General Course Information

PHYS311
Quantum Mechanics

0.125 EFTS 15 Points
First Semester 17 Feb 2026 – 22 June 2026

Course Coordinator

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General Physics and Astronomy Information

Please consult the document General Information for Physics and Astronomy Students
https://apps.canterbury.ac.nz/1/science/phys-chem/PHYS%20-%20Course%20Outlines/General.PDF

Description

This course develops a modern formulation of quantum mechanics from the basic postulates and applies the formalism to a variety of physical systems.

Objectives

The objectives of the course are to understand:

- The way in which systems are represented in quantum mechanics by wavefunctions and physical observables are represented by operators
- How to determine the possible values that can be obtained from the measurement of observables and, given the wavefunction for a state, the probability of obtaining a given value
- How the time-dependent Schrödinger's equation can be used to obtain dynamical information about quantum states and the time-independent equation can be used to determine the allowed energy states given the potential.
- How to apply perturbation theory to obtain approximate solutions to Schrodinger's equation for situations when an exact solution isn't possible
- How the algebra of angular momentum determines the allowed values for the magnitude and one component of the angular momentum and how this can be applied to orbital and spin angular momentum as well as the total angular momentum of a system
- How to use series solutions to solve various differential equations which arise in quantum mechanics

Textbooks

Course Textbook:
David J. Griffiths *Introduction to Quantum Mechanics* Prentice Hall

Recommended/Advanced texts include:

P. A. M. Dirac *The Principles of Quantum Mechanics* Clarendon Press, Oxford
J. J. Sakurai *Modern Quantum Mechanics* Addison-Wesley
Arno Bohm *Quantum Mechanics: Foundations & Applications* Springer-Verlag
J. S. Bell *Speakable and Unspeakable in Quantum Mechanics* Cambridge University Press

Assessment

25% Homework Assignments (4 @ 6.25%) It is allowed, even encouraged, for you to work together on your assignments. However, you must understand the material you hand in.

Each assignment will be followed with an oral quiz. The purpose of this oral examination will be to check you understand the working you have submitted. The quiz will only cover the assignment questions. If adequate understanding is not demonstrated for a given question, the mark for that question will be zero.

For any student where the examination percentage is higher than the total assignment percentage, the assignments will contribute 0% to the final grade and the Examination will contribute 85%.

15% Mid-semester Test, tbc – most likely on an evening in the second week of term 2

60% Examination Date tbc

The homework assignments will be distributed every three weeks and will be due approximately two weeks later.

Generative AI Tools Cannot Be Used for This Assessment

In this assessment, you are strictly prohibited from using generative artificial intelligence (AI) to generate any materials or content related to the assessment. This is because *students are expected to solve problems and demonstrate knowledge and understanding without the assistance of AI*. The use of AI-generated content is not permitted and may be considered a breach of academic integrity. Please ensure that all work submitted is the result of your own human knowledge, skills, and efforts.