620-342 Industrial & Applied Mathematics

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: 36 lectures (three per week) and up to 12 practice classes (one per week) Total Time Commitment: 120 hours
Prerequisites:	620-331.
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:	A/Prof J Sader
Subject Overview:	This subject introduces the basic principles governing flow and transport processes within continuous media. It develops vector and tensor methods needed to formulate these principles mathematically; and also introduces the concept of a constitutive equation. Students should develop the ability to select a constitutive equation and correctly pose relevant boundary-value problems; to solve transport and flow problems in simple geometries; to identify valid approximate analyses; and to interpret solutions in physical terms. This subject demonstrates the potential for mathematical modelling of flow and transport processes that arise in manufacturing, mineral exploitation and other areas of science and technology. It also shows the intimate connection between continuum mechanical problems and fundamental mathematical problems. Introduction to continuum mechanics topics include the continuum approximation, Eulerian and Lagrangian viewpoints, streamlines, conservation of mass, Cauchy equation of motion, constitutive equation for stress tensor, Cartesian tensors and dyadic notation, and hydrostatics. Incompressible ideal fluids topics include Euler equations, Bernoulli's theorem, potential flow, persistence of irrotationality and d'Alembert's paradox. Incompressible viscous fluids topics include Navier-Stokes equations, dynamical similarity and exact solutions. Special flows topics include creeping flow, Stokes drag, thin film flows, Hele-Shaw flow, lubrication, laminar boundary layer flow, flow past a plate and boundary layer separation.
Assessment:	Up to 48 pages of written assignments due during the semester (30%); a 3-hour written examination in the examination period (70%).
Prescribed Texts:	None
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 Bachelor of Arts and Bachelor of Science Bachelor of Arts and Sciences Bachelor of Science