ENGR30001 Fluid Mechanics & Thermodynamics

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2012, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus. Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 x one hour lectures per week + 1 x one hour tutorial per week + 2 x two hours of laboratory work per semester + 1 x one hour supporting and revision lecture per week Total Time Commitment: Estimated 120 hours
Prerequisites:	Students must have taken ONE of the following subjects prior to enrolling in this subject: **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20009 Vector Calculus / Semester 1, Semester 2 / 12.50 OR **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20029 Engineering Mathematics / Summer Term, Semester 1, Semester 2 / 12.50 MAST20029 Engineering Mathematics may also be taken concurrently.
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Credit will not be given for this subject and the following subject: **Subject** / **Study Period Commencement:** / **Credit Points:** MCEN30015 Thermofluids / Not offered 2012 / 12.50
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:	Assoc Prof Malcolm Davidson
Contact:	Assoc Prof Malcolm Davidson Email: **m.davidson@unimelb.edu.au (mailto:m.davidson@unimelb.edu.au)**
Subject Overview:	This subject concerns the fundamental science of fluid flow and thermodynamics relevant to a range of engineering applications. Topics covered include - Heat and work: properties of pure substances, representation of properties; change of phase, steam and air tables and vapour equation of state; ideal gases,

	ideal non-flow and flow processes; laws of thermodynamics; Carnot's principle; Clausius inequality; direct and reversed heat engines; thermal efficiencies; fluid statics, manometry, stability of floating bodies; derivation of the continuity equation, mechanical energy balance, friction losses in a straight pipe, Newton's law of viscosity, Fanning friction factor, treatment of roughness, valves and fittings; simple network problems; compressible flow, propagation of pressure wave, isothermal and adiabatic flow equations in a pipe, choked flow; Pumps- pump characteristics, centrifugal pumps, derivation of theoretical head, head losses leading to the actual pump head curve, calculating system head, determining the operating point of a pumping system, throttling for flow control, cavitation and NPSH, affinity laws and pump scale-up, introduction to positive displacement pumps; stirred tanks- radial, axial and tangential flow, type of agitators, vortex elimination, the standard tank configuration, power number and power curve, dynamic and geometric similarity in scale-up; Newtonian and non-Newtonian fluids, Multi-dimensional fluid flow- momentum flux, development of multi-dimensional equations of continuity and for momentum transfer, Navier-Stokes equations, application to tube flow, Couette flow, Stokes flow.
Objectives:	On completion of this subject students should be able to - # Apply the principles of force balance in stationary fluids to solve engineering problems # Solve mechanical energy balances in one dimensional pipe flow, scale-up pumps, and # Apply the first and second laws of thermodynamics to a range of engineering problems
Assessment:	Three assignments (practical or written – a maximum 5 pages each in length, not including diagrams, graphs and raw data) - one due around Week 4, one due around Week 8 and one due around Week 12 of the semester (30% of the total mark) One end of semester three hour examination (70% of total mark). A pass in the examination is needed to pass the subject
Prescribed Texts:	None
Recommended 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/2012/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2012/B-COM)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2012/B-MUS)** 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
Generic Skills:	On successful completion, students should have the following skills - # Ability to undertake problem identification, formulation and solution # Capacity for independent thought # Ability to plan work and to use time effectively
Related Course(s):	Bachelor of Engineering
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream B-ENG Civil Engineering stream B-ENG Mechanical Engineering stream Chemical Systems Civil (Engineering) Systems major Civil Systems Environments Discipline subjects Master of Engineering (Biomolecular) Master of Engineering (Chemical) Master of Engineering (Civil)

	Master of Engineering (Environmental) Master of Engineering (Mechanical) Master of Engineering (Mechatronics) Master of Engineering (Structural) Mechanical Systems Physical (Environmental Engineering) Systems major Science-credited subjects - new generation B-SCI and B-ENG. Core selective subjects for B-BMED.