UNSW Course Outline

ZEIT2503 Fluid Mechanics - 2024

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General Course Information

Course Code : ZEIT2503
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Engineering and Technology
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course covers fundamental aspects of fluid mechanics. It develops an understanding of the physical mechanisms underlying fluid flow. It contains a review of the fundamental equations of Fluid Mechanics, an expansion of the methods of momentum analysis known from Thermofluids, and a detailed discussion of the powerful technique of Dimensional Analysis,

which allows the systematic discovery of parameter sets that govern the characteristic features of a flow. These techniques are used in engineering applications, such as the fluid mechanical treatment of turbomachines and devices for flow measurement. Special emphasis is given to friction effects in fluid flows. Several examples of flows in which friction is important are discussed, such as Couette flows, pipe flows and boundary layers. The final chapter of the course is an introduction to compressible flows.

Course Aims

The primary aim of this course is to impart knowledge and understanding of fluid mechanics concepts. Associated with this straightforward goal is the aim of having students experience the acquisition of non-intuitive knowledge that is not immediately accessible. This fits into the underlying purpose of the whole program - to teach students how to learn. A third aim is to demonstrate that theories developed in fluid mechanics, can inform us about real world phenomena.

Relationship to Other Courses

Prerequisites for this course are ZEIT2500 Thermofluids, ZEIT1503 Engineering Mechanics, ZPEM1303 Engineering Mathematics 1a and ZPEM1304 Engineering Mathematics 1b.

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Understand the theoretical principles of incompressible fluid flow with friction, including mass, energy and momentum conservation principles, and the occurrence and features oflaminar and turbulent flow.	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline
CLO2 : Apply the above conservation principles, as expressed in the Navier-Stokes equations, to the analysis of general laminar flows and their reduction to laminar plane parallel and Couette flows	• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline
CLO3 : Appreciate and apply the principles of dimensional scaling and analysis to engineering problems of a general nature	• PEE2.2 : Fluent application of engineering techniques, tools and resources
CLO4 : Calculate the structure and effect of laminar and turbulent boundary layers, and the relative importance of viscous and pressure drag	• PEE2.1 : Application of established engineering methods to complex engineering problem solving
CLO5 : Use the concept of frictional energy losses in conjunction with conservation principles for the analysis of flow in pipes and pipe-pump systems	• PEE2.3 : Application of systematic engineering synthesis and design processes

Course Learning Outcomes	Assessment Item
CLO1 : Understand the theoretical principles of incompressible fluid flow with friction, including mass, energy and momentum conservation principles, and the occurrence and features oflaminar and turbulent flow.	
CLO2 : Apply the above conservation principles, as expressed in the Navier-Stokes equations, to the analysis of general laminar flows and their reduction to laminar plane parallel and Couette flows	
CLO3 : Appreciate and apply the principles of dimensional scaling and analysis to engineering problems of a general nature	
CLO4 : Calculate the structure and effect of laminar and turbulent boundary layers, and the relative importance of viscous and pressure drag	
CLO5 : Use the concept of frictional energy losses in conjunction with conservation principles for the analysis of flow in pipes and pipe-pump systems	

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

The Learning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

» Google Chrome 50+
» Safari 10+
** Internet Explorer is not recommended

** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click here.

Log in to Moodle here.

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au

Phone: (02) 9385-3331
International: +61 2 938 53331

Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

Additional Course Information

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Plagiarism undermines academic integrity and is not tolerated at UNSW. *It is defined as using the words or ideas of others and passing them off as your own, and* can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Referencing

In this course, students are required to reference following the APA 7 / Chicago NB referencing style. Information about referencing styles is available at: https://guides.lib.unsw.adfa.edu.au/c.php?g=472948&p=3246720

Study at UNSW Canberra

https://www.unsw.adfa.edu.au/study

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

Additional Information as required

CRICOS Provider no. 00098G

The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Lab Reports Assessment Format: Group	10%	Due Date: Lab reports due one week after the completion of the lab.
Class Quizzes Assessment Format: Individual	10%	Due Date: Class quiz 1: 6/08, Class quiz 2: 1/10
Final Exam Assessment Format: Individual	50%	Due Date: Exam week
Group Assignments Assessment Format: Group	20%	Due Date: Assignment 1: 23/08 11:59PM, Assignment 2: 18/10 11:59PM
Tutorial Reflection Assessment Format: Individual	10%	

Assessment Details

Lab Reports

Assessment Overview

Students will conduct and analyse the data obtained from two labs, and submit a short report on each in groups (5% each). These are primarily formative assessment tasks.

Assessment information

Lab reports due one week after the completion of the lab.

Class Quizzes

Assessment Overview

There will be two quizzes (weighted 5% each) conducted in class time. These are individual assessed with summative (assessment of learning) tasks.

Final Exam

Assessment Overview

The exam covers the breadth of the course and will be conducted during the examination period.

Group Assignments

Assessment Overview

Two assignments (weighted 10% each), Students will work in self-nominated groups and submit one solution document per group. These are both formative and summative (assessment as learning and assessment of learning) tasks.

Tutorial Reflection

Assessment Overview

Due in the weekly tutorial. A minimum of 10 tutorial sessions to be attended.

General Assessment Information

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is **the only official mark.** Assessments have been designed to encourage and support your learning and consists of mix of group and individual assessment items that reflect professional engineering practice and skills. Detailed descriptions of assessment items, including individual and group components, tasks, submission requirements and grading criteria will be released on Moodle.

Feedback in this course will be provided in a timely and appropriate manner through a range of formative exercises and class discussions, comments on summative assessment work and generic comments to the cohort. Mechanisms for providing feedback can include both verbal and written, formal and informal. All feedback provided is aimed at benefiting and enhancing student learning and engagement.

Late Submission of Assessment

Unless a prior arrangement is made wit hthe course convenor of a formal application for special consideration is submitted, a penalty of 5% of the mark for the assessment item will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which as assessment can no longer be submitted and a grade of 0 will be applied.

Feedback on Assessment tasks

All the assessment tasks will be graded and individual feedback will be provided to students within 10 business days. The first class quiz will be held in week 3 and feedback will be provided to students during week 4. This is to faciliate an early constructive feedback to

students about their performances and support will be offered to needy students.

Use of Generative AI in Assessments

SIMPLE EDITING ASSISTANCE

For the assessment tasks of lab reports and assignments, you may use standard editing and referencing software, but not Generative AI. You are permitted to use the full capabilities of the standard software to complete the taks (e.g., you may wish to specify software such as Microsoft Office suite, Grammarly, etc.). If the use of generative AI such as ChatGPT or Google Bard is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

To obtain a passing grade in this course, you must attain an overall mark of 50% or higher.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	Fluid kinematics: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 2 : 22 July - 26 July	Lecture	Integral form of conservation laws: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 3 : 29 July - 2 August	Assessment	Quiz 1
	Lecture	Differential form of conservation laws: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 4 : 5 August - 9 August	Lecture	Similarity & Scaling: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 5 : 12 August - 16 August	Laboratory	Building 18, Room 106M
	Lecture	Dimensional analysis: Mon 1000-1150 @ Lec Nth 07 Thu 1310-1500 @ Lec Nth 09
Week 6 : 19 August - 23 August	Laboratory	Building 18, Room 106M
	Assessment	Assignment 1
	Lecture	Internal Flow of Real Fluids: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 7 : 9 September - 13 September	Laboratory	Building 18, Room 106M
	Lecture	Internal Flow of Real Fluids: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 8 : 16 September - 20 September	Lecture	External flow of real fluids: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Nth 10 Thu 1310-1500 @ Lec Nth 09
Week 9 : 23 September - 27 September	Laboratory	Mechanical Engineering Laboratory
	Lecture	External flow of real fluids: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Nth 10 Thu 1310-1500 @ Lec Nth 09
Week 10 : 30 September - 4 October	Laboratory	Mechanical Engineering Laboratory
	Assessment	Quiz 2
	Lecture	External flow of real fluids: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Sth 01 Thu 1310-1500 @ Lec Nth 09
Week 11 : 7 October - 11 October	Laboratory	Mechanical Engineering Laboratory
	Lecture	Turbomachinery: Tue 1000-1050 @ Lec Nth 10
Week 12 : 14 October - 18 October	Assessment	Assignment 2
	Lecture	Turbomachinery: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Nth 10 Thu 1310-1500 @ Lec Nth 09
Week 13 : 21 October - 25 October	Lecture	Turbomachinery: Mon 1000-1150 @ Lec Nth 07 Tue 1000-1050 @ Lec Nth 10 Thu 1310-1500 @ Lec Nth 09

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

Scheduled contact times are:

Lectures

Monday, 10:00 – 11:50, LT07

Tuesday, 10:00 – 10:50, LT01 or LT10

Thursday, 13:10 – 15:00, LT09

Tutorials

Wednesday, 12:10 – 13:00, Z-15-152

Thursday, 11:00 – 11:50, Z-SR-07

Friday, 15:10 – 16:00, Z-15-152

Friday, 16:10 – 17:00, Z-SR-05

***Labs** (Check your individual timetable)*

Thermo lab: Weeks 5 – 7

Fluids lab: Weeks 9 - 11

Students must attend the assigned tutorial and lab sessions. Lab reports will be due within a week after the lab.

Course Resources

Prescribed Resources

Gerhart, Gerhart and Hochstein, “Munson’s Fluid Mechanics”, Global Edition, Wiley.

or you may also use:

Cengel and Cimbala, “Fluid Mechanics: Fundamentals and Applications, SI 4th ed.”, McGraw Hill.

Course Evaluation and Development

Your feedback matters!

We've used the past feedback to make some improvements.

Previous students told us:

1. Students wanted more activities in class and tutorials.

2. More support in the tutorials.

3. More time on fluid kinematics.

We have responded to this feedback by:

1. Engaging activites such as think-pair-share and active quizzes will be conducting in class.

2. Tutorial sessions will involve formal reflective activities.

3. Class material on fluid kinematics has been expanded at the start of semester.

4. Tuesday's lecture will usually involve solving numerical problems throughout the course.

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct Policy

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	David Petty		Building 17 Room 127	+61 2 5114 5393	Available for consultation during Tuesday's lecture	No	Yes
Lecturer	John Young		Building 20 Room 134	+61 2 5114 5228	Available for consultation during Tuesday's lecture	No	No
Demonstrator	Nick Heath				Available for consultation only during the lab.	No	No
	Akshay Kumar Nandhan				Available for consultation only during the lab.	No	No