MCEN90018 Advanced Fluid Dynamics

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2013.
Time Commitment:	Contact Hours: 36 hours lectures, 12 hours tutorials and workshops, 4 hours laboratory Total Time Commitment: 120 hours
Prerequisites:	Prerequisite for this subject is - **MCEN90008 Fluid Dynamics (../../view/2012/MCEN90008)** (MCEN30005 Thermofluids 3 prior to 2011)
Corequisites:	None
Recommended Background Knowledge:	N/A
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/
Contact:	**montyjp@unimelb.edu.au (mailto:montyjp@unimelb.edu.au)**
Subject Overview:	This subject will cover selected advanced topics in fluid mechanics. Building on previous fluids courses, the subject is broadly split into two units, although content of these will overlap. Unit 1: Turbulence and boundary layers. Topics covered include Navier-stokes equations applied to wall-bounded flows, similarity solutions of the boundary layer equations, Blasius solution, Falkner and Skan solution, separated flows, turbulent boundary layers, Reynolds averaged Navier-Stokes equations, scaling parameters, pipe friction, Von Karman momentum integral equation, atmospheric turbulence. Unit 2: Experimental techniques. Through a series of lectures, labs and assignments, students will be introduced to key concepts of experimental (and numerical) techniques related to experiments in fluid mechanics. Topics will include: data analysis (to include correlations, fast Fourier transform, energy spectra); Particle Image Velocimetry (PIV); hot wire anemometry; laser doppler anemometry; flow visualization; advanced potential flow and/or compressible flow numerical techniques.
Objectives:	At the conclusion of this subject students should be able to - • Understand the limitations and advantages of various available experimental techniques for fluid mechanics, and also have a sound understanding of the physics underpinning these techniques; • Be fully conversant with contemporary data analysis techniques for fluid mechanics experiments, especially for experiments relating to boundary layers and turbulence; • Have a physical understanding of particle image velocimetry and hot-wire anemometry and be able to apply these techniques and design experiments to investigate complex fluid flows; • Learn how the equations of fluid motion are applied to flows near walls; • Understand the importance of the boundary layer in engineering applications; • Understand the role of turbulence in the atmosphere including weather prediction.
Assessment:	One 2 hour examination (40%) at the end of semester. Five assignments during the course of the semester worth a total of 60%. These assignments will be a combination of laboratory

	work, computational work and advanced data analysis. Assignments will all involve basic programming skills (for data treatment and analysis).
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 science and engineering fundamentals • Ability to undertake problem identification, formulation, and solution • Proficiency in engineering design • Ability to communicate effectively, with the engineering team and with the community at large • Capacity for creativity and innovation
Related Course(s):	Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Mechanical)