PHYC30020 Quantum Systems

Credit Points:	12.5
Level:	3 (Undergraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
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 170 hours
Prerequisites:	Physics **Subject** / **Study Period Commencement:** / **Credit Points:** PHYC30018 Quantum Physics — Semester 1 — 12.50 PHYC30017 Statistical Physics — Semester 2 — 12.50 (PHYC30017 Statistical Physics may be taken concurrently) And Mathematics **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20009 Vector Calculus — Semester 1, Semester 2 — 12.50 And at least one of **Subject** / **Study Period Commencement:** / **Credit Points:** MAST10009 Accelerated Mathematics 2 — Semester 2 — 12.50 MAST20026 Real Analysis — Semester 1, Semester 2 — 12.50 MAST20030 Differential Equations — Semester 2 — 12.50
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students may only gain credit for one of # PHYC30020 Quantum Systems
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry.The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
Coordinator:	Assoc Prof Harry Quiney, Prof Robert Scholten

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Subject Overview:	Quantum mechanics governs the structure of atomic, molecular and condensed matter state systems, the nature of light and charge, and the interactions between these systems. Whereas earlier subjects detailed the principles and foundations of quantum mechanics, this subject details properties of real systems and discusses applications of this fundamental field of enquiry. The necessary use of quantum ideas in developing an understanding of the structure of matter is emphasised. Topics covered include: # the one-electron approximation, diatomic molecules # basic crystal structures and bonding, reciprocal lattices # periodic systems, phonons, free-electron model, band structure, insulators, conductors and semi-conductors # the variational method, helium atom, basic density functional theory # superconductivity.
Learning Outcomes:	To challenge students to expand their knowledge of fundamental physics principles and develop their capacity to: # explain the role that quantum mechanics plays in a range of real physical systems # apply quantum mechanics to solve problems in a variety of physical systems # interpret the solutions to these problems.
Assessment:	Two assignments totalling up to an equivalent of 3000 words during the semester (10% each); a 3-hour written examination in the examination period (80%).
Prescribed Texts:	None
Recommended Texts:	C Kittel, Introduction to Solid State Physics. 8th Edition, Wiley B H Bransden and C J Joachain Physics of Atoms and Molecules. 2nd Edition, Prentice Hall
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/2015/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2015/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2015/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 Majors/Minors/ Specialisations:	Physics Physics Physics Physics Physics (specialisation of Physics major) Science-credited subjects - new generation B-SCI and B-ENG.