MCEN40011 Advanced Computational Mechanics

Credit Points:	12.50
Level:	4 (Undergraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus. On campus only
Time Commitment:	Contact Hours: 36 hours of lectures. Total Time Commitment: 120 hours
Prerequisites:	431-202 Engineering Analysis B, or 620-331 Applied PDE's (prior to 2009)or the subjects listed below -

Subject	Study Period Commencement:	Credit Points:
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50
COMP20005 Engineering Computation	Not offered 2011	12.50

Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request 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 of 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
Coordinator:	Prof Andrew Ooi
Contact:	**a.ooi@unimelb.edu.au (mailto:a.ooi@unimelb.edu.au)**
Subject Overview:	This course will examine a number of numerical techniques for the solution of ordinary and partial differential equations commonly encountered in engineering practice. The course material will be heavily based around examples, taking specific problems and developing algorithms in class with Matlab for the solution and visualisation of the differential equations. Then the algorithms will be parallelized using the C programming language for execution on a supercomputing architecture. Upon completion, students should have the theoretical frameworks in place to understand the workings of computational fluid and solid mechanics codes.
Objectives:	At the conclusion of this subject students should be able to: # Investigate explicit and implicit methods for the solution of systems of nonlinear ordinary differential equations including Euler, Runge-Kutta, and Adams methods. # Investigate a variety of methods for the solution of partial differential equations, including Finite Difference, Finite Volume, Finite Element and Spectral methods. # Using the algorithms developed for the solution or ordinary and partial differential equations, investigate how the algorithms may be parallelized using both OpenMP and MPI for solution on a supercomputing architeccture.
Assessment:	One 3-hour end-of-semester examination (40%); two assignments due throughout semester (30% each).

Prescribed Texts:	None
Recommended Texts:	Information Not Available
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:	• Ability to apply knowledge of basic science and engineering fundamentals. • Ability to take a problem described by a partial differential equations, apply a numerical method and write a program to solve it. • Ability to take a serial algorithm and develop a parallel version to run on a supercomputer. • Capacity for independent critical thought, rational inquiry and self-directed learning.
Related Course(s):	Bachelor of Engineering (EngineeringManagement)Mechanical&Manufacturing Bachelor of Engineering (Mechanical &Manufacturing)& Bachelor of Science Bachelor of Engineering (Mechanical &Manufacturing)/Bachelor of Commerce Bachelor of Engineering (Mechanical and Manufacturing Engineering) Bachelor of Engineering (Mechatronics) and Bachelor of Computer Science
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream