

COURSE OUTLINE: ES8005/ES7005

Course Title	Environmental Earth System Science		
Course Code	ES8005/ES7005		
Offered	Study Year , Semester 1		
Course Coordinator	Caroline Bouvet de la Maisonneuve (Asst Prof)	CarolineBouvet@ntu.edu.sg	6592 7826
Pre-requisites	None		
AU	3		
Contact hours	Lectures: 39		
Approved for delivery from	AY 2019/20 semester 1		
Last revised	18 Jun 2020, 10:50		

Course Aims

This course is designed to be a comprehensive introduction to the Earth and its systems, including the atmosphere, biosphere, hydrosphere, and solid Earth. The course will focus on the linkages and feedbacks between these systems, and the role of humans in the Earth system.

Intended Learning Outcomes

Upon successfully completing this course, you should be able to:

1. Define the major processes that govern the atmosphere, hydrosphere, solid Earth, and biosphere.
2. Build linkages and draw feedbacks between these systems.
3. Discern and critically evaluate media information about the Earth system.
4. Communicate intelligently about major topics that relate to the Earth based on solid evidence (data) and embedded in current world affairs.

Course Content

The Earth System

Energy, Space, and Time

The Geosphere - Tectonics

Natural Hazards

The Hydrologic Cycle

The Ocean

The Atmosphere, Wind, and Weather

The Climate System

Evolution, Ecosystems and Populations

Natural Resources

Assessment

Component	Course ILOs tested	ASE Graduate Attributes tested	Weighting	Team / Individual	Assessment Rubrics
Continuous Assessment					
Lectures					
Participation	1, 2, 3, 4	3. , , 7. , 8. , 9. , , 10. ,	10	individual	See Appendix for rubric
Technology-enhanced Learning					
Essay	1, 2, 3, 4	1. 2. , 3. 8. , 9. , ,	40	individual	See Appendix for rubric
Mid-semester Quiz					
Multiple Choice Questions	1, 2, 3	1. , 2. , 8. , 9. , ,	25	individual	See Appendix for rubric
Multiple Choice Questions 1	1, 2, 3	1. , 2. , 8. , 9. , ,	25	individual	See Appendix for rubric
Total			100%		

These are the relevant ASE Graduate Attributes.

1. Apply environmental knowledge, concepts and skills to make sound decisions

Interpret evidence to give sound environmental advice to stakeholders

Give advice to industry regarding existing environmental legislation

2. Demonstrate intellectual flexibility and critical thinking

Demonstrate intellectual flexibility to view environmental issues from multiple perspectives

Question assumptions behind current ways of solving environmental problems

3. Demonstrate passion and use advanced communication skills to share that passion

Effectively communicate environmental concepts in writing

Effectively communicate environmental concepts in speech

Effectively communicate environmental concepts in various forms of media such as data visualisation, diagrams, animation, video, or podcasts

7. Synthesize interdisciplinary approaches to solving problems

Apply techniques from diverse disciplines to solve environmental problems

Explain how a certain problem-solving approach may impact the environment or human society

8. Demonstrate the willingness and skills for lifelong learning

Demonstrate aptitude and enthusiasm to learn independently

Demonstrate good observation skills and a curiosity about the world

9. Demonstrate ethical values

Debate the ethical implications of scientific processes and results

Respect regulations involving plagiarism and copyright

Respect requirements regarding confidentiality, data protection, conflict of interest, and falsification of data

10. Demonstrate collaboration and leadership skills

Learn collaboratively and be willing to share expertise with peers

Demonstrate leadership of small teams

Formative Feedback

With the use of Turning Point (or equivalent) for in-class quizzes, you will immediately know how you have performed, and how this performance compares to the rest of the class.

Following the first mid-term evaluation, you will receive general feedback (normally one to two weeks after) on the most poorly answered questions and the commonly observed misconceptions. Your grade will also be made available within the NTUlearn grade system.

Teaching Assistants and the Course Instructor will be following the peer-reviewed essays closely in order to provide direct feedback on the topics discussed. You will also be receiving feedback from your peers through this exercise.

Learning and Teaching Approach

Lectures (39 hours)	Lectures will pass on the theoretical knowledge required to understand the different components of the Environmental Earth system and the related scientific methods. They closely follow a book that is accessible online from the NTU library. In parallel, students will be asked to participate in class quizzes and discussions and write two short essays to demonstrate their understanding of the topics covered during lectures.
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Reading and References

Skinner, B.J., and Murck, B.W. (2011). 3rd Edition. The Blue Planet: an Introduction to Earth System Science, Wiley.

Course Policies and Student Responsibilities

(1) General

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

(2) Missed Assessments

When you are absent from an assessment due to illness, you must submit a medical certificate to your own school for processing within 7 working days. A student who is absent from assessment without valid Leave of Absence will be given zero mark for the missed assessment. Course lecturers may, however, use his/her own discretion for extenuating circumstances. Policy on medical leave for student may be found from <http://www.ntu.edu.sg/Students/Undergraduate/AdminServices/Pages/Applyforshortleave.aspx>.

(3) 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 the you 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.

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. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Caroline Bouvet de la Maisonneuve (Asst Prof)	N2-01B-27	6592 7826	CarolineBouvet@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course ILO	Readings/ Activities
1	The Earth System	1, 2, 3, 4	Ch.1
2	Energy, Space, and Time	1, 2, 3, 4	Ch.2,3 & 4
3	The Geosphere - Tectonics	1, 2, 3, 4	Ch.5 & 7
4	The Geosphere - Hazards	1, 2, 3, 4	Ch.6 Geosphere forum submission
5	The Hydrologic Cycle	1, 2, 3, 4	Ch.8
6	The Ocean	1, 2, 3, 4	Ch. 9, 10 Hydrosphere forum submission
7	MIDTERM I	1, 2, 3, 4	Chapters 1-10
8	No Class- Recess Week		
9	The Atmosphere, Wind, and Weather	1, 2, 3, 4	Ch. 11, 12
10	The Climate System	1, 2, 3, 4	Ch. 13 Atmosphere forum submission
11	Evolution, Ecosystems and Populations	1, 2, 3, 4	Ch. 14, 15 & 16

12	Resources	1, 2, 3, 4	Ch. 17 & 18
13	Anthropogenic Change	1, 2, 3, 4	Ch. 19 Biosphere & Anthroposphere forum submission
14	MIDTERM II	1, 2, 3, 4	Chapters 11-19

Appendix 1: Assessment Rubrics

Rubric for Lectures: Participation (10%)

Marks	Criteria
> 90%	Participated in >90% of the in-class quizzes and gave >90% of correct answers.
75% to 89%	Participated in >75% of the in-class quizzes and gave 75-89% of correct answers.
65% to 74%	Participated in >65% of the in-class quizzes and gave 65-74% of correct answers.
50% to 64%	Participated in >50% of the in-class quizzes and gave 50-64% of correct answers.
< 50%	Participated in <50% of the in-class quizzes and/or gave <50% of correct answers.

Rubric for Technology-enhanced Learning: Essay (40%)

Grading rubrics for written assignments #1 & #2

Category	Excellent (85-100%)	Good (70-84%)	Adequate (55-69%)	Inadequate (< 55%)
Submitted review prior to deadline	Essay submitted on time	Essay submitted on time	Essay submitted on time	Essay submitted late
Clarity, grammar and style (20%)	- The essay is clear and presented with a strong, coherent, and compelling voice that takes its audience into consideration. - Paragraphs and sentences are cohesive. - No grammatical or spelling problems.	- The essay is clear and is presented with a strong, coherent voice. - Paragraphs and sentences are structured. - No or few grammatical or spelling problems.	- The essay is mostly clear but contains a few errors that detract from the argument. - Paragraphs and sentences are not always well structured. - Common grammatical or spelling problems.	- Essay is unclear or does not address the assignment. - Paragraphs and sentences are poorly structured and difficult to understand. - Grammatical and spelling problems make the text difficult to understand.
Organization (10%)	- Introduction is inviting, states the main topic, and provides an overview of the paper. - Body presents evidence from the course and discussion. - Concise conclusion. - Word count of 600 +/- 100 words.	- Introduction states the main topic, and provides an overview of the paper. - Body presents some evidence from the course and discussion. - Conclusion. - Word count of 600 +/- 100 words.	- Introduction states the main topic. - Body presents little evidence from the course and a slim discussion. - Conclusion. - Word count of 600 +/- 200 words.	- Poor or no introduction. - Body presents no evidence from the course or discussion. - Poor or no conclusion. - Word count <400 or >800 words.
Content (50%)	- Presents a focused argument that considers alternative solutions, evaluates them, and offers an insightful resolution. - Offers multiple lines of evidence informing the argument and evaluates the merit of their contribution. - Clear connections with course content. Information cited from class is accurate and relevant to the argument.	- Presents a focused argument that considers alternative solutions and evaluates them. - Offers multiple lines of evidence and relates them to the argument. - Some connections with course content, information cited is accurate. - Argument shows an understanding of the	- Presents a simple argument with a single point which may wander or not have a solution. - Offers a single line of evidence for claims. - Some connections with course content. - Argument shows a limited understanding of the natural process and/or society's response to it.	- Does not present an argument. - Does not provide evidence for claims. - No connections with course content. - Poor understanding of the natural process and society's response to it.

	Argument shows a good understanding of the natural process and society's response to it.	natural process and/or society's response to it.		
Sources (20%)	- Expertly sourced references that include seminal articles that are relevant to the argument being presented - Adequately and appropriately cited sources. - All citations are listed in the "References" section.	- Entirely sourced references that are mostly relevant to the argument being presented. - Adequately cited sources. - All citations are listed in the "References" section.	- Offers a single line of evidence for claims. - Few cited sources, or inadequately cited sources. - Few citations are missing from the "References" section.	- Does not provide evidence for claims. - Insufficient sources cited. - Most citations are missing from the "References" section.

Grading rubrics for peer reviews #1 & #2

Category	Excellent (85-100%)	Good (70-84%)	Adequate (55-69%)	Inadequate (< 55%)
Submitted review prior to deadline.	Review submitted on time	Review submitted on time	Review submitted on time	Review submitted late
Provided meaningful feedback on content of essay (40%)	Comments include specific suggestions and additional resources for consideration	Comments indicate some suggestions for consideration	Comments are superficial and provide vague suggestions for consideration	No comments provided
Provided meaningful feedback on structure/ organization and clarity of points (30%)	Comments include specific suggestions improving structure and order	Comments identify potential problems with structure and organization	Comments are superficial	No comments provided
Provided all comments in a positive, encouraging and constructive manner (30%)	Comments praise specific strengths of the presentation as well as constructively addressing weaknesses with alternatives that might be considered. The review is written in a polite and respectful way.	Comments include positive feedback and suggestions The review is written in a polite and respectful way.	Comments are neutral or non-engaging. The review is written with a neutral tone.	Non-constructive criticism. Comments might be interpreted as insulting.

Rubric for Mid-semester Quiz: Multiple Choice Questions (25%)

Marks	Criteria
> 90%	Replied correctly to >90% of the Multiple Choice Questions demonstrating full mastery of the topic.
75% to 89%	Replied correctly to 75-89% of the Multiple Choice Questions demonstrating a good mastery of the topic.
65% to 74%	Replied correctly to 65-74% of the Multiple Choice Questions demonstrating a reasonable understanding of the topic with some knowledge gaps.
50% to 64%	Replied correctly to 50-64% of the Multiple Choice Questions reflecting a partial understanding of the topic.
< 50%	Replied correctly to <50% of the Multiple Choice Questions reflecting a rather poor understanding of the topic.

Rubric for Mid-semester Quiz: Multiple Choice Questions 1 (25%)

Marks	Criteria
> 90%	Replied correctly to >90% of the Multiple Choice Questions demonstrating full mastery of the topic.
75% to 89%	Replied correctly to 75-89% of the Multiple Choice Questions demonstrating a good mastery of the topic.

65% to 74%	Replied correctly to 65-74% of the Multiple Choice Questions demonstrating a reasonable understanding of the topic with some knowledge gaps.
50% to 64%	Replied correctly to 50-64% of the Multiple Choice Questions reflecting a partial understanding of the topic.
< 50%	Replied correctly to <50% of the Multiple Choice Questions reflecting a rather poor understanding of the topic.

Appendix 2: Intended Affective Outcomes

As a result of this course, it is expected you will develop the following "big picture" attributes:

Apply environmental knowledge and concepts to make sound decisions

Demonstrate intellectual flexibility and critical thinking

Demonstrate passion and use advanced communication skills to share that passion

Formulate key scientific questions and develop hypotheses

Conduct research

Solve environmental problems

Synthesize interdisciplinary approaches to solving problems

Demonstrate the willingness and skills for lifelong learning

Demonstrate ethical values

Demonstrate collaboration and leadership skills