

## 640-353 Atomic, Molecular & Solid State Physics

<b>Credit Points:</b>	12.50
<b>Level:</b>	3 (Undergraduate)
<b>Dates &amp; Locations:</b>	2009, This subject commences in the following study period/s: Semester 2, - 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 total time commitment.
<b>Prerequisites:</b>	Physics 640-341 or 640-321.
<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>	Prof Les J. Allen
<b>Subject Overview:</b>	<p>Quantum mechanics governs the structure of atomic, molecular and solid 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.</p> <p>The content of this subject includes aspects of the following: systems of identical particles, symmetrisation and antisymmetrisation, the Pauli exclusion principle and applications; the helium atom; degenerate perturbation theory; an introduction to many-electron atoms; fine and hyperfine structure; atoms in static external fields, the Stark and Zeeman effects, magnetism; time-dependent perturbation theory, electromagnetic transitions in atoms, spectroscopy and lasers; exponential decay and barrier penetration; an introduction to molecules and chemical bonds; crystal bonding and structure; crystal imperfections and mechanical properties; lattice vibrations and thermal properties; band theory of electrons: metals, insulators and semiconductors; dielectric and magnetic properties of solids; and superconductivity.</p>
<b>Objectives:</b>	<p>Students completing this subject should be able to:</p> <ul style="list-style-type: none"> <li># explain the role that quantum mechanics plays in a range of real physical systems;</li> <li># apply quantum mechanics to solve problems in a variety of physical systems; and</li> <li># interpret the solutions to these problems.</li> </ul>
<b>Assessment:</b>	Tests totalling up to 2 hours and 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>	Physics of Atoms and Molecules (B H Bransden and C J Joachain), Longman, 1983 Introduction to Solid State Physics (C Kittel), 6th edn, Wiley
<b>Breadth Options:</b>	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> <li># <b>Bachelor of Arts</b> (<a href="https://handbook.unimelb.edu.au/view/2009/D09">https://handbook.unimelb.edu.au/view/2009/D09</a>)</li> </ul>

	<p># <b><u>Bachelor of Commerce</u></b> (<a href="https://handbook.unimelb.edu.au/view/2009/F04">https://handbook.unimelb.edu.au/view/2009/F04</a>)</p> <p># <b><u>Bachelor of Environments</u></b> (<a href="https://handbook.unimelb.edu.au/view/2009/A04">https://handbook.unimelb.edu.au/view/2009/A04</a>)</p> <p># <b><u>Bachelor of Music</u></b> (<a href="https://handbook.unimelb.edu.au/view/2009/M05">https://handbook.unimelb.edu.au/view/2009/M05</a>)</p> <p>You should visit <b>learn more about breadth subjects</b> (<a href="http://breadth.unimelb.edu.au/breadth/info/index.html">http://breadth.unimelb.edu.au/breadth/info/index.html</a>) and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.</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>Generic Skills:</b>	<p>Students should 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>
<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>	Bachelor of Biomedical Science