



## COURSE OUTLINE

ENS204

# Climate Change Mitigation and Adaptation

**Course Coordinator:** Luke Verstraten (lverstra@usc.edu.au) **School:** School of Science, Technology and Engineering

2021 | Semester 2

USC Sunshine Coast  
USC Moreton Bay

**BLENDED  
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

*Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.*

## 1. What is this course about?

### 1.1. Description

Two centuries of burning fossil fuels and clearing land have changed our climate and produced largely irreversible and almost exclusively negative impacts on the environment and our wellbeing. In this course you'll learn basic climate science and use software to model future temperature, precipitation and sea-level scenarios. You'll investigate impacts already occurring and the limits of people and ecosystems to adapt. Spoiler alert: major challenge. Don't despair, you'll then take over as global climate change negotiator and propose policies to transform the way we live to avert catastrophe.

### 1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
<b>BLENDED LEARNING</b>			
<b>Tutorial/Workshop 1</b> – Face-to-face workshop	2hrs	Week 1	13 times
<b>Laboratory 1</b> – Face-to-face computer lab	2hrs	Week 1	13 times

### 1.3. Course Topics

Module 1: Science Fundamentals of climate change science including: greenhouse gases, radiative forcing potential, carbon dioxide equivalency, natural climate forcing factors, emissions sources and sinks, climate sensitivity and feedback loops, thermohaline and vertical diffusivity, emissions scenarios, general circulation models, downscaling, spatial and other representations, IPCC Working Group 1.

Module 2: Adaptation Direct and indirect climate change impacts on natural and human systems; perturbation, resiliency, coping and adaptation; principles of adaptation, principles of assessment and evaluation; multi-criterion analysis and decision making; writing key messages. IPCC Working Group 2.

Module 3: Mitigation Greenhouse gas sources by region and economic sector; mitigation strategies and technologies by sector; national and global climate change mitigation strategies and policies; United Nations Framework Convention on Climate Change purpose, signatories, history, agreements, barriers to progress. IPCC Working Group 3.

## 2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

## 3. What is the unit value of this course?

12 units

## 4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES	GRADUATE QUALITIES
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...
<b>1</b> Demonstrate developing-level knowledge of the science of climate change including the main carbon sources and sinks, the characteristics of different greenhouse gases and their influence on global average temperatures and ocean acidity, and their current and trending emissions profile and likely climatic changes that will result.	Knowledgeable
<b>2</b> Demonstrate developing-level knowledge of the concept, principles, and limits of adaptation in relation to impacts from changes in temperature, precipitation, sea-level rise, storm intensity, and ocean acidification on human and natural systems and the be able to articulate factors that determine resilience and adaptive capacity.	Knowledgeable Creative and critical thinker Sustainability-focussed
<b>3</b> Demonstrate developing-level knowledge of the relationship between emissions and different sectors of economies and communities and be able to articulate policies and actions to reduce emissions, enhance sinks, and limit future change.	Knowledgeable Ethical Sustainability-focussed
<b>4</b> Demonstrate developing-level knowledge of climate change policy frameworks and other initiatives at different scales and the ethical and practical issues associated with setting and meeting substantive emission reduction targets, adapting to changes, and securing sustainable development.	Ethical

## 5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

### 5.1. Pre-requisites

Not applicable

### 5.2. Co-requisites

Not applicable

### 5.3. Anti-requisites

ENS310 and ENS320

### 5.4. Specific assumed prior knowledge and skills (where applicable)

A variety of online resources have been produced or curated to support your learning, enable you to succeed in the course, and prepare you for your career in environmental management, environmental science, planning, and community development. Resources include: detailed instructions and grading rubrics, relevant readings, library reserve materials, instructional and topic related pre-recorded video and audio material, recorded interviews with experts across a range of relevant disciplines.

## 6. How am I going to be assessed?

### 6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

## 6.2. Details of early feedback on progress

The delivery approach to the course is highly interactive. Course materials will include instructional videos and examples so that you can evaluate your own progress. You'll also receive early and ongoing formative feedback as part of the class during lectures and individually during the workshops. Class-level feedback will normally take the form of instructor observations on how the whole class is progressing, guidance on common pitfalls and strategies to excel in the tasks, and responses to student questions. Constructive peer-to-peer feedback will also be encouraged, and we'll help to facilitate that. You will be provided with detailed instructions and marking rubrics which will be explained at the start of the task. To ensure you receive regular and timely individual feedback, you'll have ongoing interactions with the instructors during the workshops in relation to your work as you are completing it rather than by submitting and receiving written feedback on drafts. You will however receive written summative feedback on your graded work so that you can improve your submissions from task to task. The instructors will also be available for office hours to help you succeed in the course.

## 6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Artefact - Technical and Scientific	Individual	30%	1000 words equivalent	Week 4	Online Assignment Submission
All	2	Case Study	Individual	30%	2000 words	Week 8	Online Assignment Submission
All	3	Plan	Individual	40%	2000 words	Exam Period	Online Assignment Submission with plagiarism check

### All - Assessment Task 1: Climate scenario poster

<b>GOAL:</b>	The goal of this task is to develop foundational knowledge of the process of generating and using climate scenarios and practical skills in communicating complex information to non-scientific audiences.													
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<b>CRITERIA:</b>	<table border="1"> <thead> <tr> <th>No.</th> <th></th> <th>Learning Outcome assessed</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Depth and breadth of knowledge demonstrated in relation to main carbon sources and sinks, the characteristics of different greenhouse gases and their influence on global average temperatures, precipitation, and ocean acidity.</td> <td>1</td> </tr> <tr> <td>2</td> <td>Appropriateness and accuracy of climate change scenario modelling method and quality and insightfulness of model outputs interpretation.</td> <td>1</td> </tr> <tr> <td>3</td> <td>Depth and breadth of creative communication skills and quality of technical skills apparent in the poster.</td> <td>1</td> </tr> </tbody> </table>	No.		Learning Outcome assessed	1	Depth and breadth of knowledge demonstrated in relation to main carbon sources and sinks, the characteristics of different greenhouse gases and their influence on global average temperatures, precipitation, and ocean acidity.	1	2	Appropriateness and accuracy of climate change scenario modelling method and quality and insightfulness of model outputs interpretation.	1	3	Depth and breadth of creative communication skills and quality of technical skills apparent in the poster.	1	
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2	Appropriateness and accuracy of climate change scenario modelling method and quality and insightfulness of model outputs interpretation.	1												
3	Depth and breadth of creative communication skills and quality of technical skills apparent in the poster.	1												

### All - Assessment Task 2: Climate change vulnerability case study

<b>GOAL:</b>	The goal of this task is to help you to gain foundational knowledge and technical skills to really dig into the impacts of changes in climate conditions on people and nature at a landscape level and economic sector level, identify a range of coping and adaptation strategies, and evaluate their suitability against commonly accepted adaptation principles using techniques such as multi-criterion assessment.
<b>PRODUCT:</b>	Case Study
<b>FORMAT:</b>	This is an engaging simulation-based task where you will be part of an interdisciplinary environmental management consulting group working on a simulated project. Your team will be provided with background information for the scenario. You'll model or research impacts of changes in temperature, precipitation, storm conditions, and sea-level rise and evaluate different possible adaptive responses against commonly accepted adaptation principles using techniques such as multi-criterion assessment. You will produce a consulting report in a style common to this type of work to help you build your knowledge and prepare you for a career in environmental management, planning, international development and similar fields. You will complete an individual component and contribute to a group submission.

CRITERIA:	No.	Learning Outcome assessed
	1	Depth and breadth of analytic skills associated with investigating hazards and potential impacts of different climate change related conditions on people, the economy, and the environment at a landscape level. <span style="float: right;">2 4</span>
	2	Depth and breadth of analytic skills associated with identifying and evaluating the suitability of different adaptation options using tools such as multi-criterion analysis analysis <span style="float: right;">2 4</span>
	3	Quality of communication skills in conveying the outcomes of the investigation in a style and format consistent with the context and audience. <span style="float: right;">2</span>
	4	Proficiency in acquiring and referencing knowledge from various sources. <span style="float: right;">2</span>

### All - Assessment Task 3: Global emissions reduction plan for UNFCCC

<b>GOAL:</b>	The goal of this task is to extend your climate modelling skills to more sophisticated global climate modelling while providing you with sound foundational knowledge of the global climate change institutional and policy framework. You will develop an understanding of the major issues and challenges associated with negotiating an international allocation of emission reduction targets by gas, time, and region, that is effective in avoiding catastrophic climate change but also informed by ethics and environmental justice issues, technology transfer barriers, special interest influences, poverty alleviation priorities, and trade-offs between current and future generations.	
<b>PRODUCT:</b>	Plan	
<b>FORMAT:</b>	In this simulation task, you will take on the role of Special Advisor to the Chair of the United Nations Framework Convention on Climate Change. You will be responsible for using actual global emissions data and the Model for the Assessment of Greenhouse Gas Induce Climate Change (MAGGIC) used by the IPCC to produce a plan for cutting global emissions by gas, region, and year sufficient to avoid a 2C global average temperature change. The plan will include: technical outputs and diagrams; strategies to address issues of equity, historic responsibility and future emissions growth; technology transfer and funding arrangements; and other features you see fit to include, such that it can be presented for discussion by 165 signatories to the UNFCCC at the next Convention of the Parties (COP) meeting. Effectively, you will produce a plan to save the world as we know it.	
<b>CRITERIA:</b>	No.	Learning Outcome assessed
	1	Extent of ability of technical skills to access and manipulate emissions data using spreadsheets and more advanced climate modelling software to produce future climate scenarios at a global level. <span style="float: right;">1 3</span>
	2	Depth and breadth of analytic skills associated with applying knowledge of greenhouse gas sources and characteristics in global climate modelling. <span style="float: right;">1 3</span>
	3	Depth and breadth of analytic skills associated with identifying and evaluating the suitability of different mitigation options against a range of established criteria. <span style="float: right;">3 4</span>
	4	Quality of communication skills in conveying the outcomes of the investigation and associated plan in a style and format consistent with the context and audience. <span style="float: right;">1 2 3 4</span>

## 7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

## 8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site– Please log in as soon as possible.

## 8.1. Prescribed text(s) or course reader

There are no required/recommended resources for this course.

## 8.2. Specific requirements

The course utilises SimCLIM and MAGICC climate change modelling software. The software is only available in specific Sippy Downs and Moreton Bay computer labs.

## 9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training for students](#), and following the instructions of the University staff.

## 10. What administrative information is relevant to this course?

### 10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

### 10.2. Assessment: Additional Requirements

#### Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%

The course is graded using the Standard Grading scale

You have not failed an assessment task in the course due to academic misconduct

### 10.3. Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate:

- 2.5% per day from the date identified as the due date for the assessment task. For example, submitting the task ten days late would result in a 25% penalty (out of a possible 100% marks for the task).
- A result of zero is awarded for an assessment task submitted after 15 days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

### 10.4. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the [Learning Advisers](#) web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au).

### 10.5. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to [Student Hub](#), email [studentwellbeing@usc.edu.au](mailto:studentwellbeing@usc.edu.au) or call 07 5430 1226.

## 10.6. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, [AccessAbility Services](#) can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to [Student Hub](#), email [AccessAbility@usc.edu.au](mailto:AccessAbility@usc.edu.au) or call 07 5430 2890.

## 10.7. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website: <http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

## 10.8. General Enquiries

### In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **USC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

**Tel:** +61 7 5430 2890

**Email:** [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)