

## Marine Genomics (C003871)

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

**Credits 3.0**                      **Study time 75 h**                      **Contact hrs**                      28.0h

**Course offerings and teaching methods in academic year 2022-2023**

A (semester 1)	English	Gent	lecture	12.5h
			seminar: practical PC room	12.5h
			classes	
			seminar	5.0h

**Lecturers in academic year 2022-2023**

De Clerck, Olivier	WE11	lecturer-in-charge
Derycke, Sofie	WE11	co-lecturer

**Offered in the following programmes in 2022-2023**

	<b>crdts</b>	<b>offering</b>
<a href="#">International Master of Science in Marine Biological Resources</a>	3	A

**Teaching languages**

English

**Keywords**

Marine biology, population genetics, barcoding, metabarcoding, phylogenetics, quantitative genetics

**Position of the course**

The course deals with genome-enabled insights into the broader framework of environmental marine science. Topics within the course include evolutionary as well as functional aspects of genes, genomes and metagenomes of marine organisms from the individual to the ecosystem-level.

pre-requisites.

The course aims to provide students an introduction to the field of molecular ecology, specifically directed toward the marine environment on its organisms. The course is concerned with applying molecular population genetics, phylogenetics, as well as (meta-)genomics and (meta-)transcriptomics to traditional ecological and evolutionary questions (e.g., species diagnosis, conservation and assessment of biodiversity, quantitative genetics, heritability of traits and breeding studies, and questions of behavioral ecology).

**Contents**

The course is divided in modules which outline the use of genomic approaches, from the ecosystem-level, gradually narrowing to species-, population and individual -levels. Theoretical aspects and commonly used techniques will be demonstrated using examples and practical exercises from the marine environment.

a) Community-level addresses the use of genome data in assessing community structure of marine ecosystems. Techniques discussed include amplicon sequencing, qPCR, metagenomics (+ metatranscriptomics, metaproteomics, metabolomics).

b) Species-level offers an introduction to sequence alignment techniques, phylogenetics, species-delimitation, and phylogeography.

c) Population-level addresses the factors influencing population structure such as genetic drift, dispersal, mutation and selection. These aspects will be addressed using traditional organelle (mtDNA) and co-dominant markers (e.g. microsatellites) as well as NGS-based genome reduction techniques (Radseq, GBS). Aspects of speciation in the marine realm will be addressed also.

d) Individual-level: Heritability of physiological and morphological traits will be addressed using quantitative genetics, in combination with genome scans, QTL analyses and RNA-seq.

**Initial competences**

Bachelor in sciences. Basic knowledge in ecology, evolution and genetics is highly recommended.

**Final competences**

- 1 The graduated student understands the ecological and evolutionary processes acting at the genomic level in populations of marine organisms.
- 2 The graduated student has a good knowledge of the terminology used in the field of molecular ecology.
- 3 The graduated students understands the underlying principles of the commonly used molecular techniques, including preservation of tissues and specimens.
- 4 The graduated student is able to make a considerate choice of molecular techniques to address specific ecologically or evolutionary questions.
- 5 The graduated student has acquired the knowledge to correctly analyse and interpret molecular datasets from the individual to the community level.

**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, Lecture, Seminar: practical pc room classes

**Learning materials and price****References**

Bourlat S.J. [ed.]. Marine Genomics, Methods and protocols. Methods in Molecular Biology Series. Springer Protocols.

**Course content-related study coaching****Assessment moments**

end-of-term assessment

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

Written examination

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

Written examination

**Examination methods in case of permanent assessment**

Report

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Calculation of the examination mark**

UGent: Exam 100%