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	Kelly Andersen (Asst Prof);#1050
Course Author Email	Kelly.andersen@ntu.edu.sg
Course Title	E2S2 BIOSPHERE
Course Code	ES2003
Academic Units	0
Contact Hours	48
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	None
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

E2S2 Biosphere aims to provide a basic introduction to biological systems and to the origin and evolution of life on our planet, its distribution and the importance of maintaining biodiversity. Throughout the class there will be a focus on the relationships between biological and non-biological components of ecosystems and on the effects of human activity on the biosphere, including, but not limited, to the effects on biodiversity, climate change, and sustainability. By the end of the course, you will gain a fundamental understanding and appreciation of ecological systems, interactions between the biosphere and other earth systems, and how human activities are changing these interactions. The course is a required course for all ASE undergraduate students and is a pre-requisite for ES2303 Introductory to Ecology.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Summarize interactions between the biosphere, atmosphere, geosphere, and hydrosphere on multiple spatial and temporal scales.
ILO 2	Articulate the relationships between ecology, evolution, and biogeochemistry and explain their connections to the functioning of ecosystems on multiple spatial and temporal scales.
ILO 3	Demonstrate critical thinking to evaluate multiple hypotheses for biological processes or concepts (ie., origin of life, maintenance of biodiversity, biosphere resilience to climate changes, etc.)
ILO 4	Generalize how human activity alters ecological processes, and how ecological changes can interact with human societies at multiple scales.
ILO 5	Apply knowledge of biological systems and human-mediated environmental change to ecological and conservation challenges and potential sustainable solutions and mitigation strategies, considering implications for at-risk populations.

Course Content

The course will explore four main topics: (1) Origins of the Biosphere and Life on Earth, (2) Interactions between the Biosphere and other Earth Systems (Atmosphere, Hydrosphere, and Geosphere), (3) Evolution and maintenance of biodiversity and species interactions, (4) Human influence on the Biosphere and feedbacks with other Earth Systems

Reading and References (if applicable)

This course incorporates original research articles, online resources, and textbook resources to provide a variety of classical studies and emerging research topics related to the Biosphere and contemporary issues relating the Biosphere to other Earth systems. The main textbooks for the course are below and copies are found in the library. Textbooks are intended to supplement lecture materials. 1. Relyea, R., & Ricklefs, R. (2018). Ecology: the economy of nature (Eighth edition.). New York: W.H. Freeman and Company. 2. Skinner, B., & Murck, B. (2011). The Blue Planet. An introduction to earth system science (3rd Edition). John Wiley & Sons, Inc.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Origin of the Biosphere and life on Earth	1,2,3		In-person	Debate 1: hypotheses for the origin of life
2	Macro-Evolution: Hierarchy of life on Earth over geologic time I Adaptations to life on a changing Earth	1, 2, 3,4		In-person	Group presentations 1: Patterns of diversity over geologic time & space
3	Natural selection | micro-evolution	1, 2, 3, 4, 5		In-person	Group presentations 2: Wallace's line, Darwin & adaptation
4	Population dynamics | Life history strategies | Intraspecific interactions	1, 2, 3, 4, 5		In-person	Group activity 1: Populations
5	Ecological communities & species interactions | Food webs	1, 2, 3, 4,5		In-person	Group activity 2: Species invasions
6	Energy flow | Primary productivity & photosynthesis	1, 2, 3, 4, 5		In-person	Debate 2: Top-down vs. Bottom-up trophic cascades
7	Biomes and patterns of species diversity	1, 2, 3, 4,5		In-person	Mid-term test

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
8	Global climate systems | Biomes	1, 2,3, 4,5		In-person	Group activity 3: Biogeography
9	Biogeochemical cycles	1, 2, 3, 4, 5		In-person	Debate 3: Nutrient limitation
10	Community succession | Soil evolution | Chronosequences	1, 2, 3, 4, 5		In-person	Field trip to MacRitchie Reserve
11	Human activities & the Biosphere: Drivers of environmental degradation and species loss	1, 2, 3, 4,5		In-person	Group activity 4: IPBES report
12	Global changes and the Biosphere	1, 2, 3, 4, 5		In-person	Group activity 5: IPCC reports
13	Review of course material	1, 2, 3, 4,5		In-person	Mid-term 2

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	There will be three one hour lectures each week to pass on key conceptual and basic theoretical knowledge related to the Biosphere. Lectures will be interactive, involving your participation in the form of answering questions, discussions and contributions.
Tutorial	Tutorial discussions will be directly after the third lecture of the week and are specifically designed as an interactive summary of the key concepts of the week through different activities. Active learning and group activities will reinforce concepts and skills related to studying the Biosphere.

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([class participation])	1, 2, 3, 4,5	1, 2, 3, 4, 5, 6	10	Individual		
2	Continuous Assessment (CA): Others([quiz/test] Tutorial continuous assessments)	1, 2, 3, 4,5	1, 2, 3, 4, 5, 6	30	Individual		
3	Continuous Assessment (CA): Others([quiz/test] Mid-term assessment)	1, 2, 3, 4,5	1, 2, 3, 4, 5	30	Individual		
4	Summative Assessment (EXAM): Others([final examination])	1, 2, 3, 4,5	1, 2, 3, 4, 5	30	Individual		

Description of Assessment Components (if applicable)

Formative Feedback

Feedback is central to this course. You will receive formative feedback through written responses on mid-term assessments and through in class discussions. There will be occasional short assessments at the beginning of lectures and during tutorials, either to assess prior knowledge on the topic to adjust lecture materials appropriately to the knowledge level of students or on the topic of the previous lecture to let students check their understanding of the key concepts. Tutorials will include group presentations and debates, with feedback given during your presentation and through peer-review appraisal

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level

Course Policy

Policy (Academic Integrity)

Policy (General)

(1) General

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

Policy (Absenteeism)

(2) Absenteeism
This course requires you to be present in class and contribute to class activities. The quiz part of the assessment will build on material from the lectures. Absence from class without a valid reason will affect your overall course grade. Valid reasons include, but are not limited to: falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. Policy on medical leave for student may be found from http://www.ntu.edu.sg/Students/Undergraduate/AdminServices/Pages/Applyforshortleave.aspx. If you miss a lecture or tutorial, it is your responsibility to inform the course instructor via email and obtain relevant course material and notes from classmates and online.

Policy (Others, if applicable)

(3) Compulsory Assignments
You are required to submit/present compulsory assignments on due dates, unless a valid reason is provided. Valid reasons include falling sick supported by a medical certificate. If you will miss a deadline for a valid reason you must inform me via email (Kelly.andersen@ntu.edu.sg) prior to the deadline, and as soon as is possible.

(4) Special Accommodations
All courses will have some form of assessment and if you envision that you will have difficulty satisfying an assessment component due to your disability then you are advised to contact the Course Coordinator within the first 2 weeks of the course. Students requiring assistance in the learning environment should contact and notify the Associate Chair (Academic) in their School within the first 2 weeks of their first semester so that you and School can work together to optimise your learning experience. Examples of services that may be provided or supported in individual courses include an editor service to help those with reading and writing difficulties, and access to a personal mentor within the School. Please access the NTU Office of Academic Services' website http://www.ntu.edu.sg/sasd/oas/Pages/

Last Updated Date: 19-04-2024 05:01:47

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