Phys 3143, Syllabus

- **Course Prefix and Number:** PHYS 3143-B, Quantum Mechanics I, 3 credits
- **Term:** Fall 2026

Instructor Information

Instructor: Brian Kennedy
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General Course Information

Description

The foundations of quantum mechanics including, spin one-half, angular momentum, matrix mechanics, time evolution, wave mechanics in one dimension and an introduction to the quantum harmonic oscillator.

Course Learning Outcome

To develop an understanding and problem solving skills in the following:

- The quantum mechanics of the spin one-half system, its abstract vector space structure and the role of linear operators as physical observables; transformation theory and the spectral theorem.
- Eigenvalue problems for spin one-half system and their relevance to Stern-Gerlach experiments. General eigenvalue problem for angular momenta and higher spins.
- The statistics of quantum measurements in the context of spin one-half and other quantum systems.
- Applications of linear algebra and differential equation methods for the study time evolution of quantum systems especially spin one-half among other quantum systems.
- Wave mechanics in one dimension and the interpretation of the wave function in position and momentum representations. Use of calculus methods and differential equations to study the bound and scattering states of wave-mechanical systems.

Required Course Materials

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

Grading Policy

Letter grade: A ≥ 90, 89 ≥ B ≥ 80, 79 ≥ C ≥ 70, 69 ≥ D ≥ 60 > F

Assignments

- Quiz × 3, 45 %
- Homework 10 %
- Final Exam: 45 %

Description of Graded Components

The quizzes and final exam are in class and closed book and notes. An information/equation sheet will be provided.

Course Policies

Attendance Policy

Classroom participation is expected. Moreover, students with poor attendance have significantly weaker exam performance than those students who attend regularly. Therefore, attendance will be collected and counted in determining your final grade.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Student Code of Conduct and the Academic Honor Code

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations

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. The Student-Faculty Expectations articulates some basic expectations that you can have of me and that I have of you. Additional information for research-related work is given in The Expectations of Advisors and Advisees. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre-and/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 Vector Spaces)
- Math 2551 (Multivariable Calculus)
- Math 2552 (Ordinary Differential Equations)

Collaboration, Group Work and Use of Generative AI

Students are permitted to work in groups on all homework assignments, but work you turn in must be written/typed in your own hand (not AI generated). In-class quizzes and final exams will be entirely your own work, and will test knowledge of homework and other material. Use of old homework solutions and generative AI to produce solution sets is discouraged.

Extensions, Late Assignments and Re-Scheduled/Missed Exams

Late homework may be subject to penalties. Make-up exam requests require documentation, and are given for illness, approved institute activities and religious observances. Additional accommodations can be made for students whose presence elsewhere is required by law, or for whom a request is made by the Office of the Dean of Students.