with your work should understand what your goal was and the concept(s)/principle(s) you used to achieve this goal.

Introduction

- Place the work into broader context
- Relate to other relevant research
- Why is the work important, in plain language
- State the what the work will show “In this work”
- State techniques/methods
- State major achievements

Body Sections

- This is the least defined area of writing
 - All equations should be typeset (MS Word equation editor or LaTeX)
 - Think about the organization ahead of writing
 - Use informative headings and subheadings (as necessary) to help orient the reader
- Common possible headings: Theory, Methods, Results, Discussion

Section headings for a library project may differ.

Conclusions/Summary

- Give you article closure
- Summary of major findings (this will be repetitive)
- Prospects for future extensions
- Possible applications and relevance to other works, fields

Acknowledgements**References**

- In text citations
- Numerically ordered or alphabetically ordered bibliography
- No preference for a particular citation format but select one and be consistent

Appendices

- Many papers may not have an appendix
- Include extra material: such as code, necessary raw data, detailed theory