640-364 Computational Physics

Credit Points:	12.500
Level:	Undergraduate
Dates & Locations:	2008, This subject commences in the following study period/s: Semester 2, - Taught on campus.
Time Commitment:	Contact Hours: 12 lectures, 24 hours of practice classes (two hours per week) and up to 48 hours of project work Total Time Commitment: 120 hours.
Prerequisites:	Physics 640-321 or 640-341. Mathematics 620-231 or 620-233; and mathematics 620-232 or 620-234.No prior computing experience is necessary.
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
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:	Dr S Wyithe
Subject Overview:	This subject will introduce students to the use of computational techniques in the investigation of a wide class of problems in physics. Using professional computing tools, students will learn programming and a range of numerical methods commonly used in physics research and apply these techniques to the investigation of physical systems through the completion of projects. Students completing this subject will be able to: # explain the application of a variety of computational techniques including differencing, root finding, quadrature, ordinary and partial differential equations, matrix eigenvalue problems, Monte Carlo methods and fast Fourier transforms to physical problems; and # apply these methods to a range of physical situations. In addition, students will enhance their ability to: # participate effectively as part of a group; and # plan effective work schedules and manage their time to meet the deadlines for submission of assessable work. Four projects will be based on model problems in physics: molecular vibrations, stellar structure, quantum spin systems and large-scale magnetic systems. Students will also complete a research-style project based on one of a choice of topics from the research groups within the School of Physics, including universality in the Ising model, Fourier analysis and computer-aided tomography (CAT), many-electron atoms, hydrodynamics, interaction of radiation with matter, gravitational lensing by point masses, and atom optics.
Assessment:	Five computer-based projects due during the semester totalling up to 8000 words (100%).
Prescribed Texts:	Computational Physics: Problem Solving with Computers (R H Landau and M J PÃ¡ez), Wiley
Breadth Options:	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. This subject or an equivalent will be available as breadth in the future. 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.

	2009 subjects to be offered as breadth will be finalised before re-enrolment for 2009 starts in early October.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Notes:	This subject is available for science credit to students enrolled in the BSc (pre-2008 degree only), BASc or a combined BSc course.
Related Course(s):	Bachelor of Arts and Bachelor of Science Bachelor of Arts and Sciences Bachelor of Biomedical Science Bachelor of Science