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	Aron Meltzner
Course Author Email	meltzner@ntu.edu.sg
Course Title	E2S2 SOLID EARTH
Course Code	ES1003
Academic Units	4
Contact Hours	84
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 introductory course aims to provide a broad overview of physical geology, with an emphasis on the materials that make up the solid earth and the physical processes by which these materials are accumulated and transformed. These geological processes operate over a wide range of time scales. For example, earthquakes last only seconds, but over millions of years they result in mountain building. We will explore these processes, the concept of geologic time, and the ways that geologists learn about the earth and earth processes, so that you can begin thinking as an earth scientist.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	explain fundamental earth science concepts and principles using words and sketches
ILO 2	use Google Earth and Google Maps to identify, locate, measure, and relate geological features, and to observe global change
ILO 3	infer processes that led to the formation of a rock, an outcrop, or a landform, based on its properties
ILO 4	integrate geological observations with process to reconstruct a site's geological history

Course Content

This course is designed to give a broad overview of the basic concepts of physical geology.
We will move from one topic to another in a logical progression. Content will cover the following:

Formation of the Solar System; Plate Tectonics; Earthquakes and Tsunamis; Crustal Deformation and Isostasy; Minerals and Crystals; Magmas and Igneous Rocks; Volcanoes and Volcanic Eruptions; Sedimentary Rocks and Geologic Time; Coastal Processes and Landforms; Metamorphic Rocks and Mountains; Glaciers and Global Change; Earth Resources; and Hydrological Cycle, Streams & Rivers, and Groundwater.

Reading and References (if applicable)

Each week you should read the relevant chapters from:

Essentials of Geology by Stephen Marshak (Fourth Edition or later), W.W. Norton & Company.

ISBN 978-0393882728 or 978-0393667523 or 978-0393263398 or 978-0393919394

https://a.co/d/8SbjDVy

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Formation of the Solar System	1	Prelude; Chapter 1	In-person	Lecture
2	Plate Tectonics	1,2	Chapter 2; Interlude D	In-person	Lecture, Lab
3	Earthquakes and Tsunamis	1,2	Chapter 8	In-person	Lecture, Lab
4	Crustal Deformation and Isostasy	1,2	Chapter 9	In-person	Lecture
5	Minerals and Crystals	1	Chapter 3	In-person	Lecture, Lab
6	Magmas and Igneous Rocks	1,3	Interlude A; Chapter 4	In-person	Lecture, Lab
7	Volcanoes and Volcanic Eruptions	1,2,3,4	Chapter 5	In-person	Lecture, Lab
8	Sedimentary Rocks and Geologic Time	1,2,3,4	Interludes B, C; Chapters 6, 10	In-person	Lecture, Lab
9	Coastal Processes and Landforms	1,2,3,4	Chapter 15	In-person	Lecture, Lab
10	Metamorphic Rocks and Mountains	1,2,3,4	Chapter 7	In-person	Lecture, Lab
11	Glaciers and Global Change	1,2,3,4	Chapters 18, 19	Online	Lecture, Lab
12	Earth Resources	1,2	Chapter 12	In-person	Lecture, Lab
13	Hydrological Cycle, Streams & Rivers, and Groundwater	1,3	Interlude F; Chapters 14, 16	In-person	Lecture

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Lectures will pass on the theoretical knowledge required to understand the various concepts.
Lab	Labs will allow students to apply theoretical knowledge learned in lecture; to learn additional concepts from first principles; and to practice using basic tools, techniques, and methods of earth science.
Field excursion	Field trips will be similar to labs but will add valuable experience by getting students to apply knowledge and solve problems in the 'real world'. They will also get students to relate the 'real world' to imagery in Google Maps.

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(Online Modules)	1,2,3,4	Communication, Lifelong Learning (ASE LOs 3, 8)	20	Team	Analytic	Relational
2	Continuous Assessment (CA): Test/Quiz(Lab Test)	1,2,3,4	Communication, Lifelong Learning (ASE LOs 3, 8)	20	Individual	Analytic	Relational
3	Continuous Assessment (CA): Test/Quiz(Midterm Test)	1,3,4	Communication, Lifelong Learning (ASE LOs 3, 8)	10	Individual	Analytic	Multistructural
4	Continuous Assessment (CA): Test/Quiz(Final Test)	1,3,4	Communication, Lifelong Learning (ASE LOs 3, 8)	20	Individual	Analytic	Multistructural
5	Summative Assessment (EXAM): Report/Case study(Final Report)	1,2,3,4	Communication, Lifelong Learning (ASE LOs 3, 8)	30	Individual	Analytic	Extended Abstract

Description of Assessment Components (if applicable)

The midterm and final tests will be administered online, but you are expected to bring your laptop or tablet in order to take these tests in class. Special arrangements can be made as long as requests are made to the instructor at least one week in advance.

Instead of turning in each of your lab assignments for formal assessment, there will be a test in week 12 that is based entirely on the labs. This will be an in-person, closed notes, pencil-and-paper test, and it will involve questions adapted from the various labs. If you understand how to correctly answer the questions you will have already seen on the labs, you should do well on this test — there will be no major surprises on this test.

Two online modules will take place during Monday lab periods. These can be done online.

Your final report will push you to think more and more as an earth scientist. You will realise that in science, we often don't know the “right” answer — sometimes with the same observations and different assumptions, we can come up with competing hypotheses. Your final report will be based on your own observations, and you will be assessed based on how well your interpretations are supported by those observations. More than anything, we’re looking to see that you can make and describe observations; that you can recognize assumptions, be they explicit or implicit; and that you can think critically. We’re looking to see how you use observations to make inferences and ultimately draw conclusions. If you describe Singapore’s geological history but neglect to walk the reader

through your thought process — if you do not describe how that history was inferred from your geological observations — then you will do poorly on the final report.

Formative Feedback

You are expected to keep up with the required reading. Each chapter of the text contains review questions. Working through them on your own is a good way to monitor your progress.

Practice quizzes will be uploaded online every two weeks. These are optional and not to be submitted, but taking them on your own is a good way to monitor your progress.

Following the midterm test, you will receive feedback within a few days. In this way you and the course instructor can monitor your progress.

Following each lab, you will receive an answer key. The labs are not to be submitted or graded, but comparing your work against the answer keys will help you identify any misconceptions or misunderstandings you may have, ahead of the lab-based test, which will be assessed.

The two online modules and field trips are preparation for the final report. You will receive direct feedback within two weeks of the online module due dates. In that way, you will be able to reinforce concepts you are weak on or clarify points of confusion, before writing your final report.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Communication	Basic
Curiosity	Intermediate
Critical Thinking	Basic

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 view all lectures, and to complete all required reading, tests, and assignments. You will need to be self-disciplined to complete the work and not fall behind.
If this is something you're not naturally good at, you are encouraged to form groups with your classmates to help one another keep up.

Tuesday and Wednesday lectures will be recorded and may be viewed on NTULearn after the class. You are encouraged to attend lectures in person, but do not come to class if you are unwell.

The midterm and final tests will be administered online, but you are expected to bring your laptop or tablet in order to take these tests in class. Special arrangements can be made as long as requests are made to the instructor at least one week in advance.

Labs will be done in the classroom. Most of the lab period will be for you to work on the lab assignments, with the course instructor and TA(s) available to answer questions. Labs may be done collaboratively, but you are ultimately responsible for learning the material. Some labs will be preceded by mini-lectures; these will be recorded and posted on NTULearn in advance. You may use the lab period to watch the mini-lecture, but watching the mini-lecture in advance will allow you to use the lab period more effectively.

Labs will not be handed in or formally assessed. You will be given answer keys 1–2 weeks after a lab is assigned. You will be responsible for marking your own labs, so that you can identify your own mistakes and misconceptions and learn from them. You may wish to exchange labs with a peer for marking.

Many of the labs are designed to develop your detective skills, requiring you to figure things out yourself using your own background knowledge and intuition. While some labs are intended to be used with Google, others are not. If a lab is not intended to be used with Google or online resources but you 'cheat', you are really only cheating yourself — because you will not learn the material as well. If you are not sure, ask!

Instead of turning in each of your lab assignments for formal assessment, there will be a test in week 12 that is based entirely on the labs. This will be an in-person, closed notes, pencil-and-paper test, and it will involve questions adapted from the various labs. If you understand how to correctly answer the questions you will have

already seen on the labs, you should do well on this test — there will be no major surprises on this test.

Two online modules will take place during Monday lab periods. These can be done online.

All assignments, including the two online modules and the final report, are expected to be your own work. Plagiarism of any form (including copying too heavily from a classmate or uncited use of Generative AI) is a severe violation of NTU's academic integrity policy and will be harshly penalized. Plagiarism and other breaches of academic integrity will likely result in a failing grade for the assignment or even the course. The use of GenAI is discouraged for the online modules and final report (it won't help you much!), but if you use it you must cite it and provide details of how it is used. Online resources are forbidden for the tests.

Policy (Absenteeism)

You should never come to class if you are feeling unwell.
If you need to miss a lecture in person, you are still expected to view it on NTULearn.
If you need to miss a lab, please contact the course instructor to make alternative arrangements.

You are expected to take all three tests in-person during the specified times, unless you make prior arrangements with the course instructor or have a compelling reason otherwise (e.g., sudden illness).

Policy (Others, if applicable)

(1) Due Dates and Late Assignments (Online Modules and Final Report)

A late assignment will have 10% of the possible score deducted for each 24-hour period (or portion thereof) that it is late, unless you have an approved reason that has been agreed upon
in advance by the instructor. After the fourth day (96 hours) of being overdue without approval, the assignment will receive a zero score. You alone are responsible for checking that the assignment was properly submitted in NTULearn.

(2) Field Trips

There will be two field trips, one to Pulau Ubin and the other to Sentosa, and each field trip will be run twice, to allow for smaller groups on each day. If you have conflicts with one or both days a particular trip is run, let the instructor know as soon as possible. Sign-ups for the different days will be posted online to ensure the class is evenly distributed between the two days.

The timings of the field trips are dependent upon tides (which you will learn about!) and cannot be changed. The field trips are not compulsory per se, but students who missed a field trip in past years have commonly struggled with the corresponding online module and final report.

(3) Contacting the Instructor and TA(s) / Office Hours

We are busy and would prefer that you do not email us directly with questions. Only email us directly if you have personal concerns. If you need to email, use your academic account; use a helpful subject line; do not use SMS-style abbreviations; and proofread it before you hit send.
Do not expect an immediate response.

If you have a question that the whole class would benefit from (this is usually the case!) please ask in class. We

will make sure you get opportunities to ask questions, and the instructor will stick around regularly after lecture to answer questions. Alternatively, you may post your question on the NTULearn discussion board. We will answer the question there, answer the question in the next lecture, or set up a time to meet you in person for discussion. Please do not be shy about posting questions on the board — others are likely to have the same question, and learning to publicly ask questions is a necessary skill for success in your career.

(4) Diversity, Equity, and Inclusion

Integrating a diverse set of experiences is important for a more comprehensive understanding of science, and science benefits most when everyone can contribute to the best of their abilities.

It is our goal to create a learning environment that supports a diversity of thoughts, perspectives, and experiences, and that honours your identities (including race and ethnicity; gender and gender identity; sexual orientation; religion; socioeconomic status; or ability).

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 talk with the instructor or another 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 instructor or an ASE faculty member about it.
- As a participant in class discussions, you should also strive to honour the diversity of your classmates. You can do this by using preferred pronouns and names; being respectful of others' opinions and actively ensuring all voices are being heard; and refraining from derogatory or demeaning speech or actions.

All class members are expected to adhere to the NTU anti-harassment policy. If you witness something that goes against this or have any other concerns, please speak to your instructor or an ASE faculty member.

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