UNSW Course Outline

ZPEM2506 Physics 2A: Meteorology and Atmospheric Physics - 2024

Published on the 12 Feb 2024

General Course Information

Course Code : ZPEM2506
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

In this course we investigate the fundamentals of atmospheric physics and meteorology. Topics

covered include: hydrostatic balance and the vertical structure of the atmosphere; altimetry; thermodynamics of dry and moist air; stability; cloud formation and precipitation; geostrophic, gradient and ageostrophic balances; winds; synoptic scale weather systems, air masses and fronts; radiation and the general circulation of the atmosphere; boundary layer processes. Material will be illustrated with applications from areas such as aviation, the marine and land environments, and our everyday experience of weather. The course includes a laboratory program relating to, and supplementing the lecture material.

Course Aims

In this course we investigate the fundamentals of atmospheric physics and meteorology. Topics covered include: hydrostatic balance and the vertical structure of the atmosphere; altimetry; thermodynamics of dry and moist air; stability; cloud formation and precipitation; geostrophic, gradient and ageostrophic balances; winds; synoptic scale weather systems, air masses and fronts; radiation and the general circulation of the atmosphere; boundary layer processes. Material will be illustrated with applications from areas such as aviation, the marine and land environments, and our everyday experience of weather. The course includes a laboratory program relating to, and supplementing the lecture material.

Relationship to Other Courses

Not applicable

Course Learning Outcomes

Course Learning Outcomes
CLO1 : be able to explain the theory of, and solve relevant problems on, the structure, sun geometry, energy balance, and optical properties of the atmosphere
CLO2 : be able to explain the theory of, and solve relevant problems on, moisture, cloud development, cloud microphysics, and precipitation
CLO3 : be able to explain the theory of, and solve relevant problems on, atmospheric dynamics, the general circulation, and weather systems
CLO4 : be able to investigate atmospheric science concepts in laboratory experiments and relate the results to the atmosphere

Course Learning Outcomes	Assessment Item
CLO1 : be able to explain the theory of, and solve relevant problems on, the structure, sun geometry, energy balance, and optical properties of the atmosphere	• 2 class tests • Weather Challenge • Examination
CLO2 : be able to explain the theory of, and solve relevant problems on, moisture, cloud development, cloud microphysics, and precipitation	• 2 class tests • Weather Challenge • Examination
CLO3 : be able to explain the theory of, and solve relevant problems on, atmospheric dynamics, the general circulation, and weather systems	• Weather Challenge • Examination
CLO4 : be able to investigate atmospheric science concepts in laboratory experiments and relate the results to the atmosphere	• Laboratory

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

The course Moodle site will become available to students at least one week before the start of semester.

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

Teaching Strategies

This course explores the workings of the atmosphere, something we interact with every minute of our lives. If you observe something interesting, discuss it in the forums and try to explain it in terms of the processes we investigate during the course. Examples might be the formation of contrails; morning fog or frost; or rainbow.

The course is taught through pre-class consumption of background material, interactive classes and laboratory sessions.

Course Material includes readings from the course textbooks, supplementary notes on Moodle, lecture slides, videos, problem sets, and worksheets. Textbook readings, lecture slides/videos should be read/watched ahead of class. Problem sets and worksheets are not handed in or assessed but will help you to understand the core material especially in the lead-up to tests and the final exam. You should revise material regularly.

Classes provide an opportunity to explore and discuss the core material together to deepen understanding of concepts and how to apply them.

Laboratory experiments are designed to reinforce and develop some of the concepts in the course materials as well as develop measurements skills and provide hands-on exposure to

atmospheric science concepts. The experiment scripts provide background information and pre-lab exercises that must be finished prior to attending the laboratory. All the experimental work is conducted within the timetabled contact hours, and logbooks are handed in for marking at the end of each laboratory session.

Moodle is the platform that will be used for all course administration and distribution of course materials *except for textbooks*. It will also be used to run online asynchronous forums and *ad hoc* discussion groups, to turn in assessments, and for any other out-of-class activity. You should check Moodle before and after every class.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
2 class tests Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Not Applicable
Weather Challenge Assessment Format: Individual	5%	Start Date: in Week 11 Due Date: Week 12: 27 May - 31 May
Examination Assessment Format: Individual	35%	Start Date: Scheduled examination period Due Date: Not Applicable
Laboratory Assessment Format: Group	20%	Start Date: Week 2 Due Date: Week 12: 27 May - 31 May

Assessment Details

2 class tests

Assessment Overview

Not specified

Course Learning Outcomes

- CLO1 : be able to explain the theory of, and solve relevant problems on, the structure, sun geometry, energy balance, and optical properties of the atmosphere
- CLO2 : be able to explain the theory of, and solve relevant problems on, moisture, cloud development, cloud microphysics, and precipitation

Detailed Assessment Description

Two **class tests** on material covered since the previous class test.

Assessment Length

1 hours for each test

Submission notes

Handwritten only

Assessment information

These will be held in Weeks 6 (Wednesday April 3 – CLO 1), and Week 10 (Friday May 17 – CLO 2)

Assignment submission Turnitin type

This is not a Turnitin assignment

Weather Challenge

Assessment Overview

1 weather challenge quiz on real phenomenon relating to the lecture material

Course Learning Outcomes

- CLO1 : be able to explain the theory of, and solve relevant problems on, the structure, sun geometry, energy balance, and optical properties of the atmosphere
- CLO2 : be able to explain the theory of, and solve relevant problems on, moisture, cloud development, cloud microphysics, and precipitation
- CLO3 : be able to explain the theory of, and solve relevant problems on, atmospheric dynamics, the general circulation, and weather systems

Detailed Assessment Description

An image of an atmospheric phenomenon will be loaded up under the Weekly tab on Monday in Week 11 and a response to the question (no more than 4-6 sentences) relating back to class content will be due Friday in Week 12 via Turnitin on Moodle (CLOs 3)

Assessment Length

2 weeks

Submission notes

Both hand-written and printed

Assessment information

Use of Generative Artificial Intelligence (AI):

SIMPLE EDITING ASSISTANCE: For this assessment task, 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 answer the question.
If the use of generative AI such as ChatGPT is detected, it will be regarded as serious academic

misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Examination

Assessment Overview

Not specified

Course Learning Outcomes

- CLO1 : be able to explain the theory of, and solve relevant problems on, the structure, sun geometry, energy balance, and optical properties of the atmosphere
- CLO2 : be able to explain the theory of, and solve relevant problems on, moisture, cloud development, cloud microphysics, and precipitation
- CLO3 : be able to explain the theory of, and solve relevant problems on, atmospheric dynamics, the general circulation, and weather systems

Detailed Assessment Description

A 3-hr **final comprehensive exam** held during the scheduled examination period (35%) (CLO 1, 2, 3 – weighted more to CLO 3)

Assessment Length

3 hours

Submission notes

Hand written only

Assignment submission Turnitin type

Not Applicable

Laboratory

Assessment Overview

4 laboratory exercises with prelab preparation

Course Learning Outcomes

- CLO4 : be able to investigate atmospheric science concepts in laboratory experiments and relate the results to the atmosphere

Detailed Assessment Description

A 12-hour **laboratory** program, timetabled over four 3-hr periods (CLO 4)

Assessment Length

3 hours each

Assignment submission Turnitin type

Not Applicable

Hurdle rules

Students must achieve at least 50% in order to pass the course

General Assessment Information

General Rule for Use of Generative Artificial Intelligence (AI) in UNSW Assessments:

NO ASSISTANCE: It is prohibited to use any software or service to search for or generate information or answers for all assessments except for assessment task of "Weather Challenge ". If its use 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

Each CLO (CLOs 1-4) is unambiguously identified in assessments and the cumulative score across assessment pieces determines the grade for each CLO. The total 100% achievable for the course is distributed across the CLOs as indicated in the Outcomes-Assessment Matrix. Students must achieve at least 50% in every course learning outcome in order to pass the course.

Learning occurs over the entirety of the semester. Therefore, no single assessment item completely ensures that a learning outcome has been met.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	Structure of the Atmosphere
Week 2 : 4 March - 8 March	Lecture	State of the Atmosphere
Week 3 : 11 March - 15 March	Lecture	Earth-Sun Geometry and the seasons
Week 4 : 18 March - 22 March	Lecture	Solar Radiation and Energy Balance
Week 5 : 25 March - 29 March	Lecture	Atmospheric Optical Effects
Week 6 : 1 April - 5 April	Lecture	Moisture Variables and Adiabatic Processes
Week 7 : 22 April - 26 April	Lecture	Pseudo-adiabatic Processes
Week 8 : 29 April - 3 May	Lecture	Atmospheric Stability and Clouds
Week 9 : 6 May - 10 May	Lecture	Precipitation and Microphysics
Week 10 : 13 May - 17 May	Lecture	Microphysics
Week 11 : 20 May - 24 May	Lecture	Atmospheric Dynamics
Week 12 : 27 May - 31 May	Lecture	General Circulation and Air Masses
Week 13 : 3 June - 7 June	Lecture	Weather Systems

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings. Students are indeed expected to attend all lectures, tutorials, 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 four classes and one laboratory session scheduled per week. You are expected to attend all scheduled classes.

Classes: Wednesday 1300-1400 and Thursday 1000-1100 in LEC/A: 2 Sem 06, and Friday 1500-1700 in LEC/A: 3 Lec Sth 03 unless online or otherwise advised.

Laboratory Sessions: Four 3-hour laboratory sessions scheduled Wednesday 1400-1700 in PEMS lab 2A (Bldg 26). Laboratory sessions are currently scheduled for weeks 2-5, and 8-11. Groups will be distributed through Moodle. Labs have pre-lab exercises, which need to be done prior to

the lab itself. The activities to be undertaken are:

1. Sun geometry
2. Humidity and atmospheric density;
3. Boundary layer wind profiles; and
4. Density currents.

Course Resources

Prescribed Resources

Compulsory Texts:

Meteorology Today by **C. Donald Ahrens and Robert Henson**, 12th Ed. pub. Brooks/Cole, Cengage Learning, 2018.

Atmospheric Science – An Introductory Survey by **John M. Wallace and Peter V. Hobbs**, 2nd Ed. Pub. Elsevier.

Equipment:

A (non-programmable) scientific calculator *without* stored memory is required for this course.

Recommended Resources

Recommended Internet Site:

Australian Bureau of Meteorology: http://www.bom.gov.au/

Additional Costs

n/a

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 lecturers; the "On-going Student Feedback" link in Moodle; SSCI Student-Staff Liaison Committee meetings; and

informal feedback conducted by staff. 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
Lecturer	Difei Deng		Room 107, Building 26	n/a	Available for consultation during normal working hours. Please email to make an appointment.	Yes	Yes

Other Useful Information

Academic Information

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 each 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 (where applicable). Student opinions really do make a difference. Refer to the Moodle site for your 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.

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.