MAST90026 Computational Differential Equations

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2012, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus. On-campus
Time Commitment:	Contact Hours: 36 hours comprising one 1-hour computer lab and one 2-hour computer lab per week. Total Time Commitment: 3 contact hours and 7 private study hours per week.
Prerequisites:	Students should be able to progam in one of: C, Matlab, Mathematica, Perl, Fortran, Python etc
Corequisites:	None
Recommended Background Knowledge:	Students are required to write programs in MATLAB so previous experience in writing and debugging procedural computer programs is expected. It is recommended that students have completed a subject in partial differential equations.
Non Allowed Subjects:	

Subject	Study Period Commencement:	Credit Points:
MCEN40011 Advanced Computational Mechanics	Semester 2	12.50

Core Participation Requirements:	For the purposes of considering requests for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements for this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
Contact:	Dr Steven Carnie Email: **stevenlc@unimelb.edu.au (mailto:stevenlc@unimelb.edu.au)**
Subject Overview:	Many processes in the natural sciences, engineering and finance are described mathematically using ordinary or partial differential equations. Only the simplest or those with special structure can be solved exactly. This subject discusses common techniques to computing numerical solutions to differential equations and introduces the major themes of accuracy, stability and efficiency. Understanding these basic properties of scientific computing algorithms should prevent the unwary from using software packages inappropriately or uncritically, and provide a foundation for devising methods for nonstandard problems. We cover both time-independent problems, in one and higher space dimensions, and evolution equations of hyperbolic or parabolic type.
Objectives:	After completing this subject, students should: # appreciate how and why numerical methods are developed to solve differential equations commonly arising in finance, science and engineering; # understand the chief factors to be considered in choosing an appropriate algorithm for a given class of problem; # acquire high level numerical tools and knowledge that can be used to solve a range of problems in science and engineering; # gain the ability to pursue further studies in this and related areas.

Assessment:	Weekly homework for the first four weeks (20%); up to 40 pages of written assignments (40%: two assignments worth 20% each due mid and late in semester); a 15-minute oral presentation on a project (20%) held towards the end of semester and a take-home examination (20%, up to 20 pages) due in the examination period.
Prescribed Texts:	TBA
Recommended Texts:	R.J.Leveque, Finite difference methods for ordinary and partial differential equations. Steady-state and time-dependent problems, SIAM, 2007. A. Iserles, A First Course in the Numerical Analysis of Differential Equations, 2nd edn, Cambridge University Press, 2008.
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	In addition to learning specific skills that will assist students in their future careers in science, they will have the opportunity to develop generic skills that will assist them in any future career path. These include: # problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies; # analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis; # collaborative skills: the ability to work in a team; # time-management skills: the ability to meet regular deadlines while balancing competing commitments.
Related Course(s):	Master of Science (Mathematics and Statistics)
Related Majors/Minors/ Specialisations:	Mathematics and Statistics