ENGR90024 Computational Fluid Dynamics

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 3 x one hour lectures + 1 x two hour workshop per week Total Time Commitment: Estimated 200 hours
Prerequisites:	Students must have passed ONE OF the following subjects: **Subject** | **Study Period Commencement:** | **Credit Points:** ENGR30002 Fluid Mechanics | Semester 1, Semester 2 | 12.50 ENGR30001 Fluid Mechanics and Thermodynamics MCEN30018 Thermodynamics and Fluid Mechanics and ONE OF the following subjects: **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
Contact:	Email: **m.davidson@unimelb.edu.au (mailto:m.davidson@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 during the semester contributing 40% to the final mark An end of semester examination not exceeding three hours contributing 60% to the final mark 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):	Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream Master of Engineering (Biochemical) Master of Engineering (Chemical) Master of Engineering (Mechanical)