

PHYS 4699 – Undergraduate Research

Course Number: 82974

Semester: [Fall 2026]

Instructor: Prof. Xueda Wen

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Office Hours: By appointment

Course Description

This course provides undergraduate students with the opportunity to engage in independent research under faculty supervision. Students will work on a research project in theoretical, computational, or experimental physics, developing skills in problem formulation, literature review, technical methods, and scientific communication.

Prerequisites

- Permission of instructor
- Background appropriate to the specific research topic (e.g., quantum mechanics, statistical mechanics, or programming)

Course Objectives

By the end of the course, students will:

- Gain experience in formulating and solving open-ended research problems
- Develop the ability to read and understand scientific literature
- Learn to use appropriate analytical, computational, or experimental tools
- Communicate research results clearly in written and oral formats
- Understand the process of scientific inquiry and research ethics

Course Structure

This is an individually mentored research course. Structure will vary depending on the project, but generally includes:

- Weekly or biweekly one-on-one meetings
- Independent research work
- Periodic progress updates
- Final written report and/or presentation

Expectations

Students are expected to:

- Dedicate approximately 9–12 hours per week (for 3 credit hours)
- Actively engage in research discussions
- Maintain consistent progress
- Communicate regularly with the instructor
- Demonstrate academic integrity and proper citation practices

Assessment and Grading

Component	Weight
Participation & Effort	30%
Progress Reports / Meetings	20%
Final Report (written)	30%
Final Presentation	20%

Grading Scale: Standard A–F scale

Assignments

1. Research Plan (Early Semester)

1–2 pages outlining:

- Problem/topic
- Background
- Proposed approach

2. Progress Updates

Short written or oral updates every 2–4 weeks.

3. Final Report

Typically 5–10 pages (or more depending on project), including:

- Introduction and motivation
- Methods
- Results
- Discussion

4. Final Presentation

10–20 minute presentation (informal or seminar-style).

Possible Research Areas

- Quantum information and computation
- Condensed matter theory
- Computational physics
- Statistical mechanics
- Experimental AMO or condensed matter

Academic Integrity

Students must adhere to the policies of the Georgia Institute of Technology regarding academic honesty. All sources must be properly cited.

Flexibility Statement

Because research is inherently unpredictable, project scope and expectations may evolve during the semester. Grading emphasizes effort, learning, and engagement rather than only final results.