PHYS 3143-A Syllabus

Quantum Mechanics I, Phys 3143-A

Fall 2026

Instruction Information

Instructor: Carlos Sa de Melo

Email: carlos.sademelo@physics.gatech.edu

General Course Information

Description

This course covers elementary topics in Quantum Mechanics, a fundamental area of physics that had tremendous impact on technology. A **strong** background in Linear Algebra, Matrix Theory, Ordinary Differential Equations, and Calculus is necessary to succeed in PHYS 3143. Students without a solid knowledge of these topics may struggle in this class. Topics to be covered include the discovery of spin, matrix mechanics, angular momentum, time evolution, wave mechanics in one dimension and the one-dimensional harmonic oscillator.

Course Learning Outcomes

At the end of this course, students should be able to explain what spin is and how it was discovered, use linear algebra and the Dirac notation to investigate quantum mechanical eigenstates and eigenvalues, apply concepts of matrix theory and operator methods to calculate expectation values and uncertainties, understand the quantum theory of angular momentum, analyze problems involving time evolution of quantum states, use methods from ordinary differential equations to solve the Schrodinger's equation in one spatial dimension, interpret the meaning of the wavefunction, use calculus to compute expectation values and uncertainties, and connect theoretical concepts to experiments.

Require Course Materials

A Modern Approach to Quantum Mechanics (John S. Townsend) 2nd Edition, available at Georgia Tech Barnes and Noble Bookstore.

Grading Policy

Letter Grade: **A =** 90 to 100%; **B** = 80 to 89%; **C** = 70 to 79%; **D** = 60 to 69%; **F** = 0 to 59%

Assignments

- Homework 25%
- Midterm 1 25%
- Midterm 2 25%
- Final Exam 25%

Description of Graded Components

Homework assignments are given weekly. All midterms and the final exam will be taken in class**. No books or complete notes** can be used during the midterms or the final exam. Students are allowed to bring **a letter-sized one-sided handwritten summary sheet** with notes and formulas for the midterms and **a letter-sized two-sided handwritten summary sheet** with notes and formulas for the final exam.

Course Policies

Attendance and/or Participation

This will be an engaging classroom, where students are expected to participate. I have noticed a significant difference in exam performance between students who regularly attend class and those who do not. Therefore, I will consider attendance and participation in determining your final grade.

Academic Integrity

The foundations of the Georgia Tech community are based on honor, trust and academic integrity. Students are expected to behave according to the highest ethical standards outlined in the Georgia Tech's Honor Code (https://policylibrary.gatech.edu/student-

life/academic-honor-code) and the Student Code of Conduct (https://policylibrary.gatech.edu/student-life/student-code-conduct).

Students suspected of plagiarism or cheating on assignments, quizzes or exams will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodation for Students with Disabilities

Students with learning needs that require special accommodation should contact the Office of Disability Services (https://disabilityservices.gatech.edu/, Phone: 404 894-2563) as soon as possible to make an appointment and to obtain a letter of accommodation. Students should feel free to contact the course instructor to discuss their learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. Read the student-faculty expectations (https://catalog.gatech.edu/rules/22/), where the basic principles are articulated. Hard work, respect for knowledge, and cordial interactions will go a long way in building a healthy academic environment.

Pre- &/or Co-Requisites

- Phys 2213 (Introduction to Modern Physics) **or** Phys 2304 (Modern Physics)
- Math 1553 (Introduction to Linear Algebra) **or** Math 1554 (Linear Algebra) **or** Math 1564 (Linear Algebra with Abstract Vectors Spaces)
- Math 2551 (Multivariable Calculus)
- Math 2552 (Ordinary Differential Equations)

Collaboration, Group Work, and Use of Generative AI

Students are permitted to consult with one another and to seek other resources to solve homework problems **excluding textbook's solution manual, prior-year solutions or AI based software**, but each student must turn in their **own** original work. All exams will be taken in class. **No books or complete notes** can be used during the midterms or the final exam. Students are allowed to bring **a letter-sized one-sided handwritten summary**

sheet with notes and formulas for the midterms and **a letter-sized two-sided handwritten summary sheet** with notes and formulas for the final exam.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Penalties are given for late homework. Make-up exams requests require documentation, and are given for illness, religious observances or approved Institute activities. Additional accommodation can be made for students whose presence elsewhere is required by law, or for whom a special request is made by the Office of the Dean of Students.