Course Syllabus
PHYS 497.100X: Senior Thesis

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Office Hours: MWF 10:00-11:00 am (or by appointment)

Course Description: Integration of physics sub-disciplines, other sciences, mathematics and English in a directed theoretical or experimental research project, culminating in a written thesis and oral defense.

Prerequisite(s): PHYS 182L, completion of CO 1 – 8, junior or senior standing, permission of instructor. Recommended preparation: PHYS 421.

Course Objectives:
The overarching objective is to experience the independent research environment. You will

- Work with your advisor to frame a research proposal
- Devise an implementation plan, including a timeline, to carry out your proposed research, submit and defend your thesis.
- Develop sufficient background and contextual knowledge by conducting a thorough literature search
- Become knowledgeable (where appropriate) about safe laboratory practices.
- Adopt ethical research practices, and understand the need for objectivity in data collection, analysis and interpretation.

Throughout this course, you will communicate with your advisor and other group members. You will present your work in oral and written form in various contexts. Integration of your research project with other fields (physics, biology, engineering, etc.) will be accomplished through short thesis talks to students in various disciplines. These short thesis talks, modeled after the Three Minute Dissertation in the Graduate School, will provide the opportunity to explain your research objectives and results to an audience of non-physicists. You will also learn about research projects in other fields and have the opportunity to learn and discuss ideas across disciplines. This course will culminate in preparation of a written senior thesis that will be submitted to your research advisor, and a second
reader to be selected in consultation with your advisor. In final form, you will submit your thesis to the department chair. You will also make an oral presentation of your thesis to students and faculty in a short colloquium, to be followed by a defense with your advisor and reader. Student/faculty and student/student interactions and mentoring will be utilized to help improve the quality of your oral and written communication.

**Time Commitment:** Students are expected to dedicate a *minimum* of 12 hours of activity per week (4 hours per week per credit) to research. Note that individual research advisors may have higher expectations for the amount of time a student needs to dedicate to an undergraduate research project. Student and advisor expectations should be discussed prior to enrolling in this course.

**Core Objectives:**

**Core Objective 13:** Integration and Synthesis. Students will be able to integrate and synthesize Core knowledge, enabling them to analyze open-ended problems or complex issues.

**Core Objective 14:** Application. Students will be able to demonstrate their knowledge and skills developed in previous Core and major classes by completing a project or structured experience of practical significance.

**Student Learning Outcomes:**

**Core Objective 13 (Integration & Synthesis)**

- Students will be able to integrate Quantitative Reasoning (CO2) and Critical Analysis & Use of Information (CO3) to formulate and carry out a research project.
- Students will be able to synthesize information and techniques from previous coursework across disciplines to identify and use the basic materials and resources needed to carry out a research project.

**Core Objective 14 (Application)**

- Students will be able to communicate the results of Senior Thesis I research orally and in writing, following the standards of scholarly articles in Chemistry (CO1).

**General**

- Students will be able to articulate and follow ethical principles in a scientific context, including professional standards of laboratory practice, the communication of literature research without plagiarism, and the crediting of collaborators and standards for co-authorship. (CO12)
Grading: Your final grade will be determined based on the quality/quantity of the research performed, your time commitment in the laboratory (attendance), laboratory safety, and completion of and quality of your senior thesis. Students are required to turn in the final copy of their senior thesis no later the last day of finals. Final copies of the senior thesis shall be provided to your research advisor and the department chair. It is critical that you start working on your final report well before the due date to allow for corrections and rewriting. Draft copies of your senior thesis need to given to your advisor for review and correction prior to final submission. The timeline for handing in drafts of your thesis will be determined in consultation with your advisor. A tentative timeline is described below.

Senior Thesis Tentative Timeline:

<table>
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<tr>
<th>Event</th>
<th>Due</th>
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<tbody>
<tr>
<td>Discuss research topic with advisor (outline)</td>
<td>1st week of class (or before)</td>
</tr>
<tr>
<td>Conduct research/training</td>
<td>1st – 15th week of class</td>
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<tr>
<td>Background reading on research topic</td>
<td>1st week of class (or before)</td>
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<tr>
<td>Rough draft of introduction to senior thesis</td>
<td>4th week of class</td>
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<tr>
<td>Outline of senior thesis</td>
<td>6th week of class</td>
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<tr>
<td>Group meeting presentation(s)</td>
<td>ongoing through semester</td>
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<tr>
<td>5 min thesis presentation with other departments</td>
<td>8th week of class</td>
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<tr>
<td>Initial draft of Senior Thesis</td>
<td>12th week of class</td>
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<tr>
<td>Group meeting oral presentation of Senior Thesis</td>
<td>13th week of class</td>
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<tr>
<td>Final experiments to close loose ends</td>
<td>14-15th week of class</td>
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<tr>
<td>Revised draft of Senior Thesis</td>
<td>14-15th week</td>
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<tr>
<td>Clean up lab space/check out of lab</td>
<td>Finals week</td>
</tr>
<tr>
<td>Final Senior Thesis submitted to PI and department chair</td>
<td>Finals week</td>
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Senior Thesis (final report): All students will be required to turn in a Final Report (the senior thesis). Your thesis is due no later than the last day of finals (with draft versions due earlier). Your senior thesis must be approved by your advisor and submitted to both the department chair and your advisor. The thesis should be a minimum of 10 pages (single spaced, 12 pt font). All theses will follow the standards of scholarly articles in Chemistry and will include a title page, table of contents, abstract, introduction, experimental section, results and discussion section, conclusion, and a section on future plans for the project. Pertinent references should be included with each chapter.

Safety: All group, departmental, and university safety and environmental policies must be followed.
Statement on Academic Dishonesty: "Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. For more details, see the University of Nevada, Reno General Catalog."

Statement of Disability Services: "Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations."

Statement for Academic Success Services: For example, "Your student fees cover usage of the Math Center (784-4433 or www.unr.edu/mathcenter/), Tutoring Center (784-6801 or www.unr.edu/tutoring-center), and University Writing Center (784-6030 or http://www.unr.edu/writing-center). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student."

Statement on Audio and Video Recording: "Surreptitious or covert videotaping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded."