

PHYC30018 Quantum Physics

Credit Points:	12.50																																				
Level:	3 (Undergraduate)																																				
Dates & Locations:	This subject is not offered in 2014. 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:	<p>Physics</p> <p>All three of</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC20010 Quantum Mechanics and Special Relativity</td> <td>Semester 1</td> <td>12.50</td> </tr> <tr> <td>PHYC20011 Electromagnetism and Optics</td> <td>Semester 2</td> <td>12.50</td> </tr> <tr> <td>PHYC20009 Thermal and Classical Physics</td> <td>Semester 1</td> <td>12.50</td> </tr> </tbody> </table> <p>(PHYC20009 Thermal and Classical Physics may be taken concurrently)</p> <p>OR</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC20005 Quantum Mechanics & Thermal Physics</td> <td>Not offered 2014</td> <td>12.50</td> </tr> </tbody> </table> <p>And Mathematics</p> <p>Either both of</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST20009 Vector Calculus</td> <td>Semester 1, Semester 2</td> <td>12.50</td> </tr> <tr> <td>MAST20026 Real Analysis</td> <td>Semester 1, Semester 2</td> <td>12.50</td> </tr> </tbody> </table> <p>Or both</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST20009 Vector Calculus</td> <td>Semester 1, Semester 2</td> <td>12.50</td> </tr> <tr> <td>MAST10009 Accelerated Mathematics 2</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	PHYC20010 Quantum Mechanics and Special Relativity	Semester 1	12.50	PHYC20011 Electromagnetism and Optics	Semester 2	12.50	PHYC20009 Thermal and Classical Physics	Semester 1	12.50	Subject	Study Period Commencement:	Credit Points:	PHYC20005 Quantum Mechanics & Thermal Physics	Not offered 2014	12.50	Subject	Study Period Commencement:	Credit Points:	MAST20009 Vector Calculus	Semester 1, Semester 2	12.50	MAST20026 Real Analysis	Semester 1, Semester 2	12.50	Subject	Study Period Commencement:	Credit Points:	MAST20009 Vector Calculus	Semester 1, Semester 2	12.50	MAST10009 Accelerated Mathematics 2	Semester 2	12.50
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Corequisites:	None																																				
Recommended Background Knowledge:	None																																				
Non Allowed Subjects:	Students may only gain credit for one of # PHYC30018 Quantum Physics																																				
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.																																				

Contact:	Email: PHYC30018@physics.unimelb.edu.au (mailto:PHYC30018@physics.unimelb.edu.au)
Subject Overview:	<p>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.</p> <p>Topics covered include:</p> <ul style="list-style-type: none"> # 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.
Learning Outcomes:	<p>Students completing this subject should be able to:</p> <ul style="list-style-type: none"> # 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). One poster presentation (10%). A 3-hour written examination in the examination period (70%).
Prescribed Texts:	None
Recommended Texts:	<ul style="list-style-type: none"> # D J Griffiths Introduction to Quantum Mechanics, 2nd Ed, Pearson Prentice Hall 2005. # E Merzbacher, Quantum Mechanics, Wiley
Breadth Options:	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> # Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2014/B-COM) # Bachelor of Environments (https://handbook.unimelb.edu.au/view/2014/B-ENVS) # Bachelor of Music (https://handbook.unimelb.edu.au/view/2014/B-MUS) <p>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.</p>
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	<p>A student who completes this subject should be able to:</p> <ul style="list-style-type: none"> # 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:	Chemical Physics (specialisation of Physics major) Mathematical Physics Physics Physics Physics (specialisation of Physics major) Science credit subjects* for pre-2008 BSc, BASc and combined degree science courses Science-credited subjects - new generation B-SCI and B-ENG.