ENVS804

Climate Change and The Climate System

S1 Day 2018

Dept of Environmental Sciences

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General Information

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Credit points
4

Prerequisites
Admission to MEnv or MSc or GradDipEnv or GradCertEnv or MWldMgt or MConsBiol or GradDipConsBiol or MMarScMgt or MSusDev or GradDipSusDev or GradCertSusDev or MPlan or PGDipSc in Biodiversity Conservation

Corequisites

Co-badged status

Unit description
Global climate change is one of the important issues facing humanity in the 21st century; the ability to mitigate or adapt to projected climate changes depends on developing an integrated perspective on the physical, biological, biogeochemical, socio-economic and cultural factors that influence the climate system. This unit focuses on the scientific framework for understanding the mechanisms of climate change, and covers (a) the physics of the climate system, (b) the multiple drivers of climate change, (c) the role of physical and biogeochemical feedbacks in the climate system, (d) climate change projections and (e) how socio-economic, biophysical and biogeochemical feedbacks could modulate future changes. It will provide students with the background to critically evaluate current understanding of the complex interactions that determine climate trajectories and the reliability of the tools used to make climate-change and climate-impact projections.

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:

Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources

Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge

Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System

Able to apply climate change theory to novel situations in order to diagnose and solve problems

Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment Tasks

Name	Weighting	Hurdle	Due
Online Test 1	10%	Yes	25/03/2018
Online Test 2	10%	Yes	15/04/2018
Research Report	35%	No	27/05/2018

Name	Weighting	Hurdle	Due
Final examination	45%	No	S1 exam period - TBC

Online Test 1

Due: **25/03/2018**
Weighting: **10%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This test will require you to understand the material and interpret data in the light of information covered in the first 4 weeks of lectures and tutorial readings.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System

Online Test 2

Due: **15/04/2018**
Weighting: **10%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This test will require you to understand the material and interpret data in the light of information covered in the weeks 5-7 of lectures and tutorial readings.

On successful completion you will be able to:

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System

Research Report

Due: **27/05/2018**

Weighting: **35%**

The major assessment for this unit is to write a review article suitable for submission to the journal *Nature Climate Change*, which is one of the most widely read peer-reviewed journals in environmental sciences (5-year impact factor 21.108) and covers all aspects of research on global warming.

Many global warming articles in popular press and social media are based on peer-reviewed research published in academic journals such as *Nature Climate Change*.

Your task is to select a weather or climatic phenomenon, which can be a type of extreme weather event such as tropical cyclones or a large-scale phenomenon such as El Nino Southern Oscillation, and write a review article crtically summarising recent research on a topic related to that phenomenon.

Author guidelines for a review article can be found at the *Nature Climate Change* website:

http://www.nature.com/nclimate/authors/gta/content-type/index.html

Prior to selecting your topic you should read some existing review articles to gain an appreciation of the type and standard of article expected. Good examples would be:

Diaz, D., and F. Moore, 2017: Quantifying the economic risks of climate change. *Nature Climate Change*, **7**, 774-782.

Jones, J. M., et al., 2016: Assessing recent trends in high-latitude Southern Hemisphere surface climate. *Nature Climate Change*, 6, 917-926.

Cai, W., et al., 2015: ENSO and greenhouse warming. *Nature Climate Change*, **5**, 849-859.

In your article you should

- address current knowledge and uncertainties surrounding your selected phenomenon
- detail how your selected phenomenon is expected to change (including uncertainties) over the next 100 years with reference to current research and the latest IPCC report
- focus on the implications to the environment, society and to the economy
- discuss the viability of any proposed mitigation and/or adaptation policies

You may use previously published figures where appropriate. However, **at least one of your figures must be produced by yourself** using data obtained from a reliable source. Examples would be ploting storm frequency over the past 100 years from the Australian Bureau of Meteorology tropical cyclone database, or ploting historical rainfall maps based on the Bureau's climate data archive.

Your article - including word length, number of figures and citation style - must conform to the Nature Climate Change Author Guidelines for a Review Article.

You must submit your assignment via Turnitin.

On successful completion you will be able to:

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- Able to apply climate change theory to novel situations in order to diagnose and solve problems
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Final examination

Due: **S1 exam period - TBC**
Weighting: **45%**

The examination will consist of multiple choice questions, short answers and a choice of essay questions.

This will test your ability to appropriately use terminology, concepts and contemporary climate change issues learnt in lectures, tutorials and practicals, subject readings as well as materials that have been uploaded to the iLearn Discussion Forum.

On successful completion you will be able to:

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Delivery and Resources

Resources:

The basic resource for this unit is the Working Group I Contribution to the Fifth Assessment Report (AR5) for the Intergovernmental Panel on Climate Change (IPCC), particularly the Technical Summary and the Summary for Policy Makers. For more details, read the individual

chapters from the WG1 report. These documents can be downloaded from the IPCC website:

http://www.ipcc.ch/report/ar5/wg1/

Delivery:

Lecture: Thursday 12:00 pm to 1:00 pm at 2 Innovation Road (previously known as EMC^2) G220

Tutorial: Thursday 1:00 pm to 3:00 pm at 2 Innovation Road (previously known as EMC^2) G220

Lectures, readings and other supporting material will be available on iLearn. Email and iLearn will be the principle methods of communication in this unit. The lectures and tutorials/practicals will be recorded using the ECHO360 system.

https://ilearn.mq.edu.au/login/index.php

We expect you to use iLearn to:

- Regularly check subject announcements
- Read and contribute to the Discussion Forum
- Download lecture materials
- Download tutorial and practical materials and resources
- Download reference materials
- Check your grades

Assessment Tasks:

It is your responsibility to ensure that you understand all the requirements for the assessment tasks. Contact the Unit Convenor or lecturers if you have any concern or query with the unit content or assessments.

No extensions will be granted on assessment tasks unless an application for "Disruption of Studies" has been submitted and approved.

http://studentadmin.mq.edu.au/disruption_to_studies.html

You must notify the University if any type of potential disruption to your studies via Ask MQ.

Students who have not submitted an assessment task by the due date will be penalised 5% per day.

Attendance:

Students enrolled in "internal mode" for this unit are expected to attend all lectures and tutorials/practicals. Students enrolled in "external mode" are expect to contribute to online discussions and tutorials sesions. Please notify the Unit Convenor for any queries related to attendance.

Unit Schedule

Lecture / Tutorial Schedule:

WEEK 1 (1 March) - Atmospheric Composition and Climate / Timescales in Climate (KC)

WEEK 2 (8 March) - Timescales and Patterns of Climate Variability / Climate Data in Giovanni (KC)

WEEK 3 (15 March) - The Climate System: Atmospheric Circulation / Introduction to Matlab (KC)

WEEK 4 (22 March) - The Climate System: Ocean Circulation / Reanalysis Datasets (KC)

Sunday 25 March - Assessment 1 Online Test 1 Due

WEEK 5 (29 March) - Climate Modelling and Climate Change / Correlation Analysis (KC)

WEEK 6 (5 April) - Evaluation of Model Uncertainty / CMIP5 Global Change Viewer (KC)

WEEK 7 (12 April) - Future Climate Forcings: Projections and Uncertainties / SRES and RCP (KC)

Sunday 15 April - Assessment 2 Online Test 2 Due

**** Semester Break ****

WEEK 8 (3 May) - Projections of Climate Changes in the 21st Century / Trend Analysis (SB)

WEEK 9 (10 May) - Projections of Changes in Water Balance and Hydrology / Southern Australian Streamflow (SB)

WEEK 10 (17 May) - Projections of Sea-level and Oceanic Changes / Ocean Change Analysis (SB)

WEEK 11 (24 May) - Projections of Extremes: Castrophic Events, Tipping Points and Climate Surprises / Analysing Climate Data from BoM (SB)

Sunday 27 May - Assessment 3 Research Report Due

WEEK 12 (31 May) - The NARCliM Project / Future Extremes Events in NSW (KC)

WEEK 13 (7 June) - Unit Summary and Revision (KC)

Session 1 exam period (date and time to be confirmed) - Assessment 4 Final Exam

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Lecturers: KC = Dr Kevin Cheung, SB = Dr Stuart Browning

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy

- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

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

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
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- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System
- Able to apply climate change theory to novel situations in order to diagnose and solve problems
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen

fields.

This graduate capability is supported by:

Learning outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System
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- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System
- Able to apply climate change theory to novel situations in order to diagnose and solve problems

- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Able to handle scientific uncertainty and complexity with respect to current climate change and its impacts on the Earth System
- Able to apply climate change theory to novel situations in order to diagnose and solve problems
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- Capable of researching, interpreting, and assessing data on climate change and drawing connections across fields of knowledge
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcomes

- Capable of analysing, questioning, and synthesising knowledge about the causes of climate change from a range of sources
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- Able to apply climate change theory to novel situations in order to diagnose and solve problems
- Confidently communicate and convey opinions on climate change science in forms appropriate to different audiences

Assessment tasks

- Online Test 1
- Online Test 2
- Research Report
- Final examination