Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates UG OBTL+ or PG OBTL+
If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to Data Transformation Status for more information.

Expected Implementation in Academic Year	AY2024/25
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Asst Prof Feng Lujia
Course Author Email	lfeng@ntu.edu.sg
Course Title	CLIMATE CHANGE
Course Code	ES1007
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	N/A
Co-requisites	N/A
Pre-requisite to	N/A
Mutually exclusive to	N/A
Replacement course to	N/A
Remarks (if any)	

Course Aims

This course is designed to provide you with a comprehensive and interdisciplinary introduction to the causes, impacts, and solutions of climate change from both the science and society perspectives. The course aims to address the whole complexity of climate change as an issue, by bringing together the science, technology, economics, and policy into one course. It covers the scientific concepts and principles of climate science, the evidence for and denial of climate change, the impacts and risks of climate change on natural and human systems, the mitigation and adaptation of climate change, and the ethical and political dimensions of climate change.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Explain and evaluate the evidence for human-caused climate change in the context of historical climate change.
ILO 2	Explain and quantify the impacts of climate change on human well-being and the natural world.
ILO 3	Evaluate options for reducing emissions (mitigation) and reducing the impacts of climate change (adaptation).
ILO 4	Critically evaluate the successes and failures of past national and international efforts to address climate change and evaluate prospects for future management of climate change.
ILO 5	Apply the knowledge gained by successfully communicating science and ideas to a broader audience.

Course Content

Climate change is a complex, contentious, and critical issue. It may well be the defining environmental challenge of the 21st century. Through this course, we will explore several important questions:

- What is the scientific basis for our understanding of climate change, and how certain is that scientific basis?
- What are the sources of emissions of greenhouse gases, and how do they affect climate?
- What changes in climate have we observed, and what changes might we expect in the coming decades?
- What are the impacts of these changes in climate for human well-being and the natural world?
- What technologies exist or could be developed to slow or tackle climate change?
- What international policies are necessary or preferred to address climate change, and how have the politics surrounding this issue evolved over time?
- How is Singapore addressing the issue of climate change?

Reading and References (if applicable)

Because climate change is a rapidly evolving study, this course will make use of recent and primary sources in the literature, drawing heavily from journals such as *Science* and *Nature Climate Change*. We will also use significant portions of the Intergovernmental Panel on Climate Change reports. Full text of these reports is available online at www.ipcc.ch.

Other useful reports:

- The US National Climate Assessment reports (https://nca2023.globalchange.gov/)
- Reports on various topics from the US Global Change Research Program (https://www.globalchange.gov/reports)

Some useful websites:

- Science (www.sciencemag.org) – good news and summaries of research articles up front
- Real Climate (www.realclimate.org) – a blog on climate science that debunks the debunkers
- New York Times Climate and Environment (https://www.nytimes.com/section/climate)
- International Energy Agency (www.iea.org) – a good source for statistics on energy
- US Energy Information Administration (www.eia.doe.gov) – lots of global energy statistics
- United Nations Framework Convention on Climate Change (https://unfccc.int/) – the international body under which the Paris Agreement was negotiated and signed. Its supreme decision-making body, the Conference of the Parties (COP), meets annually to assess progress in dealing with climate change.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction to the course and Earth's climate	1, 2, 5	No reading	In-person	Lecture
2	Climate system fundamentals (dynamics and thermodynamics)	1, 2, 5	No reading	In-person	Lecture
3	E-learning week	1, 2, 5	No reading	Online	Asynchronous Learning
4	Climate in the past and natural climate variability	1, 2, 5	No reading	In-person	Lecture
5	Global warming in Anthropocene	1, 2, 5	No reading	In-person	Lecture
6	Carbon cycle	1, 2, 5	No reading	In-person	Lecture
7	Sea level change	1, 2, 5	No reading	In-person	Lecture
8	Climate change impacts	2, 3, 4, 5	No reading	In-person	Lecture
9	Group video presentation	1, 2, 3, 4, 5	No reading	In-person	Group video presentation
10	Understanding the IPCC reports	1, 2, 3, 4, 5	No reading	In-person	Lecture
11	Introduction to climate modelling	1, 2, 3, 4, 5	No reading	In-person	Lecture
12	Climate change solutions	2, 3, 4, 5	No reading	In-person	Lecture

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
13	From learning to action: A look into future	1, 2, 3, 4, 5	No reading	In-person	Lecture

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Active Learning	You will engage in active learning periodically throughout lectures and during tutorial sessions.
Group video presentation	You will collaborate with a group of students to create a video presentation on a topic relevant to climate change impacts. This will provide opportunity for you to learn from one another and to become active participants in their learning. Together as a team, you will develop a deeper understanding of the subject. Group-based work will also help students develop skills valued by employers (such as problem solving, negotiation, conflict resolution, leadership, critical thinking and time management).
Poster presentation	You will create a poster based on a guided meta-analysis. This assignment will integrate your skills in analysing primary sources, developing research topics, and building persuasive arguments. Additionally, it will enhance your presentation skills, providing a comprehensive learning experience in effectively communicating your findings.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Others(Lecture)	1,2,3,4,5	1,2,3,4,5,6	10	Individual	Holistic	Multistructural
2	Continuous Assessment (CA): Others(Tutorials)	1,2,3,4,5	1,2,3,4,5,6	20	Individual	Holistic	Extended Abstract
3	Continuous Assessment (CA): Project(Group video project)	1,2,3,4,5	1,2,3,4,5,6	20	Team	Analytic	Extended Abstract
4	Continuous Assessment (CA): Presentation(Poster presentation)	1,2,3,4,5	1,3,4,5,6	20	Individual	Analytic	Extended Abstract
5	Continuous Assessment (CA): Final exam(Exam)	1,2,3,4	1,2,3,4,5	30	Individual	Holistic	Extended Abstract

Description of Assessment Components (if applicable)

Continuous assessment - lectures: Throughout the course, short weekly quizzes will be administered during lectures to assess your understanding of the material. These quizzes will be conducted online via NTUlearn. CA1 accounts for 10% of your final grade. To earn this 10%, you must complete at least 10 quizzes.

Continuous assessment - tutorials: Assignments will be given during tutorials. These assignments will be administered online on NTUlearn. CA2 contributes 20% to your final grade, with each assignment making up 2% of your overall grade.

Group video project: You will be assigned to a group which consists of students with different backgrounds, e.g., ASE and CNY students will be mixed. This group setting mirrors what you would face in real-world situations when your colleagues or team members may not be from the same background as you. This should encourage you to improve your communication skills and provide an opportunity to understand the different perspectives that various disciplines can offer. Together as a group, you will develop a group video related to climate change impacts. This accounts for 20% of your final grade. Additionally, 25% of the video grade will be determined by peer reviews from your teammates.

Poster presentation: You will be asked to conduct a meta-analysis on climate change solutions and make a poster based on the results from your meta-analysis. The poster accounts for 20% of your final grade.

Formative Feedback

I and TAs will be available to answer questions regarding your learning or assignments throughout this course. You will also receive oral feedback from me and TAs through tutorial discussions. Throughout the course, you will

receive verbal sharing on common mistakes made in quizzes and assignments, so you can learn from them.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Adaptability	Advanced
Care for Environment	Advanced
Collaboration	Advanced
Communication	Advanced
Information Literacy	Advanced

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

Policy (Absenteeism)

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

ASE Diversity and Inclusion policy

Integrating a diverse set of experiences is important for a more comprehensive understanding of science. It is our goal to create an inclusive and collaborative learning environment that supports a diversity of thoughts, perspectives, and experiences, and that honours your identities (including ethnicity race, gender, socioeconomic status class, sexual orientation, religion or, ability., etc.).

To help accomplish this:

- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with one of the instructors or an ASE faculty member. We want to be a resource for you.
- Your classmates and instructors (like many people) are still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to the instructors or an ASE faculty member about it.
- As a participant in course discussions, you should also strive to honour the diversity of your classmates. You can do this by: (e.g., using preferred pronouns and names; being respectful of others opinions and actively, making

sure all voices are being heard; and refraining from the use of derogatory or demeaning speech or actions., etc.).

We expect all members of the class to adhere to the NTU Anti-harassment policy (https://ts.ntu.edu.sg/sites/policyportal/new/Documents/msrf%20included%20NIE%20staff/Anti-Harassment%20Policy.pdf), if you witness something that goes against this or have any other concerns, please speak to your instructors or an ASE faculty member.

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