PHYC30018 Quantum Physics

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2010, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus. Lectures
Time Commitment:	Contact Hours: 2 to 4 hours per week, 36 in total, lectures and problem-solving classes Total Time Commitment: Estimated total time commitment of 120 hours
Prerequisites:	Physics All three of # **640-214 Quantum Mechanics & Special Relativity (../../view/2010/640-214)** # **640-215 Electromagnetism & Optics (../../view/2010/640-215)** # **640-213 Thermal & Classical Physics (../../view/2010/640-213)** (may be taken concurrently). OR one of # 640-223 Quantum Mechanics & Thermal Physics (prior to 2009) # **640-243 Quantum Mechanics & Thermal Physics (../../view/2010/640-243)** And Mathematics Either both of # **620-231 Vector Calculus (../../view/2010/620-231)** # **620-295 Real Analysis with Applications (../../view/2010/620-295)** Or # 620-296 Multivariable & Vector Calculus (prior to 2010) For students who commenced second year level mathematics prior to 2009: One of # 620-231 Vector Analysis (prior to 2009) # 620-233 Vector Analysis Advanced (prior to 2009) # **620-231 Vector Calculus (../../view/2010/620-231)** And one of # 620-232 Mathematical Methods (prior to 2010) # 620-234 Mathematical Methods Advanced (prior to 2009).
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students may only gain credit for one of # 640-331 Quantum Physics # 640-321 Quantum Mechanics Advanced (prior to 2010) # 640-341 Quantum Mechanics (prior to 2009)
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:	Prof Raymond Volkas
Contact:	**Email: c640331@physics.unimelb.edu.au (mailto:c640331@physics.unimelb.edu.au)**
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. Topics covered include: # the basic principles of quantum mechanics (probability interpretation; Schrödinger equation; Hermitian operators, eigenstates and observables; symmetrisation, antisymmetrisation and the Pauli exclusion principle; entanglement) # wave packets, Fourier transforms and momentum space # eigenvalue spectra and delta-function normalisation # Heisenberg uncertainty principle # matrix theory of spin # the Hilbert space or state vector formation using Dirac bra-ket notation # the harmonic oscillator # the quantisation of angular momentum and the central force problem including the hydrogen atom # approximation techniques including perturbation theory and the variational method # applications to atomic and other systems.
Objectives:	Students completing this subject should be able to: # explain the basic principles of quantum physics including the probability interpretation, unitary time-evolution, the association of operators with observables, Pauli exclusion principle, and entanglement; # solve elementary problems involving intrinsic spin; # solve problems by applying quantum mechanical theory to situations involving atoms, molecules, solids, nuclei and elementary particles; # appreciate the importance of approximation techniques in quantum mechanics.
Assessment:	Two written assignments each totalling up to an equivalent of 1500 words during the semester (10% each). A 3-hour written examination in the examination period (80%).
Prescribed Texts:	None
Recommended Texts:	# D J Griffiths Introduction to Quantum Mechanics, 2nd Ed, Pearson Prentice Hall 2005. # E Merzbacher, Quantum Mechanics, Wiley # B H Bransden and C J Joachain, Introduction to Quantum Mechanics, Longmans
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2010/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2010/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2010/B-MUS)** 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:	A student who completes this subject should be able to: # analyse how to solve a problem by applying simple fundamental laws to more complicated situations # apply abstract concepts to real-world situations

	# solve relatively complicated problems using approximations # participate as an effective member of a group in tutorial discussions # manage time effectively in order to be prepared for tutorial classes, undertake the written assignments and the examination.
Notes:	This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BASc or a combined BSc course.
Related Course(s):	Bachelor of Science
Related Majors/Minors/ Specialisations:	Chemical Physics Mathematical Physics Mathematics and Statistics (Mathematical Physics specialisation) Physics Physics