



Source Outline  
TI 2020

**MECH4620**

**COMPUTATIONAL FLUID DYNAMICS**



# I. Staff contact details

## Contact details and consultation times for course convenors

Name: Professor Guan Heng Yeoh  
Office Location: Room 401B, J17  
Tel: (02) 9385 4099  
Fax: (02) 9663 1222  
Email: [g.yeoh@unsw.edu.au](mailto:g.yeoh@unsw.edu.au)  
Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>  
Consultation times: Thursday 2-3pm  
Communication preference: Email

Name: Dr Victoria Timchenko  
Office Location: Room 401C, J17  
Tel: (02) 9385 4148  
Fax: (02) 9663 1222  
Email: [v.timchenko@unsw.edu.au](mailto:v.timchenko@unsw.edu.au)

## 3.6 Unit credit

### 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

|                 | <b>Day</b> | <b>Time</b>       | <b>Location</b>   |
|-----------------|------------|-------------------|-------------------|
| <b>Lectures</b> | Wednesday  | 11:00pm – 12:30pm | Webster Theatre A |
| (Web stream)    | Any        | Any               | Moodle            |
| <b>Lab</b>      | 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 Engineers 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 results and to write a report conveying 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 concepts and theories in CFD. They do not simply reiterate the texts, but build on the lecture topics using examples taken directly from industry to show how the theory is applied in practice and the details of when, where and how it could be applied. The WEB stream version of the course will also be available. This provides students with the opportunity to learn the lecture content 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<br>Problem setup   |  |
| 2    | GY       | Introduction to ANSYS CFX and Fluent<br>Defining a CFD problem<br>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<br>Heat exchanger exercise: Meshes<br>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<br>T1 work   |  |
| 5    | GY       | Initial and boundary conditions;<br>Post-processing –.<br>Validation and verification                                  | Backward facing step exercise:<br>Characterization of boundary conditions<br>Heat exchanger exercise:<br>Characterisation of boundary conditions | <b>Due: T1: conservation laws (5%)</b> |
| 6    | GY       | Turbulence: basics 8.89 500  |  |  |

## 6. Assessment

### Assessment overview

You will be assessed by way of 2 sets of tutorial-style problems, one group project and one individual

## **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.

## *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](http://student.unsw.edu.au/exam-approved-calculators-and-computers)

## Recommended Internet sites

[www.ansys.com](http://www.ansys.com)

[www.cfd-online.com](http://www.cfd-online.com)

## Additional materials provided in UNSW Moodle

This course has a website on UN0 g0 G[ )]TJeW\*nBT/F1 11.04 Tf1 0 0 1 141.98 715.9 Tm0 0 1 RG[-)]T5 11

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](http://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 policies

# Competencies

## Stage 1 Competencies for Professional Engineers

|  |   |
|--|---|
|  | <b>Program Intended Learning Outcomes</b> |
|--|---|

PE1.1

**PE1: Knowledge  
and Skill Base**