Course Title	**Conservation Biology and Biodiversity**	
Course Code	**ES4301**	
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, ES2301, AAB30C, AAB30D	
AU	3	
Contact hours	Lectures: 39	
Approved for delivery from		
Last revised	3 Aug 2020, 11:40	

Course Aims

This course starts by giving you various definitions and measures of biodiversity. Throughout the course, you will learn the importance of conservation and environmental impact assessments during the planning stages of large development projects. Your will understand why it is important to prevent species extinction, what happens when a keystone taxon goes extinct and how this influences ecosystem dynamics. By the end of the course, you will also gain an appreciation of how the establishment of protected reserves can limit the impact of other threats to biodiversity such as habitat destruction, fragmentation and degradation.

Intended Learning Outcomes

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

1. Conduct field surveys using appropriate definitions and measures of biodiversity for conservation.
2. Analyze, interpret and draw conclusions from collected field data.
3. Plan conservation and environmental impact assessments for large development projects based on empirical ecological studies.
4. Work as part of a team and collaborate.
5. Apply ecological theory to real conservation situations.

Course Content

How to define and measure biodiversity.

The ecological theory of species extinctions, cascading ecological effects of the extinction of a keystone taxon on ecosystem dynamics.

Why conservation and environmental impact assessments are important during the planning stages of large development projects.

How the establishment of protected reserves can limit the impact of other threats to biodiversity such as habitat destruction, fragmentation and degradation.

That there is a gap between conservation biology research and actual conservation on the ground.

A selection of relevant classical work in the fields of biodiversity and related ecological theory.

Current trends in the fields of biodiversity and conservation research.

Assessment

Component	Course ILOs tested	ASE Graduate Attributes tested	Weighting	Team / Individual	Assessment Rubrics
Continuous Assessment					
Lectures					
Group Project	1, 3, 4, 5	**11.** **12.** **13.** **14.** **15.** **16.**	25	team	See Appendix for rubric
Individual Project	1, 2, 3, 5	**13.** **14.**	35	individual	See Appendix for rubric
Online Quizzes	1, 5	**13.** **15.**	10	individual	See Appendix for rubric
Field Trip Report 1	1, 2, 3, 4, 5	**11.** **12.** **13.** **14.** **15.**	15	individual	See Appendix for rubric
Field Trip Report 2	1, 2, 3, 4, 5	**11.** **12.** **13.** **14.** **15.**	15	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

ILO 1: You will receive direct on-site feedback from teaching staff through student-teacher interactions during field trips.
ILO 2: You will have feedback on your surveys and projects through discussion with the lecturer at various stages of the process.
ILO 3: You are expected to work fairly independently, applying knowledge from the course to realistic scenarios, but the lecturer is available for advice and discussion.
ILO 4: Teamwork is an important part of the course experience and you are encouraged to engage with your teammates for a result that is greater than the sum of the parts, drawing from each other's strengths and sharing peer feedback.
ILO 5: With the goal of best possible learning experience, your finished work will be discussed in class with opportunity for feedback from teachers, peers as well as yourself (i.e. what worked well and what would you do differently).
ILO 1, 2, 3 and 5: Continuous online quizzes will give yourself and the teacher an indication of your progress so far and what parts you need to work harder on.

Learning and Teaching Approach

Lectures (39 hours)	ILO 1, 2, 3, and 5: Field trips led by the lecturer provide a unique hands on approach where students are trained to read and interpret various local environments in Singapore under guidance. ILO 1, 2, 3, and 5: Field surveys conducted independently by the students provide opportunity to plan and carry out field work, apply theory and analyze and interpret their own original data, and to make mistakes and learn from these. ILO 2, 3, and 5: Student projects on conservation and environmental impact assessments gives you direct experience of local conservation issues and to discuss these within the context of conservation and ecological theory. It also gives insight into why there is often a gap between science and conservation on the ground, as multiple parties and factors have to be considered. ILO 4. Carrying out group projects and producing a coherent report requires a team effort, you have to find ways to work together to complete the project in the best possible way. ILO 1, 2, 3, and 5: Continuous theory quizzes help both you and the lecturer keep track of your progress with the theory that the course builds on.

Reading and References

Notes from field trips, lectures and discussions.
Scientific literature recommended during the course.

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	Definitions and measures of biodiversity.	1, 2, 5	
2	Field Trip 1.	1, 2, 3, 5	
3	Species extinctions, ecological cascades, keystone taxon.	1, 5	
4	Establishing reserves to protect biodiversity and threats to biodiversity (habitat destruction, fragmentation and degradation).	1, 2, 3, 5	
5	Conservation and environmental impact assessments.	3, 5	
6	Field Trip 2.	1, 2, 3, 4, 5	
7	The gap between conservation biology research and conservation on the ground.	1, 2, 3	
8	Data analysis and interpretation.	2	
9	Group projects.	1, 2, 3, 4, 5	
10	Group projects.	1, 2, 3, 4, 5	
11	Current trends in the fields of biodiversity and conservation.	1, 5	
12	Focus on Individual student projects.	1, 2, 3, 5	
13	Focus on individual student projects.	1, 2, 3, 5	

Appendix 1: Assessment Rubrics

Rubric for Lectures: Group Project (25%)

	Marks and criteria for Group Project To do well on this team assessment, it is necessary for you to demonstrate positive interdependence and teamwork. Your individual score will depend on: 1) The final report/product (50%): Same grade for all team members. 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 completed. Peer review will consist of a simple and anonymous spot quiz after completion of the assignment.			
Component	*Excellent* *A+ 85-100* *A 80-84*	*Very good/Good* *A- 75-79* *B+ 70-74*	*Satisfactory/Adequate B 65-69* *B- 60-64*	*Bordering unsatisfactory/ unsatisfactory* *C+ 55-59 C 50-54*
Field observations	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.
Connection of observations with theory	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.
Interpretation of observations	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.
Teamwork	The group works as a well-coordinated inclusive unit, profiting from the strengths of different members making the result greater that 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: Individual Project (35%)

	Marks and criteria for Individual Project			
Component	*Excellent* *A+ 85-100* *A 80-84*	*Very good/Good* *A- 75-79* *B+ 70-74*	*Satisfactory/Adequate B 65-69* *B- 60-64*	*Bordering unsatisfactory/ unsatisfactory* *C+ 55-59* *C 50-54*
Objective and aims	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.
Methods and execution	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.
Analysis and presentation of data	Well-documented and appropriate data collection and analysis. L imitations 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.
Discussion and conclusions	Observations discussed and linked to ecological theory and conservation on the ground. Interpretation of results independent, insightful, and demonstrate excellent understanding.	Some linking of observations to ecological theory and conservation on the ground. Interpretation of results relevant and demonstrate understanding.	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. Demonstrate lack of understanding of observations.

Rubric for Lectures: Online Quizzes (10%)

Assessment Criteria for Online Quizzes (continuous summative assessment)

The course has a number of short online quizzes spread out over the first two thirds of the course, 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: Field Trip Report 1 (15%)

	Marks and criteria for Field Trip Reports 1&2			
Component	*Excellent* *A+ 85-100* *A 80-84*	*Very good/Good* *A- 75-79* *B+ 70-74*	*Satisfactory/Adequate B 65-69* *B- 60-64*	*Bordering unsatisfactory/ unsatisfactory* *C+ 55-59* *C 50-54*
Objective and aims	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.
Methods and execution	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.
Analysis and presentation of data	Well-documented and appropriate data collection and analysis. L imitations 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.
Discussion and conclusions	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%)

	Marks and criteria for Field Trip Reports 1&2			
Component	*Excellent* *A+ 85-100* *A 80-84*	*Very good/Good* *A- 75-79* *B+ 70-74*	*Satisfactory/Adequate B 65-69* *B- 60-64*	*Bordering unsatisfactory/ unsatisfactory* *C+ 55-59* *C 50-54*
Objective and aims	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.
Methods and execution	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.
Analysis and presentation of data	Well-documented and appropriate data collection and analysis. L imitations 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.
Discussion and conclusions	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.

Appendix 2: Intended Affective Outcomes

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

Connecting the theory of biodiversity conservation with their own observations in the field.

Use ecological theory and analytical skills to interpret what they see in the field.

Appreciate the link between conservation biology work and actual conservation on the ground, and the gap between the two, where research isn't always applied or translated into tangible conservation efforts.