640-341 Quantum Mechanics

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus. Lectures and tutorials.
Time Commitment:	Contact Hours: 30 lectures, six 1-hour tutorials and up to six additional contact hours Total Time Commitment: 120 hours total time commitment.
Prerequisites:	Physics 640-223 or 640-243. Mathematics 620-231 or 620-233; and mathematics 620-232 or 620-234.
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	640-321 Quantum Mechanics (Adv)
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. Students who feel their disability may impact upon their active and safe participation in a subject are encouraged to discuss this with the relevant subject coordinator and the Disability Liaison Unit.
Coordinator:	Dr Andrew Greentree
Subject Overview:	Quantum mechanics plays a central role in our understanding of fundamental phenomena primarily in the microscopic domain. It lays the foundation for an understanding of atomic, molecular, condensed matter, nuclear and particle physics and new paradigms of information processing such as quantum computing and quantum communications. Topics covered include the probability interpretation, time evolution and the Schrödinger equation, Fourier transforms, Hermitian operators, the eigenvalue problem, expectation values, the Heisenberg uncertainty principle and commutation relations, and the Dirac delta-function. The quantum mechanics of angular momentum is developed and then applied to central force systems such as the hydrogen atom. The energy eigenstates of the one-dimensional harmonic oscillator are also analysed. The physics of spin-1/2 particles is developed using the matrix theory of spin. The Hilbert space or state vector formulation of quantum mechanics is developed and Dirac bra-ket notation introduced. Time permitting, time-independent perturbation theory is introduced.
Objectives:	Students completing this subject should be able to: # explain important concepts in quantum physics including the probability interpretation, the Heisenberg uncertainty principle, conservation laws and spin; # solve problems applying quantum mechanical theory to situations involving atoms, molecules, solids, nuclei and elementary particles; and # analyse solutions to predict measurable quantities.
Assessment:	Written assignments totalling up to 3000 words due during the semester (20%); project work involving a 15-minute group presentation and written report up to 1000 words due during the semester (10%); a 3-hour written examination in the examination period (70%).
Prescribed Texts:	Introduction to Quantum Mechanics (D J Griffiths), 2nd edn, Pearson Prentice Hall 2005.
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses:

	# **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2009/D09)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2009/F04)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2009/A04)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2009/M05)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	Students should enhance their ability to: # participate effectively as part of a group in tutorials; and # plan effective work schedules and manage their time to meet the deadlines for submission of assessable work and prepare for tests and examinations.
Notes:	This subject is available for science credit to students enrolled in the BSc (pre-2008 degree only), BASc or a combined BSc course.
Related Course(s):	Bachelor of Biomedical Science
Related Majors/Minors/ Specialisations:	Mathematics and Statistics (Mathematical Physics specialisation) Physics