ENGR90024 Computational Fluid Dynamics

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 x 1 hour lectures + 1 x 2 hour workshop per week Total Time Commitment: Estimated 200 hours
Prerequisites:	ONE OF:

Subject	Study Period Commencement:	Credit Points:
ENGR30002 Fluid Mechanics	Semester 1, Semester 2	12.50
MCEN30018 Thermodynamics and Fluid Mechanics	Semester 1, Semester 2	12.50

(Prior to 2012, ENGR30001 Fluid Mechanics and Thermodynamics)

and ONE OF:

Subject	Study Period Commencement:	Credit Points:
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50
MAST20030 Differential Equations	Semester 2	12.50

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 Dalton Harvie
Contact:	Dr Dalton Harvie Email: **daltonh@unimelb.edu.au (mailto:daltonh@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject provides presents fundamental numerical techniques relevant to the simulation of fluid flow and heat/mass transfer. It will give students an understanding of common numerical methods operating “under the hood” in Computational Fluid Dynamics software, and will provide students with an introductory basis for writing computer code to implement such numerical procedures.

	INDICATIVE CONTENT Ordinary Differential Equations: explicit and implicit methods, stability, systems of ODEs, boundary value problems, MATLAB. Partial Differential Equations: overview, types of equations, boundary conditions, convection-diffusion equations, differencing schemes, finite volume method, stability - von Neumann analysis, error analysis - dispersion, diffusion errors, solving Laplace and Poisson equations, methods for solving Navier-Stokes equations. OpenFoam: fundamentals of OpenFoam - examples, solving simple 2D problems, Laplace and Poisson equations with OpenFoam, solving complex 2D fluid flow problems. C and C++ programming.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1 Apply the differential equations governing fluid flow, heat transfer and mass transport to formulate strategies for the solution of engineering problems 2 Use basic methods for solving these equations numerically using a computer 3 Use a Computational Fluid Dynamics software package to solve engineering problems.
Assessment:	Class tests and assignments (40%), assessed throughout the semester. Time commitment of approximately 45-50 hours. Intended Learning Outcomes (ILOs) 1 to 3 addressed in the assignments and tests 3 hour end–of semester exam (60%). ILOs 1 to 3 addressed in the exam. Hurdle requirement: A pass in the end of semester examination is required to pass the subject
Prescribed Texts:	None
Recommended 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:	# In-depth technical competence in at least one engineering discipline # Ability to undertake problem identification, formulation, and solution # Ability to utilise a systems approach to complex problems and to design and operational performance # Capacity for lifelong learning and professional development.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and workshops. Students will also complete two assignments which will reinforce the material covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture material, computing resources, and Computational Fluid Dynamics software. The subject LMS site also contains example MATLAB and C computer code, and worked solutions, relevant to the workshops. **CAREERS / INDUSTRY LINKS** One assignment will involve the use of the Computational Fluid Dynamics software in an engineering context.
Related Course(s):	Doctor of Philosophy - Engineering Master of Philosophy - Engineering
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream Master of Engineering (Biochemical) Master of Engineering (Chemical) Master of Engineering (Mechanical)