

## Oceanography (C003807)

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

**Credits 4.0**                      **Study time 120 h**

**Course offerings and teaching methods in academic year 2023-2024**

A (semester 1)                      English                      Gent                      lecture

**Lecturers in academic year 2023-2024**

Vanreusel, Ann	WE11	lecturer-in-charge
Brion, Natacha	VUB	co-lecturer

**Offered in the following programmes in 2023-2024**

<a href="#">Master of Science in Marine and Lacustrine Science and Management</a>	<b>crdts</b>	<b>offering</b>
	4	A

**Teaching languages**

English

**Keywords**

Physical characteristics of oceans, marine biogeochemical cycles, primary production, heterotrophic processes, plankton and benthos, benthic pelagic coupling

**Position of the course**

To get insight in the main oceanographic processes and characteristics.

**Contents**

First an introduction will be given to the main physical processes responsible for the most important biological and chemical features and processes in oceans and seas as they take place in present times. Seafloor characteristics such as topography and bathymetry but also substrate features will be introduced together with the responsible geological and water column processes. Marine sedimentation, major ocean circulation systems but also waves and tides will be covered in this introductory part.

The main focus of the second part of the course will be on chemical and biological oceanography. In the biological part first the main processes and drivers that affect ecological patterns, including aspects of habitat characterization, biogeochemical processes and gradients, structural and functional biodiversity, food web interactions, productivity and adaptations will be introduced on a variety of spatial and temporal scales. The fundamental global processes of primary and microbial production that fuel marine ecosystems will be discussed to understand their control mechanisms as well as their importance as driving force for both pelagic and benthic ecosystems from shallow to deep. Processes of benthic-pelagic coupling, phyto- and zooplankton distribution and interactions as well as benthic biodiversity and processes of ecosystem functioning will be illustrated based on specific case studies from a variety of ecosystems from the tropics to the poles, and from shallow to the deep.

The chemical part consist of four modules: the first module will address overview of global change (esp. P,N,C) and drivers of oceanic change, and properties of water and seawater specific to chemical processes in the sea (not covered earlier). The second module will focus on major ions and conservative/trace elements in SW, and how these may are viewed in light of ocean sources circulation; global C cycle, CO<sub>2</sub> in the sea and the carbonate system and alkalinity (case study on ocean acidification). The third module will focus on oceanic box models and mass balance

approach, tracers of oceanic water movement and particle transport, the nutrient P, N cycles and use of chemical tracers such as radionuclides and stable elements. The fourth module involves examples of chemical sources, sinks and processes in the sea with case studies of the oceanic Fe cycle and biogeochemistry, the global Hg cycle and biogeochemistry, and anthropogenic organic pollutants, and their distribution, biogeochemistry and impact in the global oceans (examples may include PCBs, DDT, PAHs).

A practical exercise will illustrate how nutrient deliveries from rivers to seas can be quantified. Practically students will learn a simple method to perform a nutrient budget study, and apply it to the Scheldt River. Interpretation of results will include: identifying dominant transformation processes and estimating estuarine filtering capacity.

#### **Initial competences**

General knowledge in ecology and chemistry.

#### **Final competences**

Insights in main oceanographic processes including physical chemical and biological aspects.

#### **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**

Lecture

#### **Extra information on the teaching methods**

Lectures and practical exercise. Also online tools can be used to support the study

#### **Learning materials and price**

Course notes on Ufora and Point Caré

Selected literature readings (case studies) on Point Caré

#### **References**

- 1 Pinet, last edition: Invitation to Oceanography.
- 2 Kaiser, last edition: Marine Ecology: processes, systems and impacts
- 3 (Recommended): Aquatic chemistry, W. Stumm and J.J. Morgan, J.Wiley & Sons, 1981
- 4 (Recommended): Seawater: its composition, properties and behaviour, The Open University, Pergamon Press, 1989
- 5 (Recommended): Chemical oceanography, F.J. Millero, CRC Press, 1996
- 6 Handbook (Recommended): An introduction to marine biogeochemistry, S.M. Libes, J. Wiley & Sons, 1992
- 7 Handbook (Recommended): Tracers in the sea, W.S. Broecker and T.-H. Peng, Eldigio Press, 1982

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

After the lectures and on organized moments upon request of the students; interactive support using Ufora, email and lectures

#### **Assessment moments**

end-of-term assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

#### **Examination methods in case of permanent assessment**

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

not applicable

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

- 80% theory

- 20% exercise