MCEN90031 Applied High Performance Computing

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures and workshops Total Time Commitment: 200 hours
Prerequisites:	Both of the following - **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20029 Engineering Mathematics / Summer Term, Semester 1, Semester 2 / 12.50 COMP20005 Engineering Computation / Semester 1, Semester 2 / 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 Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Dr Stephen Moore
Contact:	**mooresm@unimelb.edu.au (https://mce_host/faces/htdocs/email: mooresm@unimelb.edu.au)**
Subject Overview:	**AIMS** With the ever increasing power of modern computers, the use of computer simulation is becoming more common in engineering practice. This course will introduce topics in high performance computing through a number of applications in science and engineering, including problems in linear algebra, partial differential equations (e.g. computational fluid dynamics), molecular dynamics, and agent based modelling. These applications will necessitate the inclusion of some theory regarding numerical methods for ordinary and partial differential equations (e.g. finite difference and finite element methods), but the key focus of the course will be on how large scale problems can be decomposed onto supercomputing architectures and introducing aspects of large scale visualization. **INDICATIVE CONTENT** This course will include study of various numerical methods used in engineering practice and how these applied to solving computational problems and hence programmed for execution on a supercomputer. The course will include both the higher level mathematics as well as practical issues associated with using a supercomputer.

Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this subject the student is expected to be able to - 1 Determine the complexity of a given parallel algorithm 2 Determine the appropriate architecture for a particular problem and implement code to decompose the problem 3 Develop numerical methods for solving ordinary and partial differential equations 4 Implement software for shared memory multi-core systems with the OpenMP application programming interface 5 Implement software for distributed memory supercomputers with MPI application programming interface.
Assessment:	Two assignments due in weeks 7 and 12, requiring 35 - 40 hours of work each (30% each, 60% total). End of semester exam (40%), assesses ILOs 1 to 5.
Prescribed Texts:	None
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 undertake problem identification, formulation and solution # Capacity for independent critical thought, rational inquiry and self-directed learning.
Notes:	**LEARNING AND TEACHING METHODS** This subject will be delivered through a combination of lectures and tutorials. **INDICATIVE KEY LEARNING RESOURCES** Resources include a selection of textbooks, a course reader, lecture slides, example codes **CAREERS / INDUSTRY LINKS** Applied research
Related Course(s):	Bachelor of Engineering (Mechanical and Manufacturing Engineering) Doctor of Philosophy - Engineering Master of Information Technology Master of Information Technology Master of Philosophy - Engineering
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream MIT Computing Specialisation MIT Distributed Computing Specialisation Master of Engineering (Mechanical)