PHYS 8901 – Special Problems

CRN: 51769
Section: 8901
Semester: Summer 2026

Instructor: Prof. Xueda Wen
Department: School of Physics, Georgia Institute of Technology
Email: xueda.wen@physics.gatech.edu
Office Hours: By appointment

Course Description

This course offers individualized instruction on advanced topics in physics through directed study. Students will explore a specialized subject beyond the standard curriculum, combining guided reading, problem solving, and research-oriented activities.

Topics vary depending on student interests and may include quantum information, condensed matter theory, quantum field theory, or computational physics.

Prerequisites

- Permission of instructor
- Prior coursework relevant to the selected topic

Course Objectives

By the end of the course, students will:

- Develop a deep understanding of a specialized topic in physics
- Strengthen skills in mathematical and theoretical analysis
- Learn to read and critically evaluate research literature
- Solve advanced problems beyond standard coursework
- Communicate technical material effectively

Course Structure

The course is organized as a directed study with the following components:

- Weekly one-on-one or small-group meetings
- Assigned readings from textbooks and research papers
- Problem sets or technical exercises
- Final project or report

Expectations

Students are expected to:

- Dedicate approximately 9–12 hours per week
- Complete assigned readings and problems
- Participate actively in discussions
- Demonstrate independent thinking and initiative

Assessment and Grading

Component	Weight
Participation and Engagement	20%
Problem Sets / Exercises	30%
Literature Review / Presentation	20%
Final Project or Report	30%

Grading Scale: Standard A–F scale

Assignments

1. Problem Sets

Regular assignments focusing on technical mastery of the subject.

2. Literature Review

Students will read and present one or more research papers.

3. Final Project

A final project may include:

- A detailed written report (8–15 pages), or
- A technical presentation, or
- A small research-style investigation

Example Topics

- Quantum computation and quantum algorithms
- Quantum many-body systems and entanglement
- Topological phases of matter
- Conformal field theory
- Numerical methods in physics

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 this is a directed study course, the syllabus may be adjusted to better align with student interests and progress. Expectations and topics may evolve during the semester.