

## 640-321 Quantum Mechanics (Adv)

<b>Credit Points:</b>	12.500
<b>Level:</b>	Undergraduate
<b>Dates &amp; Locations:</b>	2008, This subject commences in the following study period/s: Semester 1, - Taught on campus.
<b>Time Commitment:</b>	Contact Hours: 30 lectures, six 1-hour tutorials and up to six additional contact hours Total Time Commitment: 120 hours.
<b>Prerequisites:</b>	Physics 640-223 or 640-243. Mathematics 620-231 or 620-233; and mathematics 620-232 or 620-234.
<b>Corequisites:</b>	None
<b>Recommended Background Knowledge:</b>	None
<b>Non Allowed Subjects:</b>	None
<b>Core Participation Requirements:</b>	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.
<b>Coordinator:</b>	Dr A Martin
<b>Subject Overview:</b>	<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>Students completing this subject will be able to:</p> <ul style="list-style-type: none"> <li># explain important concepts in quantum physics including the probability interpretation, the Heisenberg uncertainty principle, conservation laws and spin;</li> <li># solve problems applying quantum mechanical theory to situations involving atoms, molecules, solids, nuclei and elementary particles; and</li> <li># analyse solutions to predict measurable quantities.</li> </ul> <p>In addition students will enhance their ability to:</p> <ul style="list-style-type: none"> <li># participate effectively as part of a group in tutorials; and</li> <li># plan effective work schedules and manage their time to meet the deadlines for submission of assessable work and prepare for tests and examinations.</li> </ul> <p>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, symmetries and conservation laws, 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-independent perturbation theory is introduced.</p>
<b>Assessment:</b>	Assignments totalling up to an equivalent of 3000 words during the semester (20%); a 3-hour written examination in the examination period (80%).

<b>Prescribed Texts:</b>	Introduction to Quantum Mechanics (B H Bransden and C J Joachain), Longmans Quantum Mechanics (E Merzbacher), Wiley
<b>Breadth Options:</b>	<p>This subject is a level 2 or level 3 subject and is not available to new generation degree students as a breadth option in 2008.</p> <p>This subject or an equivalent will be available as breadth in the future.</p> <p>Breadth subjects are currently being developed and these existing subject details can be used as guide to the type of options that might be available.</p> <p>2009 subjects to be offered as breadth will be finalised before re-enrolment for 2009 starts in early October.</p>
<b>Fees Information:</b>	Subject EFTSL, Level, Discipline & Census Date, <a href="http://enrolment.unimelb.edu.au/fees">http://enrolment.unimelb.edu.au/fees</a>
<b>Notes:</b>	This subject is available for science credit to students enrolled in the BSc (pre-2008 degree only), BASc or a combined BSc course.
<b>Related Course(s):</b>	<p>Bachelor of Arts and Bachelor of Science        Bachelor of Arts and Sciences        Bachelor of Biomedical Science        Bachelor of Science</p>