PHYC90007 Quantum Mechanics

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2010, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours comprising 3 one-hour lectures/week Total Time Commitment: 120
Prerequisites:	A third year subject in quantum mechanics equivalent to 640-321 Quantum Mechanics (Advanced) or 640-341 Quantum Mechanics. A third-year subject in electrodynamics equivalent to 640-323 Electrodynamics (Advanced) or 640-343 Electrodynamics or 640-383 Electrodynamics.
Corequisites:	None.
Recommended Background Knowledge:	None.
Non Allowed Subjects:	None.
Core Participation Requirements:	It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. This subject requires all students to actively and safely participate in laboratory activities. Students who feel their disability may impact upon their participation are encouraged to discuss this with the subject coordinator and the Disability Liaison Unit.
Coordinator:	Dr Nicole Bell
Contact:	Email: n.bell@unimelb.edu.au
Subject Overview:	Quantum Mechanics introduces a dramatically new and rich understanding of the universe. In addition to providing a much deeper insight into the world of atoms and subatomic particles than afforded by classical Newtonian physics, Quantum Mechanics underpins advances in science across all disciplines, from molecular biology to astrophysics. This subject provides a rigorous mathematical formalism for advanced quantum mechanics, laying the foundation for further fundamental theoretical physics and research-level experimental physics in frontier areas such as quantum communication and quantum computation. The subject describes the Hilbert-space formulation of quantum wave mechanics, including density matrix descriptions for single and joint Hilbert space systems; symmetries and conservation laws including rotations and angular momentum; many-body systems of identical particles; time-dependent perturbation theory, and scattering theory.
Objectives:	The objectives of this subject are: # understanding the Hilbert-space formalism of modern quantum mechanics, with bra-ket and matrix notations, and the role of symmetries and related conservation laws; # understanding density matrices for single and joint Hilbert spaces, the difference between pure and mixed states, and entanglement; # understanding how many-body systems can be treated with a modern quantum mechanical framework; # ability to apply time-dependent perturbation methods to physical systems and thus predict measurable outcomes;
Assessment:	Two assignments totalling up to 36 pages of written work (20%), one due mid-semester and the other due late-semester, plus one 4-hour end-of-semester written examination (80%).
Prescribed Texts:	Modern Quantum Mechanics, Revised edition, JJ Sakurai, Addison Wesley Longman

Recommended Texts:	Quantum Mechanics, E Merzbacher, Wiley, 3rd edition.
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	At the completion of this subject, students should have gained skills in: # analysing how to solve a problem by applying simple fundamental laws to more complicated situations; # applying abstract concepts to real-world situations; # solving relatively complicated problems using approximations; # participating as an effective member of a group in discussions and collaborative assignments; # managing time effectively in order to be prepared for group discussions and undertake the assignments and exam.
Related Course(s):	Master of Science (Physics)