

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

Course Overview

Expected Implementation in Academic Year (New format)	AY2018-2019
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Dr Shawn Lum
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Course Title	The Physical Environments of Singapore
Course Code	ES0001
Academic Units	3
Contact Hours	65
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	Nil
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This is an introductory course designed to provide you with a broad understanding of the physical environments in Singapore. You will learn about how Earth Systems have affected the physical environment of Singapore over time. The emphasis will be on the natural physical processes by which these environments form, evolve and interact dynamically in the Earth Systems as part of the lithosphere, hydrosphere, atmosphere, biosphere and anthrosphere. Since Earth Systems Science is interdisciplinary by nature, we will use multi-scientific disciplines, especially geology, chemistry, physics, biology and mathematics. Emphasis will be placed on examining the various environments in the field and through exploratory laboratory exercises. The material covered in this course will provide a strong basis for understanding and evaluating potential changes to Singapore's environment in the future.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Identify and describe the key physical environments of Singapore.
ILO 2	Critically evaluate the effects of human interventions into Singapore's marine, coastal and terrestrial environments.
ILO 3	Apply scientific methods of investigation of the environments of Singapore.
ILO 4	Speculate in an informed manner on the future of the physical environments of Singapore.

Course Content

Introduction to the course and assignments - Course structure, teaching style, learning outcomes, - Details on assignments and deadlines Mapping Singapore's environments - Hand draw a map of Singapore - Use external sources to locate current areas with different physical environments. Discovering Singapore's geology - Discovering the geological units of Singapore by description of hand samples - Initial thoughts about paleoenvironment and geological history The Bedrock Geology of Singapore - The deep subsurface environment - Geological inference - Geological units and facies - Paleoenvironments of formation Little Guilin Quarry - Field observations and cross-cutting relationships Singapore's Global Geological Context - Global tectonics and Earth history - Pangea - Collision with Asia - Sunda Bukit Batok West - Observations of the Jurong Formation and depositional environments Topography, Soils, and Slopes - The shallow subsurface environment - Erosion, landsliding, and geomorphology - Types and distribution of soils Singapore's Changing Landscape - Evaluation of topographic changes from excavation, quarrying, and land reclamation - Internal vs external fill material Singapore's Climate and Weather - Singapore's atmospheric environment - Weather and climate in Southeast Asia - Climate change Singapore's Forest Environments - Primary and secondary forests - Native and non-native species - Forest management Dairy Farm and Wallace Center - Mapping tree types - Interpretation of forest history Agricultural heritage of Singapore - Crops in Southeast Asia - Deforestation and economy - Estates and modern Singapore Singapore's principal crops Historical maps and land use - Tracking the development of Singapore's forest, agricultural, and urban landscape over time using historical maps. Singapore's Coastal Environments - Coral reefs - Mangrove swamps - Modified coastlines Sungei Buloh - Mapping mangroves - Primary or modified coastal environment? Urban Environments of Singapore - Infrastructural development - Drainage and flooding - Environmental impacts Marina Barrage - Urban hydrology and flooding Fauna of Singapore - Ancient fauna - Modern fauna - Environmental change and challenges

Reading and References (if applicable)

Dynamic Environments of Singapore, Daniel A. Friess and Grahame J. H. Oliver, 2015, McGraw-Hill

Planned Schedule

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
1	Lecture Introduction to the course and assignments - Course structure, teaching style, learning outcomes, - Details on assignments and deadlines Tutorial Mapping Singapore's environments - Hand draw a map of Singapore - Use external sources to locate current areas with different physical environments. Lab Discovering Singapore's geology - Discovering the geological units of Singapore by description of hand samples - Initial thoughts about paleoenvironment and geological history	1, 2, 3, 4		Lecture, Tutorial, Lab	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
2	Lecture The Bedrock Geology of Singapore - The deep subsurface environment - Geological inference - Geological units and facies - Paleoenvironments of formation Tutorial Group discussion of paleoenvironments Excursion Little Guilin Quarry - Field observations and cross-cutting relationships	1, 2, 3, 4		Lecture, Tutorial, Excursion	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
3	Lecture Singapore's Global Geological Context - Global tectonics and Earth history - Pangea - Collision with Asia - Sunda Tutorial Group exercise - Locating Singapore on paleogeographic reconstructions and comparison with geological units Excursion Bukit Batok West - Observations of the Jurong Formation and depositional environments	1, 2, 3, 4, 5		Lecture, Tutorial, Excursion	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
4	Lecture Topography, Soils, and Slopes - The shallow subsurface environment - Erosion, landsliding, and geomorphology - Types and distribution of soils Tutorial Evaluation of slope stability in a theoretical excavation Lab Singapore's Changing Landscape - Evaluation of topographic changes from excavation, quarrying, and land reclamation - Internal vs external fill material	1, 2, 3, 4		Lecture, Tutorial, Lab	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
5	Lecture Singapore's Climate and Weather - Singapore's atmospheric environment - Weather and climate in Southeast Asia - Climate change Tutorial Group analysis of weather data from Singapore Excursion East Coast Park	1, 2, 3, 4		Lecture, Tutorial, Excursion	
6	Lecture Singapore's Forest Environments - Primary and secondary forests - Native and non-native species - Forest management Tutorial Group identification of typical Singapore forest plants Excursion Dairy Farm and Wallace Center - Mapping tree types - Interpretation of forest history	1, 2, 3, 4		Lecture, Tutorial, Excursion	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
7	Lecture Agricultural heritage of Singapore - Crops in Southeast Asia - Deforestation and economy - Estates and modern Singapore Tutorial Singapore's principal crops Lab Historical maps and land use	1, 2, 3, 4		Lecture, Tutorial, Lab	
8	Lecture Singapore's Coastal Environments - Coral reefs - Mangrove swamps - Modified coastlines Tutorial Group examination of Singapore's coast using Google Earth Excursion Sungei Buloh - Mapping mangroves - Primary or modified coastal environment?	1, 2, 3, 4		Lecture, Tutorial, Excursion	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
9	Lecture Urban Environments of Singapore - Infrastructural development - Drainage and flooding - Environmental impacts Tutorial Group investigation of recent development in Bukit Batok West, Tengah and Jurong West Excursion Marina Barrage - Urban hydrology and flooding	1, 2, 3, 4		Lecture, Tutorial, Excursion	
10	Lecture Fauna of Singapore - Ancient fauna - Modern fauna - Environmental change and challenges Lab Final project introduction: Bats at NTU	1, 2, 3, 4		Lecture, Lab	
11		2, 3, 4		Final project lab time	
12		2, 3, 4		Final project lab time	
13		2, 3, 4		Final project presentations	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Active learning	You will engage in active learning techniques periodically throughout lectures, and during lab sessions and field excursions
Independent learning	You are required to show self motivation and initiative in your learning process, such as completion of homework and preparation for tutorials and excursions.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Homework (Appendix I))	1,2,3,4	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Formulating questions; Research; Problem solving; Interdisciplinary; Lifelong learning; Values; Collaboration and leadership	30		Individual		
2	Continuous Assessment (CA): Others([laboratory reports] Lab and Field reports)	1,2,3,4	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Formulating questions; Research; Problem solving; Interdisciplinary; Lifelong learning; Values; Collaboration and leadership	30		Individual		

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
3	Continuous Assessment (CA): Others([quiz/test] In-class quizzes)	1,2,3,4	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Formulating questions; Research; Problem solving; Interdisciplinary; Lifelong learning; Values; Collaboration and leadership	10		Individual		
4	Continuous Assessment (CA): Others([group or individual projects/evaluations] Final Project)	1,2,3,4	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Problem solving; Interdisciplinary	30		Team		

Description of Assessment Components (if applicable)

Formative Feedback

You will receive informal feedback continuously throughout the course where appropriate, including in the field, and formal feedback following every assignment. In addition, I will be available to answer questions regarding your assignments and labs/excursions throughout this course.

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

Students are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and hand in all scheduled assignments and labs/field activities by scheduled due dates. Students are expected to take responsibility to follow up with course notes, assignments and course related announcements for lectures or lab sessions they have missed. Students are expected to participate in all activities.

Policy (Absenteeism)

(2) Absenteeism

Absence from class without a valid reason will affect your overall course 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)

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Last Updated By: Nani Harniwati