MCEN90018 Advanced Fluid Dynamics

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours lectures, 12 hours tutorials and workshops, 4 hours laboratory work Total Time Commitment: 200 hours
Prerequisites:	(see table below)
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 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:	Dr Daniel Chung
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Prerequisites:

Subject	Study Period Commencement:	Credit Points:
MCEN90008 Fluid Dynamics	Semester 2	12.50

Subject Overview:

AIMS

The study of fluid dynamics is one of the fundamental disciplines in Mechanical Engineering. In the first part of the course, students will learn about boundary-layer theory, which is a key element of aerodynamic design. A guest-lecture series on wind engineering will build on this knowledge to give students a perspective on one of the most important forms of renewable energy in our society today.

In the second part of the course, students will learn about data acquisition and analysis. These skills are required of engineers working with the technology of today and into the future. The course will help students understand the costs, difficulties and possibilities afforded by sensor systems and instrumentation, with applications for, but not limited to, fluid dynamics.

INDICATIVE CONTENT

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-Skan solution, separated flows, turbulent boundary layers, Reynolds-averaged Navier-Stokes equations, dimension analysis, pipe friction, Von Karman momentum integral equation, roughness.

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 fluid mechanics. Topics will include: data analysis (to include correlations, discrete Fourier transform,

	energy spectra); Particle Image Velocimetry (PIV); hot-wire anemometry; advanced potential flow numerical techniques.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILOs)** # At the conclusion of this subject the student is expected to - Understand the limitations and advantages of various experimental techniques for fluid mechanics, and also have a sound understanding of the physics underpinning these techniques # Apply contemporary data analysis for experiments in the area of fluid mechanics, especially for experiments relating to boundary layers and turbulence # Apply the techniques of particle image velocimetry and hot-wire anemometry to investigate complex fluid flows # Understand 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 engineering applications.
Assessment:	One 2 hour examination end of semester (50%), assesses ILOs 4-6. Two laboratory reports (10% each), requiring approximately 13-15 hours of work each. Three assignments (10% each), requiring approximately 13-15 hours of work each. 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), and assess ILOs 1-3.
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:	On completion of this unit a student is expected to have the skills to: # Apply knowledge of science and engineering fundamentals # Undertake problem identification, formulation, and solution # Be proficient in engineering design # Communicate effectively with the engineering team and with the community at large # Be creative and innovative.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures, guest lectures, tutorials and laboratory demonstrations. The laboratory classes and tutorials are highly interactive and computer software will be used during lectures and laboratory classes. **CAREERS / INDUSTRY LINKS** Clean Energy Council: Ms Alicia Webb presents three lectures on wind engineering
Related Course(s):	Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Mechanical)