



# ENVE301

## Climate Change, Coasts and Oceans

S2 Day 2014

*Dept of Environment & Geography*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Unit Convenor

Ian Goodwin

[ian.goodwin@mq.edu.au](mailto:ian.goodwin@mq.edu.au)

Contact via [ian.goodwin@mq.edu.au](mailto:ian.goodwin@mq.edu.au)

E8C163

Credit points

3

Prerequisites

39cp including (ENVE216(P) or GEOS216(P))

Corequisites

Co-badged status

Unit description

Our oceans regulate and drive climate change, whilst the coastal and shelf environments experience some of the greatest impacts of climate change. This unit provides students with a comprehensive understanding of these interactions and impacts on a range of scales (ocean basin to regional coast) and time scales (past millennia to future decades). The unit is taught in four modules: ocean basin climate; palaeoclimatology and palaeoceanography of ocean basins; shelf oceanography; and near-shore and coastal climate change.

Module 1 is based on coupled ocean-atmosphere processes and investigates the changes in the thermohaline circulation, sea-surface temperatures, ocean gyres and eddies, surface wind-fields, marine clouds and precipitation, and storm tracks.

Module 2 investigates the past circulation of the ocean and atmosphere, including: palaeo wind-fields; palaeo sea-level changes; palaeo sea-surface temperature and salinity; and palaeo changes in climate modes such as ENSO.

Module 3 focuses on the ocean basin boundary currents, and wave climate change, with a strong focus on the eastern margin of Australia.

Module 4 examines large-scale coastal behaviour in response to climate change, such as wave climate change, sea-level change, coastal winds, coastal precipitation, and freshwater discharge and their alteration of sediment transport paths.

## 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:

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
- Investigate marine climate change using the archive of paleoclimate data, instrumental observations and modelled projections
- Understand the use of climate models to explore ocean-atmosphere change
- Explore the internal variability of our marine climate system,
- Develop an understanding of marine weather and observational data,
- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes
- Identify and attribute the causes of coastal change
- Explore the mechanisms of sea-level change and impacts on regional coasts
- Analyse wave climate data and determine the impact of extreme vs modal wave climate change on coasts
- Synthesise the impacts of marine climate change on the range of spatial-temporal scales

## General Assessment Information

Details and specific requirements of each assignment will be given in the lectures, practicals and posted on the ENVE301 website.

### ASSIGNMENT DEADLINES, RULES AND ADVICE

Assignments must be completed and submitted, on time and in full, in order to receive credit. Penalties for late assignments will be a minimum of 10% per day or part thereof, beginning at 0900, not at some time later in the day.

These are real deadlines and penalties will be imposed for late submission. Allowing some students to hand in assignments late is unfair to those who met the deadline.

The deadlines for assignments are not negotiable. Only a medical certificate or a letter with appropriate supporting documents outlining other serious, extenuating circumstances can be

used to submit an assignment after the due date without penalty. Vague medical certificates are unconvincing – they must indicate how the illness impacted your ability to perform the assignment on time. Such permission must be sought before the due date unless this is absolutely impossible. Let us know of problems in advance or as soon as possible, not after the event: we are likely to be much more sympathetic and flexible in our requirements if you follow this advice.

**All applications for extensions of deadlines for Assignments must be submitted to A/Prof Ian Goodwin.**

Please note the policy on word limits for these assignments

- Penalties apply for excessive length (10% for every 200 words exceeding the limit).
- Diagrams, figures, reference lists and footnotes don't count in the word tally.
- Inclusion of the chart used by the lecturer in setting the question doesn't count in the word tally.

While not as important as content, the stylistics and presentation of your written work are still significant. You must express your ideas clearly and succinctly. **Word limits will be enforced** (see policy above), so you must take care to stick to the point. Leave plenty of space for comments: wide margins all round (3 cm is fine), and 1.5 line-space your work.

If you experience difficulty achieving a good standard in your written presentations, please talk with your course convenor directly. The University offers excellent writing courses and resources designed to help you deal with what could potentially become a career-limiting problem if you lapse into denial about it.

Assessment of assignments will be based on the Macquarie University scale as set out in the Handbook of Undergraduate Studies (the "Calendar"): *High Distinction (HD)*, *Distinction (D)*, *Credit (Cr)*, *Pass (P)*, *Pass Conceded (PC)*, *Fail (Fail)*. The markers may choose to further refine these grades by appending "+" or "-" to indicate work towards the top or the bottom of each grade's band of marks. Feedback will also come in the form of written comments on each student's assignments, as well as general comments directed to the entire class after all marked assignments have been returned (typically in class or via the online *Discussion Forum*). Assignments are generally marked and returned with a two-week turnaround (except if they are submitted late).

## **Citing and Referencing**

**NB: References should ideally be restricted to peer-reviewed literature, government policies and official publications. The use of web sites MUST be restricted to government departments or peer-reviewed scientific information. The referencing of blogs, special interest groups, media is rarely suitable, nor is the use of popular books. If in doubt, please check with the academic staff.**

There are several systems of acknowledging your sources and other relevant work. The main requirements are clarity, consistency and the provision of all relevant bibliographic information so that someone else can easily find the source you are citing. Select a style and be consistent with your usage of it. A good system widely adopted in the physical and environmental sciences is the "Harvard" or "author-date" method, where a brief reference to the source is given in the main text. Four examples of within-text referencing are;

- The sun is hot (Smith, 1978, pp. 4-5).
- According to Smith (1978, pp. 4-5), the sun is hot.
- Others have contested that the sun was hot, citing a lack of detailed information (Jones & Bloggs 1979).

Where there are **more than two authors**, you can abbreviate their names with a handy bit of Latin, "*et alia*" or "*et al.*" (literally meaning "and others"). And being Latin, we should *italicize* the font;

- Smith *et al.* (1981), in their reply to Jones and Bloggs (1979), presented additional data confirming that the sun is indeed hot.

Notice that I used an ampersand ("&") within brackets only (c.f. Jones & Bloggs) but not in the running text.

Full bibliographic details of all sources cited must be listed in a "Reference List", in alphabetic order of authors, at the end of the report. There, you should include details of the author(s), year of publication and specific pages (if required). Examples of how to construct a Reference List include;

For a **book** give: author(s), year of publication, title, publisher, and place of publication.

- Smith, K. 1994. *The Geography of Environment*. Jones Books, London.

For a **journal article** give: author(s), article title, journal name, volume number, issue number (in parentheses) and pages.

- Smith, K. and Jones, I. 1995. The Australian environment. *Geographical Review* 68(5), 99-111.

For a **chapter in an edited book**, give the following details:

- Smith, K. 1996. Seeing the Australian environment. In Jones, E. (editor) *Global Environment*. University Publishers, Melbourne, pp. 100-112.

Don't use "et al." in a reference list; spell out all authors. Our preference is also to include full journal names, not abbreviations.

To reference a **lecture** (which is not generally encouraged because ENVE301 assignments are supposed to stretch you beyond the lectures), you might use the following format:

- Flannery, T., ENVE301 lecture, 6th November, 2008, Macquarie University.

For a **web source** we have to ensure that - (a) authors get credit where it is due, and (b) sufficient detail is given for readers to be able to visit the site. For example, a reference to a Department of Environment and Conservation website in the text would be "DEC (2006)", and in the reference list this would expand to;

- DECC (NSW Department of Environment and Climate Change) 2008. NSW Department of Environment and Climate Change, incorporating Environment Protection Authority.

<http://www.environment.nsw.gov.au/home.htm> (accessed 05 August 2008).

This gives the author (in this case a corporate entity) credit for their web page, the date of their most recent update to their site, the name/title of the web site, the full URL location of their web site, and finally, the date on which you accessed their web site.

## **Submission of Assignments**

Assignments must be submitted to the appropriate assignment box for your unit. Assignment boxes are located in the reception area of the Science Centre (E7A Level 1). Campus maps are available at [http://www.ofm.mq.edu.au/maps\\_campus.htm](http://www.ofm.mq.edu.au/maps_campus.htm). The Centre opens from 8.30 am to 5.30 pm on Monday to Friday; after-hours submissions should be submitted via a box at the southern doorway into E7A (i.e. the door that is nearest Building E5A). This box will only be accessible for use outside the normal business hours for the Science Centre.

All assignments are to be submitted by 9.00am on the date specified and must include a completed and signed coversheet stapled to the front cover. The Assignment Cover Sheet can be downloaded from the web at [http://www.science.mq.edu.au/documents/FoS\\_assignment\\_cov](http://www.science.mq.edu.au/documents/FoS_assignment_cov)

[ersheet\\_09.pdf](#). Please do not use any other folders, plastic sleeves, wallets or envelopes - these will not be returned.

If you need to hand in your work after the date in which the rest of the assignments have been returned to students, you may be set a different assignment, even if you have completed the original one. External Students must submit all assignments through COE according to their specific protocols (i.e. using their special bar-coded folders for each submission). If you know that you are going to hand in an assignment late, you must contact the course convenor beforehand. Unless there is the appropriate documentation, late assignments will be penalised or not marked.

### Obtaining Your Marked Assignment

Assignments will be returned within two teaching weeks of the submission date in the normally scheduled lectures or practical classes (so it is essential that you indicate your correct practical class timeslot on the assignment cover sheet). Assignments not collected will be returned later in the semester to the Science Centre and students may collect them there during working hours. Students will be required to show Student ID to collect assignments.

## Assessment Tasks

Name	Weighting	Due
<a href="#">Practical Reports</a>	50%	1 week after class
<a href="#">Research Assignment</a>	20%	13th October, 2014
<a href="#">Exam 1 &amp; 2</a>	30%	TBA

### Practical Reports

Due: **1 week after class**

Weighting: **50%**

10 Reports, each worth 5 marks

#### Variety of research, data analysis and computer-based tasks

On successful completion you will be able to:

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## Research Assignment

Due: **13th October, 2014**

Weighting: **20%**

Global to regional Coastal Change - Literature review, paper syntheses, report writing

On successful completion you will be able to:

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- Explore the internal variability of our marine climate system,
- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes
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## Exam 1 & 2

Due: **TBA**

Weighting: **30%**

Each exam 1 hour

**Material drawn from all lectures, tutorials, practicals and assignments**



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## Delivery and Resources

**Lectures** - There is one lecture each week. These are: Monday 11 am to 1 pm C4A 320 Tutorial Room

N.B. Lectures will be available on blackboard as powerpoint presentations in this unit. However, you are expected to attend and take notes during the live lectures. Illustrative material from the lectures will be made available from the ENVE301 web site: [www.learn.mq.edu.au](http://www.learn.mq.edu.au)

**Practicals / Tutorials** - There is ONE practical / tutorial each week: Monday 3- 6 pm E5A 260 PC Lab

These 2-3-hour “hands-on” classes will be in the computer laboratory (E5A 270). The practicals / tutorials are compulsory and are designed to help you work towards the assessable assignments, to allow you to build on lectures, reading and other material, and to develop some valuable generic skills.

The University expects that you devote 9 hours per week, in total, to a 3 credit point unit like ENVE301 - anything less will put you at a distinct disadvantage in terms of final grade. You must complete all practicals, tutorials and both assignments in order to be eligible to sit the final examination and complete the unit successfully.

### Suggested Workload Proportion

Course Component	Suggested Workload Hours
Lecture Attendance	26 hours
Weekly Reading	26 hours
Practicals – on campus, and reporting	36 hours
Research Assignments	40 hours

## Unit Schedule

Week	Date	Lecturer	Lecture Topic	Practical Topic	Assessment Due Dates
<b>Module 1 – Ocean Basin Climate Change – Observations, Proxy Data and Modelled Predictions</b>					
1	Mon 4th Aug	A/Prof Ian Goodwin	1. Introduction – Coupled Atmosphere-Ocean System in Time – Air –sea interaction, mixed layer, ocean basin heat and salt content and transport, sea-surface temperature, oceanic tunnel and atmospheric bridge, mean state and oscillation	No practical in week 1	
2	Mon 11 <sup>th</sup> Aug	A/Prof Ian Goodwin	2. Tropical –Subtropical Cells – Hadley Cell, Ocean basin windfields, ocean gyre circulation, ENSO, steric and dynamic sea-level, clouds and convergence zones SPCZ	Practical 1  Introduction to Climate Data and Matlab	
3	Mon 18 <sup>th</sup> Aug	A/Prof Ian Goodwin	3. Mid-Latitude –Extratropical tropospheric planetary waves, maritime storm tracks, and oceanic fronts, ACC, thermohaline circulation	Practical 2  Pacific Sea Surface Temperature and Salinity Data Analysis	Prac 1

4	Mon 25 <sup>th</sup> Aug	A/Prof Ian Goodwin	4. Modes of ocean-atmosphere variability and their predictability – The Pacific Ocean and Indian Ocean	Practical 3  Synoptic Typing/ MATLAB  Poama Forecasts	Prac 2
<b>Module 2 – Oceanic Island and Continental Shelf - Observations, Geohistorical Data and Modelled Predictions</b>					
5	Mon 1 <sup>st</sup> Sep	A/Prof Ian Goodwin	5. Ocean wave generation zones, propagation, wave climate data sources and extreme and modal wave climate analysis	Practical 4  Wave Climate Data Analysis	Prac 3
6	Mon 8 <sup>th</sup> Sep	A/Prof Ian Goodwin	6. Continental Shelf Oceanography -Boundary currents, coastal winds, wind-driven shelf currents, and wave-driven shoreface currents, sea-level anomalies, Australian and Antarctic Shelf examples	Practical 5  IMOS Data and EAC	Prac 4
7	Mon 15 <sup>th</sup> Sep	A/Prof Ian Goodwin	7. Oceanic island climate change – A paleoceanographic view from coral reefs	Exam No 1	Prac 5
Mid-semester break – two weeks					
8	Mon 6 <sup>th</sup> Oct	A/Prof Ian Goodwin	Public Holiday – No Lecture or Practical – Reading Assignment on Oceanic Islands		
<b>Module 3 –Nearshore and Coastal Change - Observations, Geohistorical Data and Modelled Predictions</b>					
9	Mon 13 <sup>th</sup> Oct	A/Prof Ian Goodwin	8. Continental Shelf to Coast – Seabed Characteristics and Shelf Processes (Waves, Currents and Sediment Transport)	Practical 6  Seabed Characterisation, Wave Refraction	Research Assignment:  Coastal Change
10	Mon 20 <sup>th</sup> Oct	A/Prof Ian Goodwin	9. Shoreface and surf zone processes (Field Lecture)	Field Practical 7	Prac 6
11	Mon 27 <sup>th</sup> Oct	A/Prof Ian Goodwin	11. Large scale coastal dynamics and sea-level change	Practical 8  Sea Level Data Analysis	Prac 7,
12	Mon 3 <sup>rd</sup> Nov	A/Prof Ian Goodwin	12. Large scale coastal dynamics and wave climate change	Practical 9  Coastline Planform Geometry, Wave Direction and Stability Assessment	Prac 8,

13	Mon 10 <sup>th</sup> Nov	A/Prof Ian Goodwin	13. Maritime Storms, coastal rainfall, inundation, storm wave climate and estuarine inlet dynamics	Practical 10  East Coast lows, Extreme Wave Climate and Extreme Rainfall Events	Prac 9
14	Mon 17 <sup>th</sup> Nov	A/Prof Ian Goodwin		Exam No 2	Prac 10

## 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](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](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](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/](https://students.mq.edu.au/support/student_conduct/)

## 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](http://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](http://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

### 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

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
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## **Assessment tasks**

- Practical Reports
- Research Assignment
- Exam 1 & 2

## **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**

- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
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## **Assessment tasks**

- Research Assignment
- Exam 1 & 2

## **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**

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
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## **Assessment tasks**

- Practical Reports
- Research Assignment
- Exam 1 & 2

## **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**

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
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- Understand the use of climate models to explore ocean-atmosphere change
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## **Assessment tasks**

- Practical Reports
- Research Assignment
- Exam 1 & 2

## **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**

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
- Understand the use of climate models to explore ocean-atmosphere change
- Explore the internal variability of our marine climate system,
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## Assessment tasks

- Practical Reports
- Research Assignment
- Exam 1 & 2

## 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

- Build on the prior knowledge on the climate system from ENVE216, and develop a new level of knowledge on how oceanic climate changes
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- Explore the internal variability of our marine climate system,
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## Assessment tasks

- Practical Reports
- Research Assignment

## 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

- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal

configuration changes

- Identify and attribute the causes of coastal change
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## **Assessment tasks**

- Practical Reports
- Research Assignment
- Exam 1 & 2

## **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**

- Investigate marine climate change using the archive of paleoclimate data, instrumental observations and modelled projections
- Investigate the modes of coastal evolution and climate variability, on decadal to millennial timescales, as a basis for interpreting modern trends and events in coastal configuration changes
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- Synthesise the impacts of marine climate change on the range of spatial-temporal scales

## **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**

- Investigate the components of marine climatology, surface oceanography, and atmosphere-ocean coupling,
- Investigate marine climate change using the archive of paleoclimate data, instrumental

observations and modelled projections

- Understand the use of climate models to explore ocean-atmosphere change
- Identify and attribute the causes of coastal change
- Explore the mechanisms of sea-level change and impacts on regional coasts
- Synthesise the impacts of marine climate change on the range of spatial-temporal scales

## Changes since First Published

Date	Description
28/02/2014	The Description was updated.