

Course Title	Tropical Ecology		
Course Code	ES3302		
Offered	Study Year 3, Sem 1 Study Year 4, Sem 1		
Course Coordinator	Shawn Lum Kaihekulani Yamauchi (Dr)	shawn.lum@ntu.edu.sg	
Pre-requisites	ES2303		
AU	3		
Contact hours	Lectures: 39		
Approved for delivery from			
Last revised	3 Aug 2020, 11:40		

Course Aims

This course aims to give you a general understanding of tropical ecosystems, including the location and characteristics of tropical habitats, their climate and their biogeography. Throughout this course, you will learn the influence of climate in determining the distribution of organisms and the trophic structure of the ecosystems. Specific examples will include descriptions of the characteristics of tropical rain forests, mountains, deserts, grasslands, wetlands and mangroves, while highlighting the adaptations required by autochthonous organisms. By the end of this course, you will also gain a general knowledge of how tropical ecosystems affect human societies and how humans influence the structure and function of these ecosystems.

Intended Learning Outcomes

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

1. Apply environmental knowledge and concepts to field observations (interpret what they see)
2. Apply environmental knowledge, concepts and observations to give policy advice
3. Conduct scientific ecological field experiment
4. Collect, analyze, interpret and present research data
5. Report research findings in a scientific report
6. Discuss research finding and their applications

Course Content

Location and characteristics of tropical habitats

Climate and their biogeography of tropical habitats

The influence of climate in determining the distribution of organisms

The trophic structure of the ecosystems

Adaptations required by autochthonous organisms

How tropical ecosystems affect human societies and how humans influence the structure and function of these ecosystems

Conservation and management of tropical ecosystems, with particular attention to their importance for human populations and the socio-cultural impacts of changing ecosystem services

Assessment

Component	Course ILOs tested	ASE Graduate Attributes tested	Weighting	Team / Individual	Assessment Rubrics
Continuous Assessment					
Lectures					
Group Project	1, 2, 3, 4, 5, 6	11. 12. 13. 14. 15. 16.	25	team	See Appendix for rubric
Field trip report 1	1, 2, 3, 4, 5, 6	11. 12. 13. 14. 15.	15	individual	See Appendix for rubric
Field trip report 2	1, 2, 3, 4, 5, 6	11. 12. 13. 14. 15.	15	individual	See Appendix for rubric
Online quizzes	1, 2	13. 15.	10	individual	See Appendix for rubric
Data Analysis project	3, 4, 5, 6	12. 13. 14. 15.	35	individual	See Appendix for rubric
Total			100%		

These are the relevant ASE Graduate Attributes.

11. [2020] Intellectual Flexibility and Critical Thinking

Demonstrate intellectual flexibility and critical thinking in order to apply environmental knowledge in the real world

12. [2020] Communication

Communicate environmental concepts with enthusiasm to varied audiences both orally and in writing

13. [2020] Scientific Inquiry

Formulate scientific questions, and be able to access and analyse quantitative and qualitative information to address them

14. [2020] Lifelong learning

Exhibit the motivation, curiosity and skills for lifelong learning

15. [2020] Professional Responsibility

Demonstrate ethical values and responsibility

16. [2020] Collaboration and Leadership

Collaborate and lead by influence

Formative Feedback

Online quizzes – provide fast individual feedback on environmental theory covered, multiple times throughout the course. (1, 2, 6)

Instructor-led fieldtrips – opportunity to make and discuss direct observations in the field. (1, 2, 3)

Oral feedback discussions with instructor during the process of doing field studies and projects. (1, 2, 3, 4, 5, 6)

Comments on written reports – multiple reports make room for improvement (1, 2, 3, 4, 5, 6)

Learning and Teaching Approach

Lectures (39 hours)	<p>A significant part of the teaching in this course is based on field trips and field experiments. This is to facilitate your learning to interpret real field observations and connect them to ecological theory. To set up a field experiment, collect data in the field, followed by analysis and presentation in a report is also a big part of the course.</p> <p>Instructor-led field trips (1, 2, 3, 4) Independent field experiments (1, 2, 3, 4, 5, 6) Classroom/field discussions on local conservation issues relevant to Singapore and the region. Radio programs, debate articles etc. can be used as course material to gain insight and perspective on tropical ecology.</p>
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Reading and References

Patrick L. Osborne – Tropical Ecosystems and Ecological Concepts (2nd edition) – Cambridge university press

John Kricher – Tropical Ecology – Princeton university press, 2011

Additional material provided by instructor and your own research for your reports.

Course Policies and Student Responsibilities

1. Field safety policies. You are to follow safety instructions, act responsibly and use common sense regarding suitable practices and behaviour during all field excursions related to this course.
2. Lab safety policies. If your project includes lab work, you are to follow the safety guidelines prescribed by the ASE and/or the specific lab you are using.
3. Assignment lateness policies. You are to hand in all assignments on time. If you are unable to do so, contact the course coordinator as soon as possible.

4. Preparation for tutorials, field excursions and lectures. You are expected to independently take responsibility for studying and preparing for assessments, field excursions and classroom activities.

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
Shawn Lum Kaihekulani Yamauchi (Dr)	N2-01c-55		shawn.lum@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course ILO	Readings/ Activities
1	Introduction to this course (outline, objective and requirement, and assessment). Location and characteristics of tropical habitats	1	
2	Climate biogeography of tropical habitats I Field trip 1	1, 2, 3, 4, 5, 6	
3	Climate biogeography of tropical habitats II	1, 2, 6	
4	The influence of climate in determining the distribution of organisms	1, 2, 6	
5	The trophic structure of the ecosystems. Field trip 2	1, 2, 3, 4, 5, 6	
6	Adaptations required by autochthonous organisms	1, 2, 6	
7	How tropical ecosystems affect human societies and how humans influence the structure and function of these ecosystems I	1, 2, 6	
8	How tropical ecosystems affect human societies and how humans influence the structure and function of these ecosystems II	1, 2, 6	
9	Data analysis for ecological field studies. Start Individual Data Analysis Project.	3, 4, 5	
10	Data analysis for ecological field studies. Continue Individual D A Project.	2, 3, 4, 5	

11	Conservation and management of tropical ecosystems, with particular attention to their importance for human populations and the socio-cultural impacts of changing ecosystem services	1, 2, 6	
12	Conservation and management of tropical ecosystems, with particular attention to their importance for human populations and the socio-cultural impacts of changing ecosystem services	1, 2, 6	
13	Wrap up course.	1, 2, 3, 4, 5, 6	

Appendix 1: Assessment Rubrics

Rubric for Lectures: Group Project (25%)

	<p>Marks and criteria for Group Project</p> <p>To do well on this team assessment, it is necessary for you to demonstrate positive interdependence and teamwork. In principle, you will receive the same marks as your team. However, your individual score may vary based on feedback about your contributions to the group project. The final grade will be a combination of:</p> <p>1) The final report/product (50%): The end result (same grade for all team members)</p> <p>2) Teamwork and contribution/process (50%): Contributions of each team member to the work and the team spirit (different team members may receive different grades depending on their contribution). This grade will be based on instructor observation, review meetings of work progress with instructor and peer rating of each group members' contribution when the project is finished.</p>			
Component	<i>Excellent</i> A+ 85-100 A 80-84	<i>Very good/Good</i> A- 75-79 B+ 70-74	<i>Satisfactory/Adequate</i> B 65-69 B- 60-64	<i>Bordering unsatisfactory/unsatisfactory</i> C+ 55-59 C 50-54
<i>Field observations</i>	Observations very perceptive and systematic considering multiple relevant aspects, and with evidence of curiosity, and passion.	Observations comprehensive, considering one or a few relevant aspects, and with some evidence of curiosity, and passion.	Observations adequate, considering key aspect(s) but missing some relevant part or containing errors. Limited evidence of curiosity, and passion.	Observations incomplete, missing some relevant part or containing errors. Very limited evidence of curiosity, and passion.
<i>Connection of observations with theory</i>	Connects observations to multiple aspects of the theory of ecology and conservation, making several independent, coherent, and relevant points.	Connects observations to one or a few aspects of the theory of ecology and conservation, making one or a few coherent relevant points.	Connects observations to some key aspect(s) of the theory of ecology and conservation, making one or a few coherent/relevant points.	Poor connections between observations and key aspect(s) of the theory of ecology and conservation. Points incoherent or lacking relevance.

<i>Interpretation of observations</i>	Interpretation of observations goes beyond synthesis of key points and issues to create a new independent, well-motivated point.	Interpretation of observations synthesizes key points and issues into one or a few coherent conclusions.	Interpretation of observations covers some key points and issues but without synthesis.	Interpretation of observations covers one or two points that are not connected and/or misses important point.
<i>Teamwork</i>	The group works as a well-coordinated inclusive unit, profiting from the strengths of different members making the result greater than the sum of the parts.	The group works well together, communicating and producing a coherent outcome of even standard.	The group lacks sufficient communication between members. The outcome is somewhat incoherent, and the standard is uneven.	Cooperation within the group is insufficient or not working. The outcome is incoherent and uneven.

Rubric for Lectures: Field trip report 1 (15%)

	<p>Marks and criteria for Field Trip Reports 1&2</p> <p>When field reports are authored by more than one student together, it is necessary for you to demonstrate positive interdependence and teamwork. In principle, you will receive the same marks as your team. However, your individual score may vary based on feedback about your contributions to the group project. The final grade will be a combination of:</p> <p>1) The final report/product (50%): Same grade for all team members</p> <p>2) Teamwork and contribution/process (50%): Different team members may receive different grades depending on the contributions of each team member to both the working process and the team spirit. This grade will be based on instructor observation, review meetings of work progress with instructor and peer rating of each group member's contribution when the project is finished.</p>			
Component	<i>Excellent</i> A+ 85-100 A 80-84	<i>Very good/Good</i> A- 75-79 B+ 70-74	<i>Satisfactory/Adequate B</i> 65-69 B- 60-64	<i>Bordering unsatisfactory/unsatisfactory</i> C+ 55-59 C 50-54
<i>Objective and aims</i>	Well defined objectives. Aims explicit and well-motivated and connected to theory.	Objectives defined but required refinement. Aims motivated with link to relevant theory.	Objectives poorly defined. Aim is unclear, not based on theory.	Objectives poorly defined and superficial. Aims lacking or irrelevant.
<i>Methods and execution</i>	Well thought out, and explicit description of methods. Execution with organization,	Well thought out but description of methods was less explicit. Execution somewhat organized	Poor design of study and execution, and vague description of methods. Lack of organization, and dedication/curiosity.	Methodology was flawed. Vague description of methods. Serious lack of organization and dedication/curiosity.

	dedication, and curiosity.	with some evidence of dedication/curiosity.		
<i>Analysis and presentation of data</i>	Well-documented and appropriate data collection and analysis. Limitations or caveats related to data or analysis stated. Data presentation clearly displays most interesting findings using graphs, figures, and tables.	Appropriate techniques were used to evaluate data. The process of data collection was documented. Data limitations were stated. Data presentation adequately displays results using graphs, figures, and tables.	Appropriate techniques used to evaluate data. The process of data collection was not documented. Data presentation confusing or lacking important results. Contains graph, figure or table.	No reflection of data limitations and potential caveats in study. Inappropriate techniques used to evaluate data. No attempt made to collect data for project. Data presentation inadequate or lacking.
<i>Discussion and conclusions</i>	Observations discussed and linked to ecological theory. Interpretation of results clear, independent, insightful, and demonstrate excellent understanding.	Some linking of observations to ecological theory. Interpretation of results fairly clear, independent, and demonstrate understanding.	Linking of observations to ecological theory poor. Interpretation of observations limited.	Observations not linked to ecological theory. Demonstrate lack of understanding of results and vague explanations.

Rubric for Lectures: Field trip report 2 (15%)

	<p>Marks and criteria for Field Trip Reports 1&2</p> <p>When field reports are authored by more than one student together, it is necessary for you to demonstrate positive interdependence and teamwork. In principle, you will receive the same marks as your team. However, your individual score may vary based on feedback about your contributions to the group project. The final grade will be a combination of:</p> <p>1) The final report/product (50%): Same grade for all team members</p> <p>2) Teamwork and contribution/process (50%): Different team members may receive different grades depending on the contributions of each team member to both the working process and the team spirit. This grade will be based on instructor observation, review meetings of work progress with instructor and peer rating of each group member's contribution when the project is finished.</p>			
Component	<p><i>Excellent</i> A+ 85-100 A 80-84</p>	<p><i>Very good/Good</i> A- 75-79 B+ 70-74</p>	<p><i>Satisfactory/Adequate B</i> 65-69 B- 60-64</p>	<p><i>Bordering unsatisfactory/unsatisfactory</i> C+ 55-59 C 50-54</p>

<i>Objective and aims</i>	Well defined objectives. Aims explicit and well-motivated and connected to theory.	Objectives defined but required refinement. Aims motivated with link to relevant theory.	Objectives poorly defined. Aim is unclear, not based on theory.	Objectives poorly defined and superficial. Aims lacking or irrelevant.
<i>Methods and execution</i>	Well thought out, and explicit description of methods. Execution with organization, dedication, and curiosity.	Well thought out but description of methods was less explicit. Execution somewhat organized with some evidence of dedication/curiosity.	Poor design of study and execution, and vague description of methods. Lack of organization, and dedication/curiosity.	Methodology was flawed. Vague description of methods. Serious lack of organization and dedication/curiosity.
<i>Analysis and presentation of data</i>	Well-documented and appropriate data collection and analysis. Limitations or caveats related to data or analysis stated. Data presentation clearly displays most interesting findings using graphs, figures, and tables.	Appropriate techniques were used to evaluate data. The process of data collection was documented. Data limitations were stated. Data presentation adequately displays results using graphs, figures, and tables.	Appropriate techniques used to evaluate data. The process of data collection was not documented. Data presentation confusing or lacking important results. Contains graph, figure or table.	No reflection of data limitations and potential caveats in study. Inappropriate techniques used to evaluate data. No attempt made to collect data for project. Data presentation inadequate or lacking.
<i>Discussion and conclusions</i>	Observations discussed and linked to ecological theory. Interpretation of results clear, independent, insightful, and demonstrate excellent understanding.	Some linking of observations to ecological theory. Interpretation of results fairly clear, independent, and demonstrate understanding.	Linking of observations to ecological theory poor. Interpretation of observations limited.	Observations not linked to ecological theory. Demonstrate lack of understanding of results and vague explanations.

Rubric for Lectures: Online quizzes (10%)

Assessment Criteria for Online Quizzes (continuous summative assessment)

The course has a number of short online quizzes, together worth 10% of the total grade (the exact number of quizzes can vary between years as the course is modified but expect about 5 quizzes). These

tests will consist of the following type of questions: multiple choice questions, short answer questions , fill in the blank, highlight area on map, and similar.

To score a high mark, you must provide complete, clear answers to the questions and correctly naming or explain ecological terms, concepts, and phenomena. To receive a passing mark, you must provide mostly complete and correct answers to the questions on the quiz . The purpose of the quiz is to ensure a good grasp of ecological theory, that you then apply and discuss in your other assignments (reports and projects).

Rubric for Lectures: Data Analysis project (35%)

	Marks and criteria for Data Analysis Project This is an individual assignment to be conducted independently by each student.			
Component	<i>Excellent</i> A+ 85-100 A 80-84	<i>Very good/Good</i> A- 75-79 B+ 70-74	<i>Satisfactory/Adequate B</i> 65-69 B- 60-64	<i>Bordering unsatisfactory/unsatisfactory</i> C+ 55-59 C 50-54
<i>Objective and aims</i>	Well defined objectives. Aims explicit, well-motivated.	Objectives defined but required refinement. Aims motivated.	Objectives poorly defined. Aim is unclear or too general.	Objectives poorly defined and superficial. Aims lacking or irrelevant.
<i>Methods and execution</i>	Well planned, organized, and systematic execution. Explicit description of methods.	Planned and reasonably organized, systematic execution. Sufficient description of methods.	Poor study design and/or execution of study. Vague description of methods. Lack of organization.	Methodology flawed. Vague description of methods. Serious lack of planning and/or organization.
<i>Analysis and presentation of data</i>	Well-documented and appropriate data collection and analysis. Limitations or caveats related to data or analysis stated. Data presentation clearly displays interesting findings using graphs, figures, and tables.	Appropriate techniques were used to evaluate the data. The process of data collection was documented. Data limitations were stated. Data presentation adequately displays results using graphs, figures, and tables.	Appropriate techniques used to evaluate data. The process of data collection not adequately documented. Data presentation confusing or lacking relevant results. Contains graph, figure or table.	Inappropriate techniques used to evaluate data. No attempt or failed attempt to collect data for project. No reflection of data limitations and potential caveats in study. Data presentation inadequate or lacking.
<i>Discussion and conclusions</i>	Observations discussed and linked to ecological theory and conservation on the	Some linking of observations to ecological theory and conservation on the ground.	Linking of observations to ecological theory and/or conservation on the ground poor. Interpretation of observations limited.	Observations not linked to ecological theory or conservation on the ground.

	ground. Interpretation of results independent, insightful, and demonstrate excellent understanding.	Interpretation of results relevant and demonstrate understanding.		Demonstrate lack of understanding of observations.
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Appendix 2: Intended Affective Outcomes

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

Appreciation for the importance for humanity of ecosystem services from tropical ecosystems

Understanding for the many ways that tropical ecosystems are unique compared to other climatic zones

Ability to observe and draw conclusions from a tropical field site