Academic Year	2019	**Semester**	II
Course Coordinator	Dr. Janice Ser Huay Lee		
Course Code	ES8006		
Course Title	Environmental Sustainability		
Pre-requisites	NA		
No of AUs	3		
Contact Hours	Emails should be sent from your NTU account to the course email ES8006@ntu.edu.sg from Monday through Friday, 9am-5pm. My office hours are 10am-12pm on Fridays at N2-01c-43 for consultations. The office hours for teaching assistants are 4.30-5.30pm on Mondays at the lecture hall or at N1.1-B2-01c for consultations. Please send an email to make an appointment beforehand.		
Proposal Date	27 December 2019		

Course Aims

In this inter-disciplinary introduction to environmental science, we will look at 1) the interconnections between biological, geological, and chemical processes, 2) how human behavior responds to and shapes these processes, and 3) how interdisciplinary communication, through scientific research, governmental policy, economics, and education, is essential for identifying, managing, and solving for human impacts on the natural world. This course will provide opportunities for you to learn the basics of the environmental system (i.e., biogeochemical, energy and biological cycles), understand more about natural resource and waste management, share insights you have gained from the coursework with students from other programs, and identify, evaluate and propose solutions to relevant sustainability issues.

This course is suitable for students from all disciplines and it does not require you to have a science background. We have had students from across the different schools and we do not require you to have any 'A' Level background in biology. The content related to the basics of the environmental system will be catered to students with no prior background in the sciences.

You should take up this course because it concerns you! As we are faced with more and more news about environmental issues, it is imperative for you to understand what is reported, whether these issues are supported by scientific evidence, and what can you do about environmental issues through your lifestyle choices, your political action or your career.

Intended Learning Outcomes (ILO)

By the end of this course, you should be able to:

1) Demonstrate intellectual flexibility and critical thinking in order to apply environmental knowledge in the real world
2) Communicate environmental concepts with enthusiasm to varied audiences both orally and in writing
3) Formulate scientific questions, and be able to access and analyze quantitative and qualitative information to address them
4) Exhibit the motivation, curiosity and skills for lifelong learning
5) Demonstrate ethical values and responsibility
6) Collaborate and lead by influence

Course Content

We will cover a range of topics in environmental sustainability, beginning with an understanding of human-environment interactions, how humans have traditionally managed natural resources and some relatively new concepts used to redefine the relationship between people and nature. We will have lectures that allow you to have a basic scientific understanding of ecological, biogeochemical and energy systems, then focus on the topics that are more related to the management of resources such as land, water and waste. We will end the course with the most pertinent environmental issue – climate change, and focus more on mitigation and adaptation strategies. Throughout the lecture, there will be Turning Point questions that will be used to engage students in the lecture. The final portion of the lecture will be dedicated to highlighting how each discipline has a role to play in environmental sustainability. This portion of the lecture will showcase how achieving environmental sustainability is a highly interdisciplinary effort.

1. Defining environmental commons and concepts on 'Tragedy of the Commons' and 'Common Pool Resource Management'
2. Using systems thinking to understand human-environment interactions and learning the concepts on planetary boundaries, environmental justice and degrowth
3. Ecosystems and biological diversity
4. Flow of nutrients and chemicals across geological, oceanic, biological and atmospheric systems
5. Extraction and use of non-renewable energy sources and the potential of renewable energy sources
6. Drivers and consequences of land-use change such as deforestation and urbanization
7. Evaluating how water resources are managed under different societal conditions
8. Understanding how and where waste is generated and evaluate current solutions to manage waste
9. Climate change adaptation and mitigation

Assessment (includes both continuous and summative assessment)

Component	ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual	Assessment Rubrics
1. Group Essay	1,2,3,5,6	Communication, Creativity & Competence.	20%	Team	Appendix 1
2. Online Quizzes	1,4	Creativity & Competence	20%	Individual	N/A
3. Continuous Assessment 1: MCQ	1,2,3,4	Competence	30%	Individual	N/A
4. Continuous Assessment 2: MCQ	1,2,3,4	Competence	30%	Individual	N/A
Total			100%		

Description of Assessment Components:

Group Essay: You will be assigned to a group which consists of students who come from different disciplines. This multi-disciplinary group setting imitates what you would face in real-world situations when your colleagues or team members may not be from the same background as you. This should encourage you to improve your communication skills and to have a chance to understand what a different discipline can offer in terms of environmental solutions. Together as a group, you will write a group essay related to improving a sustainability issue in Singapore.

Online Quizzes: There will be five online quizzes which will be based on a required reading and will also test your knowledge on specific lectures in the semester. These quizzes will be administered online on NTU Learn. Each quiz accounts for 4% of your grade.

Continuous Assessments (CA) 1 & 2: Each CA consists of 50 multiple-choice questions which will test your knowledge on the content from the lectures, your ability to interpret evidence to make decisions involving environmental issues, and your ability to interpret and analyze environmental data to make. Each midterm exam contributes to 30% of your grade.

Formative feedback

You will receive formative feedback through written responses to your essays and verbal feedback through in-class discussion on your group essay and the performance of your peers.

You will receive feedback on your online quizzes through in-class review of the online quizzes.

You will receive feedback for CA1 for questions in which majority of the class fared poorly. This will be conducted through in-class discussions.

Learning and Teaching approach

Approach	**How does this approach support you in achieving the learning outcomes?**
Active Learning	The course adopts an active learning approach by encouraging students to respond to clicker questions in class.
Project based Learning	The course adopts a project based learning approach where students are involved in groups to investigate a sustainability issue in Singapore, and are expected to work in interdisciplinary teams to develop their group essay.

Reading and References

Textbook: Miller: Living in the Environment (18th ed.)

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all lectures punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for classes you have missed.

(2) Absenteeism

Absence from class will affect your overall course grade. It is important for you to attend the lectures even though they have been recorded on video. Absenteeism during Continuous Assessments is NOT ALLOWED without a valid medical certificate. This medical certificate has to be submitted to your school to be verified, before it reaches our school's undergraduate administration.

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.

You will be penalized should you attempt to cheat in your Continuous Assessments or in your group essays. Please ensure that you communicate well in your assigned groups and learn to work well with one another in this process.

Course Instructors

Instructor	Office Location	Phone	Email
Dr. Janice Lee	N2-01C-43	+65 65923601	janicelee@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	ILO	Readings/ Activities
Week 1	Introduction to Environmental Sustainability	1	Chapter 1,2
Week 2	Human Populations and Wealth	1,2	Chapter 6, 23

Week 3	Chemicals in the Environment	1,2,3	Chapter 13,14,18
Week 4	*No class – explore group essay*		
Week 5	Energy systems	1,2,3	Chapter 15,16
Week 6	Climate Change	1,2,3	Chapter 19
Week 7	**CA 1**		
Week 8	Land Management	1,2,3	Chapter 10,12,22
Week 9	Biodiversity and Ecosystems	1,2,3	Chapter 3,4,5
Week 10	Water Resources	1,2,3	Chapter 13,20
Week 11	Waste Management	1,2,3	Chapter 21
Week 12	**CA 2**		
Week 13	Environmental Justice	1,2,3,5	Chapter 24, 25

Appendix 1: Assessment Criteria for Group Essay

Grading Rubric
The teaching team will evaluate your group's paper with the following rubric.

Please note that in practice each group member would receive the same score. However, it may vary should there be evidence that you have not contributed meaningfully to your team.

Category	**Sophistication**				
	0 pts	1 pts	2 pts	3 pts	4 pts
Clarity	Essay is unclear or does not address the assignment	The essay is mostly clear but contains a few errors that detract from the argument	The essay is clear but may contain a few errors that do not detract from the argument	The essay is clear and is presented with a strong, coherent voice	The essay is clear and presented with a strong, coherent, and compelling voice that takes its audience into consideration
Argumentation	Does not present an argument	Presents a simple argument with a single point which may wander or not have a solution	Presents a simple, but focused, argument with a solution	Presents a focused argument that considers alternative solutions and evaluates them	Presents a focused argument that considers alternative solutions, evaluates them, and offers an insightful resolution
Context	Does not provide context for the argument being presented	Offers a simple context for the argument being presented	Offers a simple context for the argument being presented that uses course terms and language	Offers a detailed context for the argument being presented that correctly uses course terms and language	Offers a detailed context for the argument that fluidly integrates course themes and language
Evidence	Does not provide evidence for claims	Offers a single line of evidence for claims	Offers multiple lines of evidence for claims	Offers multiple lines of evidence and relates them to the argument	Offers multiple lines of evidence informing the argument and evaluates the merit of their contribution

Sources	Unsourced references	Mostly sourced references	Mostly sourced references that are mostly relevant to the argument being presented	Entirely sourced references that are mostly relevant to the argument being presented	Expertly sourced references that include seminal articles that are relevant to the argument being presented