

## Modelling for Quantitative Management of Marine Resources and Ecosystems (C004304)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

<b>Course size</b>	<i>(nominal values; actual values may depend on programme)</i>		
<b>Credits 6.0</b>	<b>Study time 150 h</b>	<b>Contact hrs</b>	32.0h

### Course offerings in academic year 2021-2022

A (semester 1)	English	Gent
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### Lecturers in academic year 2021-2022

Guarini, Jean-Marc	PARISO1	lecturer-in-charge
Bacher, Cédric	BRESTO2	co-lecturer
Cugier, Philippe	BRESTO2	co-lecturer
Franke, Brice	BRESTO2	co-lecturer

### Offered in the following programmes in 2021-2022

	crdts	offering
<a href="#">International Master of Science in Marine Biological Resources</a>	6	A

### Teaching languages

English

### Keywords

### Position of the course

Modelling has a growing role in Marine Sciences, which aims at being more and more "quantitative". However, the development of methods in modelling has led to a huge variety of approaches and not unity or consensus emerges. In addition, incorporation of evolutionary concepts is more and more required as soon as models aim at being "realistic". This course aims at teaching what "Modelling" is, what are the basic mathematics behind, and how choices can be made between classes of methods, as a function of the goal pursued or question asked. A particular emphasis is given to the management of exploited living (renewable) resources and ecosystems. The parallel and complementarities with Statistics are explored, with a focus on probabilistic models able to represent stochastic dynamics. Applications in Conservation are reviewed. Specific objectives are:

- to grasp the landscape of modelling in marine sciences
- to be able to conceive a model with specialists in the discipline
- to be able to choose and use the most appropriate approach to solve a problem (e.g. to develop applications for resource management and ecosystem assessment).
- to associate quantitative tools to concepts that can be proposed in Marine Sciences

### Contents

Courses are proposed on a 3-week basis, and organized in such a way that they alternate lectures (20h) and practices (40h + personal work). Lectures are associated with material to read for personal work, as a function of specific requirements or interest.

First Week :

- Introduction to Modelling
- Basic Choices
- Basic Mathematics
- Introduction to programming

Second Week:

- Defining Projects

- Modelling Biological entities, their adaption and evolution.
- Modelling population dynamics
- From individuals to populations and communities.
- Tools for managing resources in an adaptive and evolutionary context.

Third Week:

- A look back at ecological systems, with system theory
- Modelling ecosystems (on earth and outside)
- Defining Ecosystems and modelling their evolution.
- Tools for managing nature with an ecosystem-based approach.

Personal or group projects are developed in order to put in practices what is learned from the classes.

### **Initial competences**

Basic competences in Marine Sciences and Mathematics

### **Final competences**

- 1 Students should be able to work with modeller in order to transform questions they can formulate in a quantitative framework to test their conceptualization.
- 2 They will be formed to use models in the context of direct applications regarding resources management and ecosystem evaluation.
- 3 Practical skills acquired are:
  - Knowing diversity of models and making appropriate choices
  - Understanding the basic mathematics behind modelling
  - Identifying challenges from a methodological point of view
  - Designing simple Models
  - Coding models and exploiting numerical simulations

### **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**

Demonstration, Online discussion group, Group work, Guided self-study, Seminar, Lecture, Project, Seminar: practical pc room classes

### **Learning materials and price**

### **References**

### **Course content-related study coaching**

### **Assessment moments**

end-of-term and continuous assessment

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

Oral examination

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

Oral 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

### **Calculation of the examination mark**