GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2026-2027

Applied Marine Ecology (I002535)

Course size *(nominal values; actual values may depend on programme)*

Credits 3.0 **Study time 90 h**

Course offerings and teaching methods in academic year 2026-2027

A (semester 1)	English	Gent	seminar
			lecture
			excursion
			independent work

Lecturers in academic year 2026-2027

Semmouri, Ilias	LA22	lecturer-in-charge

Offered in the following programmes in 2026-2027	**crdts**	**offering**
Bachelor of Science in Environmental Technology	3	A
Master of Science in Aquaculture	3	A
Master of Science in Bioscience Engineering: Environmental Technology	3	A
Master of Science in Bioscience Engineering: Forest and Nature Management	3	A
Master of Science in Bioscience Engineering: Land, Water and Climate	3	A
Master of Science in Environmental Science and Technology	3	A
Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level)	3	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	3	A
Exchange Programme in Bioscience Engineering: Land and Forest management (master's level)	3	A

Teaching languages

English

Keywords

Marine biotic and abiotic processes, Marine ecosystems, Blue growth, Ocean threats

Position of the course

This course introduces the fundamental and applied concepts of marine processes and ecosystems, with a strong focus on environmental functioning and human–ocean interactions. Through an integrated combination of theory and field excursions, students gain insight into how physical, chemical, and biological processes interact to shape marine ecosystems across spatial and temporal scales. The theoretical lectures link abiotic drivers – such as circulation, light, temperature, salinity, and ocean chemistry – to biotic processes including primary production, microbial dynamics, and trophic interactions. Moving beyond classical marine ecology, the course explicitly incorporates the modern human relationship with the ocean. Key environmental pressures such as climate change, pollution, eutrophication, and resource exploitation are analysed in relation to marine ecosystem services, environmental risks, and sustainability. From an environmental scientist's perspective, the course emphasizes system thinking by linking ocean physics, chemistry, and biology to ecosystem services and human pressures.

Contents

Part I - Ocean characteristics, physical-chemical processes and man

a) Planet Ocean: Introduction and terms

b) Moving Oceans: seafloor, winds and currents
c) Salty Oceans: salinity and importance
d) Deep Oceans: temperature, pressure and density
e) Dark Oceans: light and importance
f) Chemical Oceans: CO2, interactions, climate change and consequences

Part II - Ocean life processes

a) Living Ocean: origin of life, biodiversity and production
b) Primary production: species, light/depth/nutrients/growth, cycles and phenomena
c) Microbial ecology: production, decomposition, ecological context and seasonal cycles
d) Secondary production: P/B ratio, measurements and drivers

Part III - Ocean Systems

a) Rocky and sandy shores: waves, tides, environmental variables, zonation and research
b) Estuarine ecology: zones, salinity and ecological features
c) Pelagic and benthic ecosystems
d) Mangrove forests and seagrass ecosystems

Part IV – Threats and opportunities in marine systems

a) Introduction: pressures, risks and benefits, ecosystem services and blue growth
b) "Toxic" Ocean: presence and effects of chemicals, other stressors
c) "Unbalanced" Ocean: risks of eutrophications
d) "Tasty" Ocean: need for food from the oceans
e) "Healthy" Ocean: provision of known and unknown health services

Initial competences

General Biology, General Ecology, General Physics, General Chemistry

Final competences

1 The student can describe the main physical, chemical, and geological characteristics of the world's oceans and explain their global environmental significance.
2 The student can explain how environmental factors shape productivity and biological processes in marine environments.
3 The student can describe the role of ocean chemistry, including CO_2 dynamics and buffering processes, in regulating climate and ocean acidification.
4 The student can outline major marine biodiversity patterns, and the basis of marine productivity.
5 The student can critically evaluate the effects of multiple stressors (e.g. climate change, chemical contamination, eutrophication) on marine ecosystem functioning and resilience.
6 The student can integrate knowledge of ocean processes, ecosystem dynamics, and ecosystem services to assess scientifically grounded options for sustainable use and management of marine systems.
7 The student can quantitatively assess the impacts and opportunities of human activities on different marine ecosystems using physical, chemical, and biological indicators.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Excursion, Lecture, Independent work

Extra information on the teaching methods

The theoretical content of the course is delivered through a combination of online and oncampus lectures. The online component consists of semiprofessional video lectures that cover the majority of the course chapters. Oncampus lectures focus primarily on course introduction, selected advanced or topical themes, and interactive questionandanswer (Q&A) sessions. For one chapter, students acquire the targeted end competences and knowledge through an interactive learning pathway.

Two mandatory field excursions are organised: (1) a visit to rocky and sandy shores and a salt marsh area near Boulogne (France), and (2) a monitoring campaign in the Belgian part of the North Sea aboard the research vessel *Simon Stevin*. Both excursions combine applied fieldwork with in situ lectures, providing handson experience that links theoretical concepts to real marine environmental systems. Due to the limited capacity of the research vessel, the North Sea excursion is organised multiple times (up to four per programme).
In the seminar session (practical PC class), students learn to translate theoretical marine processes and concepts into quantitative estimates. Through applied exercises, students calculate and analyse how different anthropogenic pressures affect marine ecosystem functioning.
Students are not required to submit reports or give presentations for the field excursions or PC classes; however, active participation in all practical components is mandatory.
Additional guided selfstudy is encouraged through the provision of extra exercise questions, example examination questions, and selected scientific publications for further reading.

Study material

Type: Slides

Name: Applied marine ecology
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No

Type: Audiovisual Material

Name: Applied marine ecology
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No
Usability and Lifetime within the Course Unit : regularly
Usability and Lifetime within the Study Programme : regularly
Usability and Lifetime after the Study Programme : not

Type: Excursion

Name: Applied marine ecology - field excursions
Indicative price: Free or paid by faculty
Optional: no

References

Kaiser et al., 2012, Marine ecology - Processes, Systems, and Impacts, Second Edition, Oxford University Press, 528 pages.

Course content-related study coaching

Q&A sessions at the beginning and/or end of every lecture, interaction during the lectures, guided excursions and fieldwork, guided exercise class, contact hours for individual guidance (upon request).

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Participation

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

The final examination mark is based on the periodic evaluation (i.e. the exam). Students who eschew period aligned and/or non-period aligned evaluations (i.e. participation of mandatory excursions and PC classes) may be failed by the examiner.