

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

Expected Implementation in Academic Year (New format)	AY2025-2026
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Asst Prof Kyle Morgan
Course Author Email	kmorgan@ntu.edu.sg
Course Title	MARINE & AQUATIC ECOLOGY
Course Code	ES4303
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	ES2303 Introduction to Ecology; OR AAB20D Ecology
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course builds on the basic concepts learned in Introduction to Ecology and will allow you, the student, to apply these to Marine and Freshwater ecosystems. In this course you will become familiar with the major processes, systems and impacts associated with marine and freshwater habitats and related taxa of organisms, and how these habitats and organisms interact.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Communicate key concepts of marine and freshwater ecological processes, systems, and impacts orally and in writing.
ILO 2	Describe, compare, and contrast major marine and freshwater habitats.
ILO 3	Apply ecological concepts within aquatic ecosystem contexts.
ILO 4	Analyse and evaluate scientific questions related to aquatic ecosystems using critical reasoning.
ILO 5	Discuss contemporary aquatic environmental issues in a measured and evidence-based manner.
ILO 6	Lead and facilitate structured group discussions.
ILO 7	Analyse and interpret environmental and biological data using multivariate statistical tools (e.g., PRIMER).
ILO 8	Conduct an in-depth literature review and produce a topical scientific report on an aquatic ecological issue.

Course Content

The course is split into three main sections: (i) Processes, where you will be exposed to the key ecological processes that occur in all aquatic systems, such as production, nutrient cycling and decomposition and remineralisation of organic matter; (ii) Systems, where you will learn how these processes differ in aquatic environments, and how this influences biological communities; and (iii) Impacts, or how anthropogenic influences effect these systems and processes

Reading and References (if applicable)

Course textbooks:

- Kaiser, 2011. Marine Ecology: Processes Systems and Impacts. Oxford University Press, 2nd edition. ISBN-13: 978-0199227020
- Dodds & Whiles, 2010. Freshwater Ecology. Academic Press, 2nd edition. ISBN-13: 978-0123747242
- Solon and Whitely, 2016. Stressors in the Marine Environment. Oxford University Press, 1st edition. ISBN-13: 978-0198718833

Supplemental reading will be given for tutorials and debates

Planned Schedule

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
1	Introduction to Marine and Freshwater Ecology: course overview; evolution of aquatic ecology; key differences between marine and freshwater environments	1,2,3	In-person	Lecture and introductory discussion	No assigned reading
2	Patterns in Marine and Freshwater Environments: biogeography, zonation, biodiversity, abundance and size patterns	1,2,3,7	In-person	Lecture and introduction to computer laboratory and PRIMER software	No assigned reading
3	PROCESSES – Production: primary and secondary production in aquatic ecosystems	1,2,3,4,7	In-person	Lecture and PRIMER computer laboratory (Session I)	No assigned reading
4	PROCESSES – Organic Material: production and degradation; microbial processes	1,2,3,4,7	In-person	Lecture and PRIMER computer laboratory (Session II)	No assigned reading
5	SYSTEMS – Lentic Systems: lakes and reservoirs	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
6	SYSTEMS – Lotic Systems: rivers and canals	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
7	SYSTEMS – Estuaries and Coasts: estuaries; rocky and sandy shores	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
8	SYSTEMS – Tropical and Sub-tropical Systems: mangroves, seagrasses, coral reefs	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
9	SYSTEMS – Open Water Systems: continental shelf seabed; pelagic ecosystems	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
10	SYSTEMS – Environmental Extremes: deep-sea and polar ecosystems	1,2,3,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
11	IMPACTS – Threats and Management: fisheries and aquaculture	1,2,3,4,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
12	IMPACTS – Threats and Management: pollution, disturbance, climate change	1,2,3,4,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings
13	IMPACTS – Threats and Management: Marine Protected Areas	1,2,3,4,5,6	In-person	Lecture and student-led tutorial discussion	Assigned tutorial readings

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Interactive lectures	Lectures introduce and synthesise core ecological concepts and frameworks in marine and freshwater systems, supporting your ability to describe, compare, and apply ecological processes and systems (ILOs 1–3). Interactive questioning during lectures encourages engagement and critical thinking.
Discussion-based tutorials	Tutorials are structured around contemporary environmental case studies and debates. Through guided discussion and peer interaction, you will develop critical analysis, communication, and leadership skills, and learn to articulate evidence-based arguments on aquatic ecological issues (ILOs 4–6).
Active participation and peer learning	Student-led discussions and collaborative activities promote active engagement, attendance, and preparation, enabling you to practise scientific communication and facilitate group discussions in a supportive learning environment (ILOs 1, 5, 6).
Hands-on data analysis (computer laboratories)	Practical computer-based sessions introduce multivariate ecological analysis tools (e.g. PRIMER). These sessions support your ability to analyse and interpret environmental and biological data, and to apply quantitative methods to real ecological datasets (ILOs 4, 7).
Independent learning and research-based inquiry	Independent reading, literature review, and report writing develop your capacity to evaluate scientific literature, synthesise information, and communicate complex ecological concepts in writing, supporting higher-order learning outcomes (ILOs 1, 4, 8).

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Report/Case study(Data Report)	1, 2, 3, 4, 7	1,2,3	40	You are required to analyse provided environmental and biological datasets using multivariate statistical tools introduced in the computer laboratory sessions (e.g. PRIMER). You will present your analysis in a structured data report, demonstrating appropriate application of analytical methods, interpretation of results, and clear scientific communication.	Individual	Analytic	Relational

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
2	Continuous Assessment (CA): Presentation(Tutorial Presentation & Discussion Facilitation)	1, 4, 5, 6	1,2,4,6	35	Working in small groups, you will lead a tutorial session based on assigned readings and a contemporary aquatic environmental issue. This assessment evaluates your ability to synthesise scientific literature, communicate key ideas clearly, facilitate group discussion, and respond critically to questions.	Team	Holistic	Relational
3	Continuous Assessment (CA): Class Participation(Participation and Engagement)	1, 5, 6		5	This component assesses your consistent and meaningful engagement in scheduled learning activities, including attendance, preparation, contribution to discussions, and participation in tutorials and practical sessions. Participation is evaluated holistically across the semester.	Individual	Holistic	Multistructural

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
4	Continuous Assessment (CA): Test/Quiz(Continuous Assessment (Quizzes))	1, 2, 3, 4, 5, 6		20	Short quizzes will be administered periodically to assess your understanding of key concepts covered in lectures and readings. These quizzes are designed to reinforce learning and provide timely feedback on your conceptual understanding.	Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

Data Report (40%)

You are required to analyse provided environmental and biological datasets using multivariate statistical tools introduced in the computer laboratory sessions (e.g. PRIMER). You will present your analysis in a structured data report, demonstrating appropriate application of analytical methods, interpretation of results, and clear scientific communication.

Tutorial Presentation and Discussion Facilitation (35%)

Working in small groups, you will lead a tutorial session based on assigned readings and a contemporary aquatic environmental issue. This assessment evaluates your ability to synthesise scientific literature, communicate key ideas clearly, facilitate group discussion, and respond critically to questions.

Participation and Engagement (5%)

This component assesses your consistent and meaningful engagement in scheduled learning activities, including attendance, preparation, contribution to discussions, and participation in tutorials and practical sessions. Participation is evaluated holistically across the semester.

Continuous Assessment – Quizzes (20%)

Short quizzes will be administered periodically to assess your understanding of key concepts covered in lectures and readings. These quizzes are designed to reinforce learning and provide timely feedback on your conceptual understanding.

Formative Feedback

You will receive formative feedback throughout the course through a combination of written and verbal feedback. Written feedback will be provided on assessed coursework to guide improvement in data analysis, scientific writing, and critical thinking. Verbal feedback will be given during tutorials, discussions, and practical sessions to support ongoing learning and engagement. General feedback addressing common strengths and areas for improvement will also be shared with the class. You are encouraged to approach the teaching team during and outside of class to seek additional feedback on your learning progress.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Care for Environment	Advanced
Collaboration	Intermediate
Communication	Intermediate
Information Literacy	Intermediate
Critical Thinking	Intermediate

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 complete all assigned readings, activities, and assessments, attend scheduled classes punctually, and submit all coursework by the stated deadlines. You are responsible for keeping up to date with course-related announcements, materials, and instructions communicated during classes or via official course platforms. Active participation in lectures, tutorials, discussions, and practical sessions is expected and contributes to your learning and overall performance in the course.

Policy (Absenteeism)

In-class learning activities form an integral component of this course and contribute to the participation component of the final grade. Absence from scheduled classes without a valid reason may affect your participation grade. Valid reasons for absence include illness supported by a medical certificate, or participation in NTU-approved activities supported by an official excuse letter from the relevant authority. Due to the interactive nature of in-class activities, no make-up opportunities will be provided for missed sessions.

Policy (Others, if applicable)

Diversity and inclusion policy

Integrating a diverse set of experiences is important for a more comprehensive understanding of science.

It is our goal at ASE to create an inclusive and collaborative learning environment that supports a diversity of perspectives and learning experiences, and that honours your identities; including ethnicity, gender, socioeconomic status, sexual orientation, religion or ability.

To help accomplish this:

- If you are neuroatypical or neurodiverse, have dyslexia or ADHD (for example), or have a social anxiety disorder or social phobia;
- If you feel like your performance in the class is being impacted by your experiences outside of class;
- If something was said in class (by anyone, including the instructor) that made you feel uncomfortable;

Please speak to your teaching team, a peer or senior, Janelle or Michel (either in-person or via email) about how we can help facilitate your learning experience.

As a participant in course 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 making sure all voices are being heard;

and refraining from the use of derogatory or demeaning speech or actions.

All members of the class 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 instructors or an ASE faculty member.

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