Course Outline

T1 2020

MECH4620

COMPUTATIONAL FLUID DYNAMICS

1. Staff contact details

Contact details and consultation times for course convenors

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3. [illegible]

Credit points

This is a 6 unit-of-credit (UoC) course and involves 3.5 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

This means that you should aim to spend about 9 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Contact hours

	Day	**Time**	**Location**
Lectures	Wednesday	11:00pm – 12:30pm	Webster Theatre A
(Web stream)	Any	Any	Moodle
Lab	Wednesday	13:00pm – 15:00pm	Ainsworth 203

- Develop an awareness of the power and limitations of CFD.

This course builds on knowledge gained in other courses such as Fluid Mechanics, Thermodynamics, and Numerical Methods.

Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional ngineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should be able to:

Learning Outcome		**EA Stage 1 Competencies**
1.	An underlying understanding of the theoretical basis of CFD	P1.1, P1.2, P1.4
2.	The ability to develop a CFD model for “real world” engineering problems	P2.1, P2.2
3.	The technical ability to address complex problems using CFD with the specific focus on developing practical skills in using a commercial CFD package, ANSYS CFX	P1.3, P1.5
4.	The ability to interpret computational esults and to write a report veying the result of the computational analysis	P3.1, P3.2, P3.3

4. Teaching strategies

Lectures in the course are designed to cover the terminology and core cepts and theories in CFD. They do not mply reiterate he texts, but ild on the lecture topics using examples taken directly from industry to show w the theory is applied in practice and the details of when, where and how it uld be applied. The WEB stream version of the course will also be available. This provides students with the opportunity to learn he lecture tent online interactively in their own time.

Lab sessions

5.

Week	Lecturer	Topic	Work during laboratory session	Assignment Activity
1	GY	Introduction to CFD and some examples of CFD	• Backward facing step exercise • Problem setup	
2	GY	• Introduction to ANSYS CFX and Fluent • Defining a CFD problem • Creating and/or Importing Geometry in Design Modeler	• Lab work on creating geometry and meshing	Release: group allocation
3	VT	Mass and momentum conservation and Navier-Stokes equations	• Lab work on creating geometry and meshing • Heat exchanger exercise: Meshes • Discussions of group project topics	Release: group project topics
4	VT	Kinematic properties of fluids, dynamic similarity and energy conservation	• Discussions of group project topics • T1 work	
5	GY	Initial and boundary conditions; Post-processing –. Validation and verification	• Backward facing step exercise: Characterization of boundary conditions • Heat exchanger exercise: • Characterisation of boundary conditions	**Due: T1: conservation laws (5%)**
6	GY	Turbulence: basics8.89 50(		

6. Assessment

Assessment overview

You will be assessed by way of 2 sets of tutorial-style problems, one group project and one individual project and a two-hour examination at the end of the session. Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are given below.

Assessment task	**Group Project?** (# Students per group)	**Length**	**Weight**	**Learning outcomes assessed**	**Assessment criteria**	**Due date, time, and submission requirements**	**Deadline for absolute fail**	**Marks returned**
Tutorial style problems (T1 & T2)	No	20 0 1 2						

Assignments

Tutorial-

Presentation

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

a. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
b. Online quizzes where answers are released to students on completion, or
c. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
d. Pass/Fail assessment tasks.

Marking

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Examinations

There will be a two-hour examination at the end of the Term.

Final examinations for each course are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for

Calculators

You will need to provide your own calculator of a make and model approved by UNSW for the examinations. The list of approved calculators is available at student.unsw.edu.au/exam-approved-calculators-and-computers

Recommended Internet sites

www.ansys.com
www.cfd-online.com

Additional materials provided in UNSW Moodle

This course has a website on UNSW Moodle which includes:

- copies of assignments (as they are issued, in case you missed the hand-

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:
www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

10. Administrative matters and links

All students are expected to read and be familiar with School guidelines and polices

Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1