UNSW Course Outline

ZPEM3401 Ocean Circulation and Mixing - 2024

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General Course Information

Course Code : ZPEM3401
Year : 2024
Term : Semester 1
Teaching Period : Z1
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

This course examines the dynamics of large-scale wind-driven ocean currents. The course aims to explain why there is a broad equator-ward flow in all the major ocean basins, except the Southern Ocean, and why there are strong, poleward-flowing boundary currents such as the Gulf

Stream and the East Australia Current on the western boundaries. The production of turbulence in the oceans and its role in mixing is also examined. The discussion of mixing in the ocean normally includes Kolmogoroff and Batchelor lengths, molecular mixing and diffusive boundary layers; the logarithmic boundary layer and mixing lengths; vertical mixing by wind and tidal stirring; dispersion in the ocean, its measurement, and the Taylor mechanism.

Course Aims

The course aims to explain why there is a broad equator-ward flow in all the subtropical ocean basins (but not in the Southern Ocean), and why there are strong, poleward-flowing boundary currents such as the Gulf Stream and East Australia Current on the western boundaries. The production of turbulence in the oceans and its role in mixing is also examined. The discussion of mixing in the oceans includes Kolmogoroff and Batchelor lengths, molecular mixing and diffusive boundary layers, the logarithmic boundary layer and mixing lengths, vertical mixing by wind and tidal stirring, dispersion in the ocean, its measurement, and the Taylor mechanism.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : At the end of this course students will be able to define, analyse, and solve problems relating the force balances that drive the large-scale ocean circulation.
CLO2 : At the end of this course students will be able to describe and solve problems relating to the role of turbulence in mixing water properties and momentum in the ocean.
CLO3 : At the end of this course students will be able to communicate to a broad audience processes and drivers of the ocean circulation.

Course Learning Outcomes	Assessment Item
CLO1 : At the end of this course students will be able to define, analyse, and solve problems relating the force balances that drive the large-scale ocean circulation.	• final exam • Coursework • Two in-class tests
CLO2 : At the end of this course students will be able to describe and solve problems relating to the role of turbulence in mixing water properties and momentum in the ocean.	• final exam • Coursework • Two in-class tests
CLO3 : At the end of this course students will be able to communicate to a broad audience processes and drivers of the ocean circulation.	• final exam • Coursework

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360 | EdStem

Learning and Teaching in this course

In teaching, we attempt to present a general conceptual framework and then use it to understand specific problems in oceanography. We use up-to-date research and data and incorporate our own research wherever possible. Our ultimate goal is to provide the students with a set of tools to comprehend and address problems, particularly oceanographic ones.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
final exam	50%	Start Date: 17/06/2024 12:00 AM Due Date: 17/06/2024 11:59 PM Post Date: 17/06/2024 05:00 PM
Coursework	30%	Start Date: Not Applicable Due Date: Not Applicable Post Date: 11/05/2024 12:00 PM
Two in-class tests	20%	Start Date: Not Applicable Due Date: Not Applicable Post Date: 30/06/2024 12:00 AM

Assessment Details

final exam

Course Learning Outcomes

- CLO1 : At the end of this course students will be able to define, analyse, and solve problems relating the force balances that drive the large-scale ocean circulation.
- CLO2 : At the end of this course students will be able to describe and solve problems relating to the role of turbulence in mixing water properties and momentum in the ocean.
- CLO3 : At the end of this course students will be able to communicate to a broad audience processes and drivers of the ocean circulation.

Assessment Length

2hrs

Submission notes

It is supposed to be submitted right after the exam

Assessment information

It is supposed to be submitted right after the exam

Assignment submission Turnitin type

Not Applicable

Coursework

Assessment Overview

Laboratory reports (10%) and field school reports (20%)

Course Learning Outcomes

- CLO1 : At the end of this course students will be able to define, analyse, and solve problems relating the force balances that drive the large-scale ocean circulation.
- CLO2 : At the end of this course students will be able to describe and solve problems relating to the role of turbulence in mixing water properties and momentum in the ocean.
- CLO3 : At the end of this course students will be able to communicate to a broad audience processes and drivers of the ocean circulation.

Detailed Assessment Description

Laboratories are held on Friday 14:10-18:00 in the Level 3 Lab (Room 129 for Dynamics and 111 for Mixing) in Building 26 in the weeks shown below (subject to change if needed).

The Field school will take place in Jervis Bay (or Batemans Bay) from 16-19 April during 2nd week of the Orange Book period.

Field School and laboratory reports are to be submitted at the end of field school and each laboratory classes. Late field school and reports laboratory will only be accepted if prior arrangement is made with the lecturer, or a formal application for special consideration is submitted. There will be no repeat tests for students who miss the scheduled tests.

Assessment Length

4days

Submission notes

The full report is supposed to be submitted within a month after field school

Assessment information

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Assignment submission Turnitin type

Not Applicable

Two in-class tests

Assessment Overview

Not specified

Course Learning Outcomes

- CLO1 : At the end of this course students will be able to define, analyse, and solve problems relating the force balances that drive the large-scale ocean circulation.
- CLO2 : At the end of this course students will be able to describe and solve problems relating to the role of turbulence in mixing water properties and momentum in the ocean.

Detailed Assessment Description

In **class tests**, each counting 10% of the session mark, will be held during lecture time in the weeks starting April 3 and May 29.

Assessment Length

1hr

Submission notes

It should be submitted in the class

Assessment information

It should be submitted in the class

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.**

The assessment of the course consists of:

- **Coursework (30%):** Lab reports (10%) and Field school reports (20%).
- Two **in-class tests** and a **final exam** (70%).

The Field school will take place in Jervis Bay (or Batemans Bay) from 16-19 April during 2nd week of the Orange Book period. In **class tests**, each counting 10% of the session mark, will be held during lecture time in the weeks starting April 3 and May 29. Final exam has a duration of 2 hours and counts for 50% of the final mark.

Use of Generative Artificial Intelligence (AI)

You can use generative AI software in this course to the extent specified in the assessment instructions. Any output of generative software within your assessment must be attributed with full referencing.

If the outputs of generative AI such as ChatGPT form part of your submission and is not appropriately attributed, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

* To cite: OpenAI (Year Accessed). ChatGPT. OpenAI. https://openai.com/models/chatgpt/

* Please note that the outputs from these tools are not always accurate, appropriate, nor properly referenced. You should ensure that you have moderated and critically evaluated the outputs from generative AI tools such as ChatGPT before submission.

Grading Basis

Standard

Requirements to pass course

50 out of 100

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	Dynamics
Week 2 : 4 March - 8 March	Lecture	Dynamics
Week 3 : 11 March - 15 March	Lecture	Dynamics (Monday Lost)
Week 4 : 18 March - 22 March	Lecture	Dynamics
	Laboratory	
Week 5 : 25 March - 29 March	Lecture	Dynamics (Friday Lost)
Week 6 : 1 April - 5 April	Lecture	Dynamics (Monday lost)
Week 7 : 22 April - 26 April	Lecture	Dynamics (Wed: Military training Day Thu: ANZAC DAY)
Week 8 : 29 April - 3 May	Lecture	Mixing
Week 9 : 6 May - 10 May	Lecture	Mixing (Fri: Military training day)
Week 10 : 13 May - 17 May	Lecture	Mixing
	Laboratory	
Week 11 : 20 May - 24 May	Lecture	
Week 12 : 27 May - 31 May	Lecture	Mixing (Tuesday: Monday timetable)
Week 13 : 3 June - 7 June	Lecture	Mixing

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings. Students are indeed expected to attend all lectures, field school, laboratory sessions and assessments unless their absence has been approved by the course coordinator. Students who have missed assessments or a laboratory, or expect to miss such a requirement, must inform the course coordinator by email at the earliest practicable date. In typical circumstances of missed assessments, a formal application for Special Consideration via the prescribed University procedure is appropriate. Alternative assessment can then be arranged. Otherwise, in the case of absence a mark of zero will be awarded for the assessment.

General Schedule Information

There are three lectures per week in the course:

Monday *11:00 (G23)*

Wednesday *9:00 (G23)*

Thursday *10:00 (G23)*

Laboratories are held on Friday 14:10-18:00 in the Level 3 Lab (Room 129 for Dynamics and 111 for Mixing) in Building 26 in the weeks shown below (subject to change if needed). A field school is scheduled 16-19 April in Batemans Bay, NSW.

Course Resources

Prescribed Resources

Calculator – Compulsory

- *Casio fx-82AU*

Additional Reading – Required

- *Notes, papers and excerpts supplied by lecturer*
- *Thorpe, S.A., 2007. An Introduction to Ocean Turbulence. Cambridge University Press, pp267.*

Recommended Resources

- *Apel, S.R., 1987. Principles of Ocean Physics, International Geophysics Series, Vol 38, Academic Press, pp631.*
- *Open University, 2001, Ocean Circulation, 2nd edition, Butterworth-Heinemann.*

- *McWilliams, J.C. 2006. Fundamentals of Geophysical Fluid Dynamics, Cambridge University Press.*
- *Pond, S., and Pickard, G.L., 1983. Introductory Dynamical Oceanography (2nd Ed), Pergamon Press, pp329.*
- *Gill, A.E., 1982. Atmosphere-Ocean Dynamics, International Geophysics Series, Vol 30, Academic Press, pp662.*
- *Cushman-Roisin, B., 1994. Introduction to Geophysical Fluid Dynamics, Prentice Hall, pp320.*

Additional Costs

none

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.*

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Xiao Hua Wang		G21 Building 26	(2) 5114 5044	Monday-Friday	No	Yes
Lecturer	Vivian li		G19 Building 26	0420215236	Monday-Friday	No	No

Other Useful Information

Academic Information

Course Evaluation and Development

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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.

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

Equitable Learning Services (ELS)

Students living with neurodivergent, physical and/or mental health conditions or caring for someone with these conditions may be eligible for support through the Equitible Learning Services team. Equitable Learning Services is a free and confidential service that provides practical support to ensure your mental or physical health conditions do not adversely affect your studies.

Our team of dedicated **Equitable Learning Facilitators** (ELFs) are here to assist you through this process. We offer a number of services to make your education at UNSW easier and more equitable.

Further information about ELS for currently enrolled students can be found at: https://www.student.unsw.edu.au/equitable-learning

Academic Honesty and Plagarism

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. Find relevant information at: Student Code of Conduct (unsw.edu.au)

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

Submission of Assessment Tasks

Special Consideration

Special Consideration is the process for assessing and addressing the impact on students of short-term events, that are beyond the control of the student, and that affect performance in a specific assessment task or tasks.

Applications for Special Consideration will be accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause;
- The circumstances are unexpected and beyond the student's control;
- The circumstances could not have reasonably been anticipated, avoided or guarded against by the student; and either:

(i) they occurred during a critical study period and was 3 consecutive days or more duration, or a total of 5 days within the critical study period; or

(ii) they prevented the ability to complete, attend or submit an assessment task for a specific date (e.g. final exam, in class test/quiz, in class presentation)

Applications for Special Consideration must be made as soon as practicable after the problem occurs and at the latest within three working days of the assessment or the period covered by the supporting documentation.

By sitting or submitting the assessment task the student is declaring that they are fit to do so and cannot later apply for Special Consideration (UNSW 'fit to sit or submit' requirement).

Sitting, accessing or submitting an assessment task on the scheduled assessment date, after applying for special consideration, renders the special consideration application void.

Find more information about special consideration at: https://www.student.unsw.edu.au/special/

consideration/guide

Or apply for special consideration through your MyUNSW portal.

Late Submission of assessment tasks (other than examinations)

UNSW has a standard late submission penalty of:

- 5% per day,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Electronic submission of assessment

Except where the nature of an assessment task precludes its electronic submission, all assessments must be submitted to an electronic repository, approved by UNSW or the Faculty, for archiving and subsequent marking and analysis.

Release of final mark

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.