620-342 Industrial & Applied Mathematics

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 2, - Taught on campus. Lectures and practice classes.
Time Commitment:	Contact Hours: 36 one-hour lectures (three per week) and up to 12 one-hour practice classes (one per week) Total Time Commitment: 120 hours total time commitment.
Prerequisites:	*Applied Partial Differential Equations.*
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:	Prof John Elie 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.
Objectives:	.
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 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 (Mathematical Physics specialisation)