UNSW Course Outline

ZPEM3306 Waves and Fluids - 2024

Published on the 30 Jun 2024

General Course Information

Course Code : ZPEM3306
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : UC Science
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

Fluid dynamics arises in many different fields of science and engineering. Predicting weather, designing ships and other vehicles, improving building safety, and positioning wind farms are all large scale practical applications of fluid mechanics.

This course will work on the foundations of theoretical fluid dynamics. Many fluid dynamics

problems are inherently complicated. In fact, there is a whole sub-field of fluid dynamics called Computational Fluid Dynamics (CFD) which is dedicated to accurately simulating fluid flow using computational techniques. Therefore this course will cover some of the basic computational techniques which are used to solve real-world problems.

A computational project, which aims to simulate some fluid motion, is a theme throughout the course. Students will learn the fundamental equations of fluid motion, the computational techniques to approximate the solution to those equations, write a solver to conduct simulations using Matlab, and finally report on their findings.

Course Aims

The aim of this course is to provide mathematical descriptions of wave motion and fluid mechanics and their application to the physical world.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Recall and apply major concepts of water surface waves, sound waves, and nonlinear waves.
CLO2 : Utilise linear wave theory to predict water surface wave behaviour and acoustic scattering.
CLO3 : Analyse nonlinear wave behaviour in idealised conditions.
CLO4 : Evaluate fluid wave applications such as: bubble acoustics, ocean wave energy conversion, or streaming in medical contexts.

Course Learning Outcomes	Assessment Item
CLO1 : Recall and apply major concepts of water surface waves, sound waves, and nonlinear waves.	• Final Summative assessment • Formative Assessments
CLO2 : Utilise linear wave theory to predict water surface wave behaviour and acoustic scattering.	• Summative assessments • Final Summative assessment • Formative Assessments
CLO3 : Analyse nonlinear wave behaviour in idealised conditions.	• Summative assessments • Final Summative assessment
CLO4 : Evaluate fluid wave applications such as: bubble acoustics, ocean wave energy conversion, or streaming in medical contexts.	• Final Summative assessment

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

Enrolment in this course or participation in any activity that is recorded constitutes consent to be recorded during tutorial and other teaching sessions. Recordings will only be used for the purposes of teaching this course. If you do not consent to be recorded, you must notify your course convenor immediately so other arrangements can be made.

Effective learning of mathematics is best supported by a climate of enquiry in which students are actively engaged in the learning process; that is a *learner-centred* environment.

The intention in this course is that you will spend this time watching recorded lecture videos and reading the textbook. In class, you will be actively engaged in summarising and discussing the material, or working through quantitative problems.

Study as much as you need to understand the material. As a very rough guideline the University recommends about **6–8 hours of work per week outside classes.**

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Summative assessments Assessment Format: Individual	28%	Start Date: Not Applicable Due Date: Not Applicable
Final Summative assessment Assessment Format: Individual	50%	
Formative Assessments Assessment Format: Group	22%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Summative assessments

Assessment Overview

Two tests, worth 14\% each, will feature questions similar to formative exercises. The questions will be formatted to indicate the level of student performance that they represent. For example, there will be questions that should be answered to indicate a passing grade, there will be harder questions that indicate credit level, and even harder questions that, if answered well, indicate

distinction or high-distinction level performance.

Course Learning Outcomes

- CLO2 : Utilise linear wave theory to predict water surface wave behaviour and acoustic scattering.
- CLO3 : Analyse nonlinear wave behaviour in idealised conditions.

Assessment Length

50 mins

Assignment submission Turnitin type

Not Applicable

Final Summative assessment

Assessment Overview

In this assessment students will demonstrate their knowledge of the fundamental principles, their comprehension and ability to apply relevant analysis techniques, their ability to synthesize these skills and knowledge and apply them to a sophisticated problem. Students will need to communicate all information in a manner clear for the audience and produce a whole coherent document.

Course Learning Outcomes

- CLO1 : Recall and apply major concepts of water surface waves, sound waves, and nonlinear waves.
- CLO2 : Utilise linear wave theory to predict water surface wave behaviour and acoustic scattering.
- CLO3 : Analyse nonlinear wave behaviour in idealised conditions.
- CLO4 : Evaluate fluid wave applications such as: bubble acoustics, ocean wave energy conversion, or streaming in medical contexts.

Assignment submission Turnitin type

Not Applicable

Formative Assessments

Assessment Overview

Formative assessments will occur weekly, in class times, and there will be two different forms, quantitative and qualitative exercises.

Quantitative exercises directly prepare students for the summative assessments, and contribute to the technical skills required for the capstone assessment. Qualitative exercises prepare

students for the capstone assessment. Quantitative exercises are tutorial problems, reasonable attempts at the questions must be made and presented for feedback.

It is the combination of attempting the problem and receiving feedback that earns marks, not the correctness of the attempt. Each formative assessment is worth approximately 2%.

Course Learning Outcomes

- CLO1 : Recall and apply major concepts of water surface waves, sound waves, and nonlinear waves.
- CLO2 : Utilise linear wave theory to predict water surface wave behaviour and acoustic scattering.

Assignment submission Turnitin type

Not Applicable

General Assessment Information

USE OF GENERATIVE AI: PLANNING ASSISTANCE.

As the formative assessments and the final summative assessment involve some planning or creative processes, you are permitted to use software to generate initial ideas. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work, i.e. only occasional AI generated words or phrases may form part of your final submission. You are required to submit the original AI generated responses.

If the outputs of generative AI such as ChatGPT form a part of your submission, 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

The assessment for the course has been designed so that an overall mark of 50% or greater indicates that the student has demonstrated satisfactory performance.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Topic	Fundamentals
Week 2 : 22 July - 26 July	Topic	Fluid dynamics tools
Week 3 : 29 July - 2 August	Topic	Wave tools
Week 4 : 5 August - 9 August	Topic	Water surface waves
Week 5 : 12 August - 16 August	Topic	Depth
Week 6 : 19 August - 23 August	Topic	Wakes
Week 7 : 9 September - 13 September	Topic	Sound waves
Week 8 : 16 September - 20 September	Topic	Acoustics
Week 9 : 23 September - 27 September	Topic	Nonlinear wave theory
Week 10 : 30 September - 4 October	Topic	Nonlinear wave interactions
Week 11 : 7 October - 11 October	Topic	Ocean wave energy conversion
Week 12 : 14 October - 18 October	Topic	Bubble acoustics
Week 13 : 21 October - 25 October	Topic	Medical streaming

Attendance Requirements

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

General Schedule Information

See the course schedule

Course Resources

Prescribed Resources

Fluid Waves By Richard Manasseh

1st Edition 2021

DOI https://doi.org/10.1201/9780429295263

Available as an ebook in the library.

https://primoa.library.unsw.edu.au/permalink/61UNSW_INST/1m02euc/alma9951350753201731

Course Evaluation and Development

Course Evaluation and Development

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
	Duncan Sutherland					No	Yes