ENVE216

The Atmospheric Environment

S1 Day 2015

Dept of Environmental Sciences

Contents

General Information

Unit convenor and teaching staff
Convenor
Kevin Cheung
kevin.cheung@mq.edu.au

Lecturer
Stuart Browning
stuart.browning@mq.edu.au

Credit points
3

Prerequisites
ENVE117(P) or GEOS117(P) or GEOS112(P) or 3cp in PHYS units at 100 level

Corequisites

Co-badged status

Unit description
This unit provides an introduction to the major atmospheric, oceanic and other environmental processes that are responsible for our weather and climate. The unit builds on themes introduced in ENVE117 and GEOS112 with a focus on Australian region weather and climate. Specific themes include: atmospheric energy, wind systems, water in the atmosphere, meteorological analysis of weather systems and weather forecasting. Severe weather events such as tropical cyclones, thunderstorms, hail and tornadoes are discussed, and each year an operational meteorologist will contribute to our teaching program. Besides the regular lectures, online training modules are available to enhance the understanding of lecture topics. Assessment tasks in the unit include peer discussion, project-based reports and formal examination. While mathematical skills at HSC level are beneficial to completing some of the assessment tasks in the unit, conceptual understanding of weather and climate phenomena is emphasized.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Understand the fundamental principles on which meteorology and climatology are based
Understand important meteorological and oceanic processes which shape weather and climate
Recall and appropriately utilise meteorological and climatological terminology
Recognise and appropriately utilise basic equations which govern weather and climate
Apply basic concepts and equations to practical (real world) problems
Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
Conceptualise and apply simple models relating to weather and climate processes

Assessment Tasks

Name	Weighting	Due
Competency Test	0%	N/A
Atmospheric Stability	15%	Week 5
Horizontal Motion of Air	15%	Week 7
Weather Tipping Competition	30%	Week 12
Examination	40%	TBA

Competency Test

Due: **N/A**
Weighting: **0%**

The competency test is not a formal assessment, but you are encourged to attempt the questions until you are able to answer them all correctly. The purpose is to identify weaknesses in your learning and gain confidence to move on.

On successful completion you will be able to:

- Understand the fundamental principles on which meteorology and climatology are based
- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology

Atmospheric Stability

Due: **Week 5**
Weighting: **15%**

This assignment consists of questions on the representations of moisture in the atmosphere and the concept of stability. Answers are in the form of numerical and graphical analysis, written explanation and supports from drawn diagrams.

On successful completion you will be able to:

- Understand the fundamental principles on which meteorology and climatology are based
- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)

Horizontal Motion of Air

Due: **Week 7**
Weighting: **15%**

This assignment consists of numerical questions on the various types of horizontal motion of air or winds, and their responsible driving forces. Understanding of the governing equations and applications of them in algebric calculations are expected.

On successful completion you will be able to:

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- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Recognise and appropriately utilise basic equations which govern weather and climate
- Apply basic concepts and equations to practical (real world) problems
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)

Weather Tipping Competition

Due: **Week 12**
Weighting: **30%**

The Weather Tipping Competitive (http://tipping.amos.org.au/dist/pages/index.php#static/home) is a game open to the public organised by the Australian Meteorological and Oceanographic Society (AMOS). The game will start from March and last for about 10 weeks (rounds). Students are asked to participate in this game, but instead of just putting out your forecasts (of temperatures and rainfall) you are requested to document your reasonings behind the forecasts based on the concepts learnt from this unit. A case study on a weather system using meteorological analysis techniques is also required in the report. A more detailed description of this assessment will be released.

On successful completion you will be able to:

- Understand the fundamental principles on which meteorology and climatology are based
- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
- Conceptualise and apply simple models relating to weather and climate processes

Examination

Due: **TBA**
Weighting: **40%**

Exam date, structure, etc., will be available later in the semester. The exam is run through the formal university examination process. The exam structure may take the form of numerical, short answer and/or essay questions. You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in draft form approximately 8 weeks before the commencement of the examinations and in final form approximately 4 weeks before the commencement of the examinations. (http://www.timetables.mq.edu.au/exam) The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. You are advised that it is Macquarie University policy not to set early examinations. All students are expected to ensure that they are available until the end of the teaching semester; that is the final day of the official examination period.

On successful completion you will be able to:

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- Recall and appropriately utilise meteorological and climatological terminology
- Recognise and appropriately utilise basic equations which govern weather and climate
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- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
- Conceptualise and apply simple models relating to weather and climate processes

Delivery and Resources

This year the unit will be conducted using the 'Flipped Classroom' model. That is, instead of running the regular lectures and practical sessions, online modules developed by the convenor and the Learning and Teaching Centre have been developed to learn the necessary background knowledge at your own times. These online modules are in the form of sequences in the Learning Activities Management System (LAMS), which has been builted into iLearn. External online resources developed by other educational institutes and publishers will also be utilised, and if login information are necessary other than iLearn they will be delivered to you by the convenor.

Besides the times you spend on learning from the LAMS, you are to finish the assessment tasks set for the unit, which consist of two regular assignments and a research report based on your experience of participating in the Weather Tipping Competition organised by AMOS. Under this 'Flipped Classroom' model, the convenor and other instructors of this unit will be your consultants to help you learn from the online resources and work out the assessment tasks. We are going to use the contact hours (i.e., the lecture and practical sessions set in the university timetable) in very flexible ways. These **contact hours** for this year are

Monday 11 am - 12 pm (E5A 120); Friday 12 pm - 1 pm (E7B 263)

Monday 12 pm - 2 pm (E5A 270); Wednesday 12 pm - 2 pm (E5A 260 and 270)

Group meetings with the convenor will be arranged on regular basis such that we know about the progress of your learning. Because there will be no recorded lectures for this year, we do not have to access the Echo360 system. For both the internal and external students, a computer with internet access, web browser, Microsoft Office or equivalent word processing tool and software to read 'pdf' documents is necessary to access the online teaching modules and completing the assessment tasks. For the internals, if you need the computers in our laborabories to perform your work, they are always available within the designated 'practical' sessions outlined above.

Although lecture notes will be given in the online modules, we still have a recommended textbook for you to do more detailed readings after you completed the online resources. The recommended textbook is **The Weather and Climate of Australia and New Zealand (Second Edition, Oxford University Press) by A. Sturmana dn N. J. Tapper (2006)**. Other useful

reference books include Understanding Weather and Climate (Sixth or Seventh Edition, Pearson) by E. Aguado and J. E. Burt (2013/2015) and Meteorology Today (Tenth Edition, Cengage Learning) by C. D. Ahrens (2013), which are accessible from the Univeristy Library.

Unit Schedule

Based on our 'Flipped Classroom' teaching model this year, there will be no regular lectures (except the first one) and practical sessions. The online modules and asessment tasks will cover the following themes and topics:

Introduction and Course Overview (23 February, please come to the classroom for first meeting)

Theme **Energy**: Radiation; Energy Balance; Hydrostatic Balance

Theme **Winds**: General Circulation; Ocean Circulation; Horizontal Motion

Theme **Water**: Water in the Atmosphere; Atmospheric Stability; Clouds and Precipitation; Microphysics

Theme **Meteorological Analysis**: Synoptic-scale Circulation; Weather Systems; Monsoon; Mesoscale Processes; Weather Forecasting

Theme **Climate**: Weather and Climate

Learning and Teaching Activities

Understanding Tropical Cyclone Trial Module

Before we formally commence our teaching session, there will be a trial module called 'Understanding Tropical Cyclone' available for access in iLearn for you to go through. This module was developed by our Education Department under the Opening Real Science project supported by the Office of Learning and Teaching. Although the name of the module is Tropical Cyclone, it is actually a general module to test your understanding on the physical environment, such as the concept of air pressure, temperature and moisture, and how they are related to severe weather such as that found in the storms. This module is a good way to kickstart this unit on the atmospheric environment, and would be especially useful for those who have not a strong background on physical geography. A separate invitation email will be sent to those who have already enrolled in this unit to participate in this trial module, and more details about this project including the method of access will be found there.

Student Workload

You are expected to spend a minimumof 9 hours per week on this course. Given the new teaching model we apply this year, you can learn with your own available time. However, it is recommended that you follow this sequence of study each week: 1. Go through the online modules in the order set by the instructor, perform the activities and quizzes suggested by the module and participate in the topic-specific discussion forum. 2. Do the recommended reading for each module. 3. For the internal students, participate in the group discussion meetings organised by the instructor. 4. Set aside time a few hours each week to work on assignments

and projects for the assessments. 5. Engage in discussion regarding to any aspects of the course through the discussion board in iLearn.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Recognise and appropriately utilise basic equations which govern weather and climate
- Apply basic concepts and equations to practical (real world) problems
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
- Conceptualise and apply simple models relating to weather and climate processes

Assessment tasks

- Atmospheric Stability
- Horizontal Motion of Air
- Weather Tipping Competition
- Examination

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement.

They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Recognise and appropriately utilise basic equations which govern weather and climate
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
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Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Apply basic concepts and equations to practical (real world) problems
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
- Conceptualise and apply simple models relating to weather and climate processes

Assessment tasks

- Atmospheric Stability
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Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Understand the fundamental principles on which meteorology and climatology are based
- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Recognise and appropriately utilise basic equations which govern weather and climate
- Apply basic concepts and equations to practical (real world) problems
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
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Assessment tasks

- Competency Test
- Atmospheric Stability
- Horizontal Motion of Air
- Weather Tipping Competition
- Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to

have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understand the fundamental principles on which meteorology and climatology are based
- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Recognise and appropriately utilise basic equations which govern weather and climate
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Assessment tasks

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- Horizontal Motion of Air
- Weather Tipping Competition
- Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Recognise and appropriately utilise basic equations which govern weather and climate
- Apply basic concepts and equations to practical (real world) problems
- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)

- Analyse and evaluate categorical and numerical data (e.g., interpreting environmental data)
- Conceptualise and apply simple models relating to weather and climate processes

Assessment tasks

- Atmospheric Stability
- Horizontal Motion of Air
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- Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Acquire field skills to collect data by measurement or observation (e.g., familiarity with the use of basic meteorological instruments)
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology
- Conceptualise and apply simple models relating to weather and climate processes

Assessment tasks

- Atmospheric Stability
- Horizontal Motion of Air
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- Examination

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Recall and appropriately utilise meteorological and climatological terminology
- Apply basic concepts and equations to practical (real world) problems
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology

Assessment tasks

- Competency Test
- Atmospheric Stability
- Horizontal Motion of Air
- Weather Tipping Competition
- Examination

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Understand important meteorological and oceanic processes which shape weather and climate
- Recall and appropriately utilise meteorological and climatological terminology
- Critically evaluate scientific literature in the fields of meteorology, oceanography and climatology

Assessment tasks

- Competency Test
- Atmospheric Stability
- Horizontal Motion of Air
- Weather Tipping Competition
- Examination

Changes from Previous Offering

New teaching model

For the first time in this unit, we are going to offer this unit mostly through online resources and without the regular lectures and practical sessions. While these will provide a high level of

flexibility to students in term of learning schedule, the success of this model depends on the active participation of the students and their well planned study timetable. Therefore, you are encouraged to make use of the available platforms to comunicate with the instructors and peers including emails, iLearn forums and face-to-face group meetings organised by the instructors.

Learning through a weather forecasting game

Research-based projects as assessment tasks, such as the meteorological analysis report in 2014, has been introducted to this unit from previous offerings. This year we further emphasize this learning strategy by expanding such mini project to include participation of a weather forecasting game. By thinking like an operational weather forecaster, students will learn how to apply the principles of weather systems on the real environment.