620-381 Computational Mathematics

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus. Lectures, computer laboratory classes and project work.
Time Commitment:	Contact Hours: 24 one-hour lectures (two per week), 12 one-hour computer laboratory classes (one per week) and 60 hours of project work Total Time Commitment: 120 hours total time commitment.
Prerequisites:	One of # 620-122 (prior to 2008) # 620-142 (prior to 2009) # 620-192 (prior to 2006) # 620-194 (prior to 2006) # 620-211 (prior to 2008) And one of # 620-113 (prior to 2008) # 620-123 (prior to 2008) # 620-143 (prior to 2009) # 620-193 (prior to 2006) And one of # 433-171 (prior to 2008) # 433-151 (prior to 2008) # 620-131 (prior to 2008) # or other evidence of competence in C, C++, Fortran, Pascal, or similar languages.
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 Steven Lyle Carnie
Subject Overview:	This subject introduces the underlying basis for numerical techniques to solve a variety of problems; and the role of various kinds of numerical error and how algorithms are designed to minimise this error; and develops basic algorithms in the areas of root-finding, linear systems, interpolation, quadrature and solution of differential equations. Students should acquire skills in implementing the above algorithms in well-constructed computer programs and interpreting the results obtained from the programs. This subject demonstrates the difficulties and possible pitfalls in numerical computation. It also shows where to find sources of reliable numerical software. Topics include errors, roundoff, truncation error and stability; root-finding, iteration, bisection, Newton's method and secant method; linear systems, Gauss elimination, pivoting, LU factorisation, tridiagonal systems, condition number; interpolation, polynomial and spline; data

	fitting and least squares methods; quadrature, Newton-Cotes, Gaussian quadrature, adaptive quadrature and improper integrals; and differential equations and initial value problems: Euler, Runge-Kutta, predictor-corrector and stiff problems.
Objectives:	.
Assessment:	Computational assignments of up to 75 pages in total due during the semester (50%); a 2-hour written examination in the examination period (50%).
Prescribed Texts:	None
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2009/D09)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2009/F04)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2009/A04)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2009/M05)** 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
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 Majors/Minors/ Specialisations:	Mathematics & Statistics Major Mathematics and Statistics (Applied Mathematics specialisation) Mathematics and Statistics (Discrete Mathematics specialisation) Mathematics and Statistics (Financial Mathematics specialisation)