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

Course Overview

Expected Implementation in Academic Year (New format)	AY2021-2022
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Kyle Bradley
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Course Title	Global Tectonics
Course Code	ES3102
Academic Units	3
Contact Hours	65
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	ES2802, ES2001, ES2002, ES2004
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

The word 'tectonics' refers to the myriad of processes that have progressively shaped, and continue to shape, Earth's solid surface and interior. Tectonic processes are fundamentally about motion: rocks move from one place to another as part of a rigid plate, or are squeezed like toothpaste in a collision zone, or erode from regions of uplift and are deposited as sediment in regions of subsidence, or rise toward the surface from regions of mantle melting. The integration of these motions over time has produced the highly complex crust of Earth that we observe today. This course will cover global-scale tectonic processes and systems, with a focus on active tectonic environments where rich observational data can be mined for a better understanding of processes. Students will develop fluency with tectonic elements and processes through readings of seminal papers, interactive lectures and in-class discussions, and computational laboratory exercises based on real-world data. Each student will adopt a different active tectonic region of Earth and will progressively develop a deep understanding of its origin, evolution, and tectonic environments, culminating in a final report and presentation.

This course aims to:

expose you to the major topics in global tectonics

engage you in reading primary literature to support active learning

build skills in geospatial and data analysis relevant to tectonics using free and open source software and in-house codes

develop fluency in tectonic concepts through individual student projects focusing on specific areas of Earth

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Describe the primary observations that support tectonic models
ILO 2	Apply basic tectonic principles to analyze a geological region
ILO 3	Visualize and manipulate publicly available datasets to support regional tectonic interpretations
ILO 4	Read and understand primary literature relevant to global tectonics
ILO 5	Communicate fundamental ideas of global tectonics and relate these ideas to other disciplines.

Course Content

Course content will be delivered in the form of pre-lecture readings and reflections, lectures that combine group discussions, and computer-based laboratory exercises. Students will choose a region of Earth and use skills developed in class to progressively develop a deep understanding of the tectonics of that region, which they will present in the form of a final presentation and report. Students will engage in online discussions outside of class using the YellowDig platform.

Reading and References (if applicable)

Assigned weekly readings of published research papers.

Planned Schedule

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
1	What is tectonics, and why do people study it?	1,2,3,4,5	In-person	Exercise: Exploring the tectonics literature with Google Scholar	Reading: How to seriously read a scientific paper
2	Just the Basic Facts: The absolute essentials of plate tectonics	1,2,3,4,5	In-person	Exercise: Visualizing plate motions and global datasets	Reading: Hamilton, 1988: Plate tectonics and island arcs
3	On Land: The formation and fate of the continental crust	1,2,3,4,5	In-person	Exercise: What is the average elevation of exposed cratonic crust?	Reading: Bleeker, 2003: The late Archean record: a puzzle in ca. 35 pieces
4	At Sea: The formation and fate of the oceanic crust	1,2,3,4,5	In-person	Exercise: Evolution of the Indian Ocean	Reading: McKenzie and Selater, 1973: The Evolution of the Indian Ocean
5	Going Down: Burial, subsidence, and extension	1,2,3,4,5	In-person	Exercise: Basins of Earth	Reading: Ingersoll, 1988: Tectonics of sedimentary basins
6	Going Up: Erosion, uplift, and collision	1,2,3,4,5	In-person	Exercise: Ranges of Earth	Reading: Dewey and Bird, 1970: Mountain belts and the new global tectonics
7	Tremors!: Using seismicity to understand tectonics	1,2,3,4,5	In-person	Exercise: Visualizing seismicity of complex plate boundaries	Reading: Oliver et al., 1969: Seismology and the new global tectonics
8	Fast and Furious: Using geodesy to understand tectonics	1,2,3,4,5	In-person	Exercise: The relative motions of India, Australia, and Sunda	Reading: DeMets et al., 2010: Geologically current plate motions
9	The Arc of the Story: Volcanism, magmatism, and tectonics	1,2,3,4,5	In-person	Exercise: Comparing magmatic arcs	Reading: Karig, 1974: Evolution of arc systems in the western Pacific
10	Patterns in global tectonics	1,2,3,4,5	In-person	Exercise: Exploring supercontinent breakup using GPlates	Reading: Buiter and Torsvik, 2014: A review of Wilson Cycle plate margins: A role for mantle plumes in continental break-up along sutures?

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
11	What's left to learn? Big ideas and big questions in global tectonics	1,2,3,4,5	In-person	TBD	Reading: Bercovici and Ricard, 2014: Plate tectonics, damage and inheritance
12	Home, sweet home: Tectonics of Southeast Asia	1,2,3,4,5	In-person	TBD	Reading: Hall, 2002: Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations
13	Final project completion and presentation	1,2,3,4,5	In-person	Final project consultation during lecture period Final presentations during lab period	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Lectures will convey information on fundamental theories and key concepts and to bring all students up to similar levels of knowledge (LO1,LO2)
Interactive activities	Online and in-class discussions will help you learn from each other and improve their communication skills. (LO2,LO3,LO4,LO5)
Independent learning	Pre-class reading reflections will help you engage more effectively with the course material provided in lectures and lab exercises. Individual lab exercises will encourage creative thought and critical. (L01,LO2,LO3,LO4,LO5)

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)] Reflections on pre-lecture reading)	1,4	Knowledge, Intellectual flexibility and critical thinking, formulating questions	15		Individual		
2	Continuous Assessment (CA): Others([class participation] Weekly online discussions)	1,2,3,4,5	Knowledge, Intellectual flexibility and critical thinking, formulating questions, problem solving, passion and communication	10		Individual		
3	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Computer-based laboratory exercises)	1,2,5	Knowledge, Intellectual flexibility and critical thinking, formulating questions, problem solving	40		Individual		
4	Continuous Assessment (CA): Others([presentations] Final project and presentation)	1,2,3,4,5	Intellectual flexibility and critical thinking, formulating questions, passion and communication	35		Individual		

Description of Assessment Components (if applicable)

Formative Feedback

You will receive feedback from instructors and a teaching assistant who will monitor online discussion groups and assess all turned-in work.

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

You are expected to complete all assigned pre-class readings and activities on time, attend all lectures, tutorial and class discussions, and submit all scheduled assignments by their due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for lecture sessions they have missed.

Policy (Absenteeism)

(2) Absenteeism

Absence from scheduled lectures and discussion 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 scheduled group or in-class activities.

Policy (Others, if applicable)

(3) Compulsory Assignments

You are required to submit compulsory assignments on schedule due dates, unless a valid reason is provided. Valid reasons include falling sick supported by a medical certificate.

Last Updated Date: 09-04-2026 19:25:47

Last Updated By: Sze Chun Chau (Dr)