

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	
Semester/Trimester/Others (specify approx. Start/End date)	
Course Author * Faculty proposing/revising the course	
Course Author Email	
Course Title	Global Change Ecology
Course Code	ES3306
Academic Units	0
Contact Hours	39
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	ES2003, ES2303_x000D_
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

Currently the planet is experiencing a range of global scale environmental changes, such as land transformations, atmospheric CO₂ increase, global warming, pollution, soil degradation and more. The course takes a closer look at the ecological effects that follow from some of these phenomena on organisms, communities, and whole ecosystems. Throughout the course we focus on C balance, cascading ecological effects, resilience, stability and predictability of whole ecosystems and the processes that take place within these systems. Topics covered include species range shifts, CO₂ fertilization, soil respiration shifts (from tropical peatlands to arctic tundra) and changing fire regimes. Both terrestrial and aquatic ecosystems will be considered but the main focus will be on terrestrial ecosystems. Literature seminars and discussions constitute the main assessment and there is no final exam. Ability to consider multiple perspectives, think critically and draw connections is emphasized. The literature consists of research and review articles. Assessment through continuous minor assignments with fast personal feedback allows for improvement of skills throughout the course. Working towards short deadlines, synthesising and evaluating information, applying knowledge, and presenting well underbuilt arguments and conclusions are very useful skills to have in real work situations, whether in or out of academia.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Apply basic ecological concepts and theory to real world ecosystems in a global change context
ILO 2	Synthesise and interpret primary scientific literature, put it into context and communicate it in oral and written form.
ILO 3	Discuss the effects of different global change phenomena on various levels of ecosystems and its implications for ecosystem services that humans depend on
ILO 4	Formulate well supported arguments and conclusions in controversial environmental issues, taking multiple perspectives into consideration.
ILO 5	Identify areas in global change ecology in need of more future study and suggest suitable approaches.
ILO 6	Collaborate in teams

Course Content

Major anthropogenic influences on the natural environment and their ecological effects. How to read, comprehend, discuss and reflect upon scientific articles. How to see environmental issues from multiple perspectives, weighing and evaluating different effects. Communicate and teach new knowledge to their peers. How multiple global environmental change phenomena relate to Singapore and the surrounding region. Anthropocentric impact on the major pools and fluxes of carbon in the Earth system. Ecosystem stability and resilience, positive and negative feedbacks in global environmental change context. Links between species and ecosystem processes, trophic cascades.

Reading and References (if applicable)

This course will be based on original research and review articles, mixing classical papers with the latest research and newly emerging topics. Papers will vary from year to year as new research is published. The subject of the course emerges from papers such as: Vitousek, PM; Mooney, HA; Lubchenco, J and Melillo, JM. 1997. Human domination of Earth's ecosystems. *Science*, 277 (5325): 494-499. Foley, JA; DeFries, R; Asner, GP; et al. 2005. Global consequences of land use. *Science* 309 (5734): 570-574. The choice of papers will include some of the latest research available in fast moving topic areas and can also be somewhat adjusted depending on the interests of the students.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction and overview of course. The Anthropocene.	1, 2, 3	William H. Schlesinger. 2006. Global change ecology. Trends in ecology and evolution 21: 348 - 351 Monastersky. 2015, Anthropocene: The human age. Nature Vol: 519, Issue: 7542, news feature (https://www.nature.com/news/anthropocene-the-human-age-1.17085)	In-person	
2	Land use change – from global perspective to Singapore and Southeast Asia and Singapore.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
3	Peatland ecology – from palm oil plantations to global carbon balance.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
4	Global change and coastal/marine ecosystems.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
5	Coral reef ecology – effects of climate change on tropical marine environments	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
6	Climate warming and species range shifts.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
7	Changing climate – changing fire regimes.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
8	CO2 fertilization and N pollution – effects on productivity and C capture.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
9	Soil respiration and tropical forest biogeochemistry	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
10	The ecology of food production & food security.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
11	Endocrine disrupters pollution – effects on individuals and populations.	1, 2, 3, 4, 5, 6	Available on NTU learn	In-person	
12	Time for project work	1, 2, 3, 4, 5, 6		In-person	
13	Synthesis.	1, 2, 3, 4, 5, 6		In-person	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures (26 hours)	Lecture time will be used to: Outline context, background and basic concepts you are expected to be familiar with. (ILO1). Discuss and interpret scientific examples from scientific literature (ILO2, 3) Student presentations of assigned literature (ILO 1, 2, 3, 4, 5, 6)
Tutorials (13 hours)	Tutorial time will be used for discussion (ILO 1, 2, 3) and group exercises (1, 2, 3, 4, 5, 6).

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([quiz/test])	1	6,7	10	Individual		
2	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Written reflection on discussions)	1,2,3,4,5	1,2,3,5,6,7,8	20	Individual		
3	Continuous Assessment (CA): Others([class participation] Discussion)	1,2,3,4,5	2,3,6,8,9	20	Individual		
4	Continuous Assessment (CA): Others([presentations])	1,2,3,4,5,6	2,3,6,8,10	25	Team		
5	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Written Report)	1,2,3,4,5,6	2,3,4,5,6,8,9,10	25	Team		

Description of Assessment Components (if applicable)

Formative Feedback

The format of the course, with continuous discussion, written reflections and regular short quizzes provide three types of continuous feedback: Weekly literature/topic discussions address ILO 1, 2(oral), 3, 4, and 5. (Directoral feedback in classroom) Weekly written reflections address ILO: 1, 2(written), 3, 4, 5. (Short written feedback from teacher within a week). Bi-weekly quizzes give students direct feedback on ILO: 1. ILO 6 generally only receives feedback if the teacher observes that it is needed.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
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Course Policy

Policy (Academic Integrity)

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Policy (General)

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminarsessions you have missed. You are expected to participate in all seminar discussions and activities.

Policy (Absenteeism)

(2) Absenteeism

Discussions and team work is a crucial part of the course and a significant part of the assessment, therefore, students that miss a tutorial discussion seminar without a valid reason will need to compensate with additional assignments in order to avoid their grade being affected. TBL requires you to be in class to contribute to team work. 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 limited make-up opportunities for in-class activities. If you know you will be absent from a lecture or tutorial you should inform the teacher in advance via e-mail (alagerstroem@ntu.edu.sg).

Policy (Others, if applicable)

(3) Compulsory Assignments

The course grade relies entirely on weekly compulsory assignments, with no final exam. Hence, submission of all assignments is necessary for a final grade and submission on time is necessary for the teacher to have time to provide feedback before the next assignment. Students who fall sick or for other reasons fail to meet expected deadlines should contact the teacher (a.lagerstroem@ntu.edu.sg).

Last Updated Date: 02-05-2024 02:30:59

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