Senior Thesis: General Instructions to Students and Faculty

Physics 499W and Physics (489W-490W)

(one and two-semester options)

2025

Senior Thesis Coordinator: Dr. Colm Whelan

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Senior Thesis Web Site: http://www.odu.edu/physics/academics/undergraduate/thesis

Course Communication: By e-mail.

CATALOG DESCRIPTIONS

PHYS 489W. Senior Thesis I. 1 Credit.

Part one of a two-semester option for completing the Senior Thesis. This is a writing intensive course. PHYS 489W plus PHYS 490W is equivalent to PHYS 499W. Prerequisites: permission of the instructor and a grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C.

PHYS 490W. Senior Thesis II. 2 Credits.

Part two of a two-semester option for completing the Senior Thesis. PHYS 489W plus PHYS 490W is equivalent to PHYS 499W. This is a writing intensive course. Prerequisites: PHYS 489W.

PHYS 499W. Senior Thesis. 3 Credits.

Each student will undertake a research experience under the supervision of a department faculty member. The experience can be of an experimental, theoretical, or calculational type. A final oral and written report are required. The research may be completed on campus or at one of the department affiliated research organizations. This is a writing intensive course.(offered fall, spring, summer) Prerequisites: grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C and permission of the instructor.

Introduction:

The Senior Thesis is a capstone experience in which the student works with a physics department faculty member (Thesis Advisor) on an individual research project. The student has the opportunity to apply knowledge and skills acquired in the classroom to real-life research problems in physics. This research can be done either in on-campus laboratories and facilities or at other scientific institutions in the region where departmental faculty members perform research, such as the Thomas Jefferson National Accelerator Center (TJNAF), the Applied Research Center, or NASA Langley Research Center.

There are two options for completing Senior Thesis. The first is to complete Physics 499W, which is a 3 credit course taken in one semester, (Fall, Spring or Summer). The second is a two-semester option in which the student takes the one credit hour Physics 489W in the first semester and the **two credit hour Physics 490W the following semester**. Senior Thesis can also be scheduled during the summer sessions. Successful completion of both Physics 489W and 490W is equivalent to Physics 499W and satisfies both the writing and oral communication upper level general education requirements for physics majors.

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The truncated semester, together with the increased teaching load on the faculty and social distancing restrictions will make it very difficult to compete on time

The total time commitment required by the student should be commensurate with a senior level three credit hour physics course. For completion of Physics 499W or Physics 490W, the student must prepare a written final report (Thesis) which is reviewed and critiqued by their Thesis Committee, and make a public oral presentation on their project to the department on Physics Seniors' Day.

There are three objectives for the Senior Thesis Research courses:

- Provide an independent research experience for the student.
- Teach the student how to write an in depth physics research report, complete with figures, figure captions, table of contents, tables, references, abstract, etc.
- Reinforce material from earlier courses on giving scientific presentations.

Project Topics:

Senior Thesis topics must involve genuine physics, and not just library research. The thesis topic can be experimental, computational, or theoretical. The thesis does not necessarily have to present original research, but, some level of original contribution by the student is strongly preferred and topics should be chosen accordingly. The thesis should represent a significant integration of each student's undergraduate coursework. Normally, the research portion of the thesis project should be chosen so as to be realistically do able in 100-150 hours (8-10 hours per week), thereby leaving time for the student to prepare the oral presentation and written report. The exact timing of the research portion is left up to the advisor, but the scope of the project should be chosen so that the project will be completed in the allocated course time. In preparation for Senior Thesis research, students may elect to undertake independent study with a faculty member, though this is not a prerequisite to Senior Thesis research.

General Information:

1. SEMESTER PRIOR TO STARTING SENIOR THESIS:

Project Selection and Registration.

Close to the end of the semester <u>prior to registering</u> for Senior Thesis, the student must contact the Senior Thesis Coordinator to inform of him of their intent to begin Senior Thesis the following semester, and to get a list of projects available. It is a very good idea to directly contact a potential advisor. Not all faculty will have prepared a project but may be willing to create one for a student they know

The student must then arrange to meet with prospective Thesis Advisors to discuss projects of mutual interest. Once an agreement is made, *Thesis Advisor will request the department to issue a course CRN to allow them to register for Physics 489W or Physics 499W under the* ***Thesis Advisor****'s name*. This registration process should be completed by the end of the first week of the first semester.

2. REGISTERING FOR SENIOR THESIS

(i) PHYSICS 489W and 499W

Students can only register for Phys489W and Phys499W after they have received the correct CRN from the **Thesis Advisor**.

(ii) PHYSICS 490W: (2 credit hours)

The course prerequisite for Physics 490W is a pass with greater than C, in Physics 489W. Registration for Physics 490W proceeds through the normal process with a new CRN under the name of the same Thesis Advisor. A student whose Physics 489W grade has not been recorded with the Registrar needs to contact their Thesis Advisor, or the university will drop them from the Physics 490 W registration for lack of prerequisite.

3. THESIS COMMITTEE and PROJECT OUTLINE:

Prior to the end of the second week of semester, the student must have selected their Thesis Committee who will help guide the project, examine the written Senior Thesis, and determine the Final Grade for the semester. The makeup of the Thesis Committee is presented below. The student must discuss the makeup of the Thesis Committee with their Thesis Advisor who must approve the members. The names of the Thesis Committee must be sent to the Senior Thesis Coordinator using Form ST03. The student must also complete the Senior Thesis Project Summary Form ST04 and **submit it to their Thesis Advisor for approval**, and then to their **Thesis Committee AND the Senior Thesis Coordinator** who will file it as part of the departmental records and update the Physics website. Only the Project Title/Outline on ST04 will be posted on the Physics Department's website.

Thesis Committee:

Each student will have a thesis committee consisting of at least three members, including the Thesis Advisor as chair. The student and their advisor should choose the other members of the committee, keeping in mind that at least one of the members must be from a subfield of physics different from that of the Senior Thesis research. Three committee members must be physics faculty (regular or adjunct). Additional members from outside the department, whose expertise coincides with the research topic, are allowed. The student must ask the other committee members if they are willing to serve on their Senior Thesis Committee. **For**

students taking the two-semester sequence they must confirm that each committee member is available for the two semesters required to complete the courses. A list of the Thesis Committee members must be forward to their Thesis Advisor for approval. The approved list must then be submitted to the Senior Thesis Coordinator using Form ST03.

4. MID-SEMESTER PROGRESS:

Close to Mid-Semester (typically the week before Fall or Spring Break), all Senior Thesis students should arrange to meet with their Thesis Advisor to discuss their progress in the project. The Advisor may request a written progress report and/or a meeting with the other Committee Members.

5. END OF SEMESTER REPORTS:

At the end of the semester, all Physics 489W students must complete a brief Progress Report using Form ST05 and submit it to their Thesis Advisor before a grade can be recorded for the 1 credit hour course. Students in Physics 490W and Physics 499W will complete and submit/present their written Senior Thesis and Presentation as explained in Sections 6 and 7 below.

6. SENIOR THESIS PRESENTATIONS:

Senior Thesis Presentations are held on Physics Seniors' Day which is usually the last Tuesday or Thursday of semester. It not only depicts the event in which all Physics 490W and 499W students give their Oral Presentation but also the deadline for having their Senior Thesis completed and examined by their Thesis Committee. It is also the deadline for which Physics 489W students must have completed and submitted to their Thesis Advisor a Progress Report of the work they completed during their first Senior Thesis semester. The Senior Thesis Presentation date, time, and location will be listed in the Physics Department Colloquium Schedule on the Physics Website. The date and times may vary or be split depending on the number of Senior Thesis Oral Presentations.

Oral Presentation:

The talks are typically 13-15 minutes long, including 3 minutes for questions. The student must prepare a draft of the oral presentation and meet with their Thesis Advisor to go over the content, organization, and slides for the talk at least 2 weekdays before the presentation. The presentation is expected to be a concise and well-organized PowerPoint presentation. Diagrams, figures, and text must be large enough to be readable by the audience on the overhead projection screen in the scheduled room. Axis labels on figures must be clearly legible. At least one practice talk should be given with the advisor prior to Presentation Day.

7. WRITING THE SENIOR THESIS:

Sufficient time needs to be allocated to the writing of a quality Senior Thesis and to have it submitted for review and examination. After completing the research portion of their project, the student should allow two weeks to compile the data, figures and tables and to write the document. **Seven days before the Senior Thesis Presentation Da**y a complete written draft of the thesis is due to the advisor. The advisor must critique both the writing and the science in the thesis, and return the draft to the student within 2 days for possible corrections. The student incorporates changes requested by the advisor and gives the written thesis to the Thesis Committee members 3 days before Presentation Day.

Senior Thesis Committee members will give comments on the written draft to the student immediately after the oral Senior Thesis Presentation. The student must revise the draft and submit a copy of the final thesis to all members of the committee 3 days prior to ODU Commencement Day for the particular semester, independent of whether or not they are graduating. When the Committee is satisfied they will sign the Signature Page of the written thesis which will remain with the Thesis Advisor. The completed final Senior Thesis will be submitted to the Thesis Advisor as BOTH a hard copy and digital format (PDF). The digital format must be complete except for the Signature Page which will be the responsibility of the Thesis Advisor to complete and submit to the Physics Office (Delicia Malin) along with one hard copy and the digital copy. **The department will bind the original signed Thesis for its records.** The digital format will be used by the department to produce bound copies in color for the student and Examination Committee. **Only after complete fulfillment of the Senior Thesis requirements will the Thesis Advisor submit a grade to the university. This must be done prior to Commencement Day for that semester.**

Written Thesis:

The thesis is expected to be at least 20 pages long, double spaced (excluding title page, table of contents, abstract, references, etc.). It can be written using any word processing software, but templates are available on the Physics Website for MS Word and LaTeX. Refer to Form ST06 for information and links to templates. The thesis must have an abstract, title page, table of contents, clearly delineated chapters, and references. The formatting must be consistent and "professional" throughout; the document must be free of grammatical errors or other typos. Figures must be of high quality and have appropriate figure captions. Pages must be numbered. **Please note that the Date to be put on the TITLE PAGE of the Thesis will be that of the student's expected graduation (Month and Year). The DATE that goes on the Senior Thesis ABSTACT PAGE with the date of Senior Thesis completion. These dates will be the same if you graduate the same semester.** Often student graduation date is different to Senior Thesis completion. Links to Senior Thesis examples from previous semesters are available on Form ST06. It is expected that the final original signed Thesis will be printed by the student on paper of higher quality than standard photocopy paper. For help see the Senior Thesis Coordinator. Paper will be available in the Physics Office.

8. GRADES:

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Course Grades:

Course grades will be assigned by the Thesis Advisor in consultation with the Thesis Committee using the following weights.

(i) Physics 489W (1 credit):

Research	60%
Progress Report (end of semester)	40%

(ii) Physics 490W (2 credits) and Physics 499W (3 credits):

Research	50%
Written Thesis	30%
Oral Presentation	20%

Evaluation of the Written Senior Thesis:

The written Senior Thesis will be evaluated according to the following criteria:

(i) Scientific Content (50%)

a. The topic is introduced clearly, demonstrating an understanding of the relevance of the topic and motivation for the work.

b. The project is presented accurately and thoroughly, including detailed discussion of the work actually done by the student.

c. The results/ conclusions/ significance of the work are presented clearly.

d. The abstract is appropriate and constitutes an accurate summary of the work.

e. Relevant work by others is appropriately cited.

(ii) Quality of the Writing (25%)

a. The writing is grammatically correct.

b. The thesis is well organized.

c. The sentence structure and vocabulary are appropriate for an undergraduate science major.

(iii) Presentation and Formatting (25%)

a. Formatting is professional and consistent throughout the document.

b. References are formatted in a way consistent with a standard physics journal.

c. Figures and tables are presented clearly, with appropriate captions.

Evaluation of Oral Senior Thesis Presentation:

The oral presentation will be evaluated according to the following criteria:

(i) Organization and clarity of the slides (25%)

a. Text, diagrams and figures are readable by the audience.

b. The talk is well organized.

c. The slides are not too cluttered but they do have meaningful content.

(ii) Scientific content (25%)

a. The level of the talk is appropriate for the audience.

b. The main aspects of the science and the student's work are conveyed with appropriate depth.

(iii) Language and delivery (25%)

i. The student uses appropriate language, not too informal, and without too many "uhms."

b. The student faces the audience, uses a pointer as necessary, and makes eye contact with the audience.

c. The student dresses appropriately.

(iv) Questions and Answers (25%)

a. The student understands the questions and answers the ones that he/she should be able to answer.

b. The student answers appropriately when he/she does *not* know the answer.

9. FINALIZING SENIOR THESIS:

A Final Grade will not be assigned for Senior Thesis students until all course requirements have been met. **For Physics 489W students** this includes an end of semester **Physics 489W End of Semester Report using Form ST05,** submitted to and approved by their Thesis Advisor**. For Physics 490W and 499W students** this includes completion of the **Oral Presentation and the written Senior Thesis** which has had all corrections completed and the Signature Page signed by the Thesis Committee.

Each student will be responsible for delivering one final hard copy and digital version of the Thesis to their Thesis Advisor. **In addition each student must submit to their Advisor, a completed Contact Information Form (ST09) to enable the Department to mail the bound Thesis to them at a later date. Please include a valid mailing address, e-mail address and Phone Number for the following semester. Information on this form will remain solely within the Physics Department for use by the Administrative Staff. Note that the bound Thesis will be mailed around the middle of the following semester, so the mailing address must be still valid at that time.** The Thesis Advisor will submit the hard copy and digital version (PDF) of the Thesis as well as the **original Signature Page and completed Form ST09 to the Physics Office, (Delicia Malin), before the date of the University Commencement Ceremonies**. The digital version copy will be used to print (color) and bind the required number of theses. Five bound copies of the thesis will be made (Department (1), examiners (3), student (1)). Additional bound copies are often requested by the student, Thesis Advisor, and Committee. Ask your Thesis Advisor to request this through staff in the Physics office. Once the Senior Thesis requirements are fulfilled the Thesis Advisor will submit a grade following consultation with the committee members.

10. FORMS AND DOCUMENTS:

The following forms and documents are available for download from the Physics Department's Senior Thesis website, located at

http://www.odu.edu/physics/academics/undergraduate/thesis

(i) ST01: Intent to Begin Senior Thesis: (Physics 489W and Physics 499W).
(ii) ST02: Senior Thesis Project Selection/Approval Form. (Physics 489W & 499W).
(iii) ST03: Senior Thesis Committee Members Form.
(iv) ST04: Senior Thesis Project Summary Form.
(v) ST05: End of Semester Progress Report for Physics 489W Students
(vi) ST06: Senior Thesis Templates: (for Physics 490W and Physics 499W).
(vii) ST07: Reserved

(viii) ST08: Reserved
(ix) ST09: Senior Thesis Student Contact Information. (For mailing bound Thesis).

Updated: 2 August 2020.

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Senior Thesis Coordinator

Old Dominion University