ESE 332 Quantum Mechanics for Engineers
Fall 2025

Syllabus

Important notes

- Class will take place on Mondays and Wednesdays, 09:30 to 11:00 AM in Frey 326.

- This course includes problem sets, pop quizzes, and two mid-term exams (**NO final exam**).

- If you have a physical, psychological, medical, or learning disability that may impact your coursework, please contact the Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation are confidential.

1. Course Staff and Office Hours

Instructor: Prof. Hyeongrak Choi ("Chuck")

hyeongrak.choi@stonybrook.edu

617-335-5420

Office Hours: Thursday 2PM to 3PM, Light Engineering 265

Individual office hour can be reserved here – in person only.

*Office hours and locations may change. Please check Brightspace for the most up-to-date information.

2. Course Description

Introductory undergraduate-level first course in quantum mechanics geared towards engineers and applied physicists. Comprehensive introduction to quantum mechanics and its application to real-world problems. Concepts covered will include blackbody radiation, the photoelectric effect, the quantization of the electromagnetic field, wave-particle duality, Heisenberg's uncertainty principle, the electron wave function, superposition, stationary states, the Pauli exclusion principle, many-body systems, tunneling, quantum mechanics in crystalline materials, quantum measurement, wavefunction collapse, entanglement, and teleportation. Applications covered will include lasers, LEDs, solar cells, MOSFETs, flash memory, quantum cryptography, quantum computation, and quantum teleportation, among others.

Prerequisites: PHY 122/124 or PHY 126 and 127 and 134 or PHY 132/134 or PHY 142/134; MAT 127 or 132 or 142 or 171 or AMS 161. Advisory Corequisite: AMS 261 or MAT 203 or 205 or 307

Credits: 3

3. Textbook

OPTIONAL (NOT REQUIRED) TEXTBOOKS

Arthur Beiser, Concepts of Modern Physics, McGraw-Hill, 2003.

David Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, 2018

4. Course Learning Objectives

At the end of this course, students will:

- Know how to solve introductory problems in quantum mechanics.

- Understand quantum mechanical concepts relevant to electronic devices.

5. Student Learning Outcomes

Student Outcomes	% contribution
An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	80%
An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
An ability to communicate effectively with a range of audiences.	
An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive	

environment, establish goals, plan tasks, and meet objectives.	
An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	20%

6. Assignments (Problem sets)

Problem sets will be posted on Brightspace with specified due dates and must be submitted through Brightspace. Late submissions will not be accepted—**no exceptions**. All calculations and intermediate steps must be clearly shown to receive full credit. Grades will be posted as soon as possible, and students will have one week after grades are released to dispute the evaluation of their problem set.

Collaboration on the assignment is allowed and encouraged to the extent that students discuss problem-solving approaches and key steps. However, simply copying another student's work is strictly prohibited. Each student must independently complete their assignment and clearly acknowledge any collaborators on the first page of their submission. ***Any instance of academic misconduct, such as copying another student's work, will result in a failing grade for the course and will be reported to the appropriate school authorities — no exception.***

7. Pop Quizzes

This course includes pop quizzes consisting of straightforward, conceptual questions. Pop quizzes can be given anytime during the class. Problems are designed to be easy enough so that students are expected to achieve a perfect score. The purpose of these quizzes is not to penalize students but to ensure a basic understanding of fundamental concepts and to encourage consistent attendance.

8. Exams

There will be no final exam. Two midterm exams will be held during the regular class time and in the usual classroom. All calculations and intermediate steps must be clearly shown to receive full credit. Grades will be announced as soon as possible, and students will have one week after receiving their results to dispute their grades.

9. Course Grading

The course grade will be based on the following components:

Items	Contribution
Problem Sets	35%
Pop Quizzes	15%
Midterm 1	25%
Midterm 2	25%

10. Policies on Large Language Model (LLM) Usage

Students are strongly encouraged to utilize Large Language Models (LLMs) as a resource, especially given that quantum mechanics is a challenging study. LLMs can be invaluable tools for exploring concepts, generating ideas, and synthesizing information for assignments.

However, it is essential that **the final form of all submitted work be the product of the student's own understanding and effort.** Simply relying on LLM-generated content without critical engagement and independent thought will not meet the course's expectations.

The combination of easy access to materials via LLMs and deep, reflective thinking is key to achieving the best results. Students should aim to actively integrate insights gained from these tools into their learning process, while ensuring that their work demonstrates originality and personal comprehension.

"Let me know if you'd like further refinements!" — Please note that this section is indeed written with LLM — started with my original draft and finished with my careful rewriting.

Class Protocol

All electronic devices are to be turned off during class unless advance permission is given by the instructor. **No recording of lectures of any kind (including audio and video) is allowed.**

Class resources

Brightspace (https://it.stonybrook.edu/services/brightspace) will be used as the primary means of distribution for course materials.

If you have a physical, psychological, medical, or learning disability that may impact your coursework, please contact the Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities

Academic Honesty

Any academic dishonesty on a written homework will result in a zero grade for the assignment for all parties involved.

All exam work must be entirely your own with no collaboration or outside materials/information. Any academic dishonesty on the midterm exams or the final exam will result in failing the course. The case will be submitted to the College of Engineering's Committee on Academic Standing and Appeals.

Electronic Communication Statement

Email and especially email sent via Brightspace is one of the ways the faculty officially communicates with you for this course. It is your responsibility to make sure that you read your email in your official University email account. For most students that is Google Apps for Education (http://www.stonybrook.edu/mycloud), but you may verify your official Electronic Post Office (EPO) address at http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo.

If you choose to forward your official University email to another off-campus account, faculty are not responsible for any undeliverable messages to your alternative personal accounts. You can set up Google Mail forwarding using these DoIT-provided instructions found at http://it.stonybrook.edu/help/kb/setting-up-mail-forwarding-in-google-mail.

If you need technical assistance, please contact Client Support at (631) 632-9800 or supportteam@stonybrook.edu.

Student Accessibility Support Statement

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Academic Integrity Statement

Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Course Materials and Copyright Statement

Course material accessed from Brightspace, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook’s Academic Integrity.