# *OCÉANOGRAPHIE : CONCEPTS GÉNÉRAUX ET ÉTUDES DE CASS*

# OCEANOGRAPHY : GENERAL CONCEPTS AND CASE STUDIES

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| Lecturers : 16 | TC : 0 | PW : 0.0 | Autonomy : 0.0 | Study : 12 | Project : 0.0 | Language : AN

## Objectives

This course will address several aspects in the field of Ocean Sciences, in relation with the scientific background of students in mathematics (signal processing, numerical modelling), physics & chemistry (fluid mechanics, thermodynamics) and energetics (energy balance, geo-engineering). Ocean Sciences cover an important field of knowledge related to environmental, economcal and geopolitical questions of the XXIst century. Several applied studies will be made by the students in order to introduce them to realistic datasets and cases.

Keywords : Oceanography, Physics, Fluid Mechanics, Data Analysis, Energy, Environment

## Programme

«The planetary ocean» (2x2h + BE1) Typical scales, main basins. Earth motion. Pressure and sea-level variations. Properties of Sea Water, stratification. Differences between coastal and offshore.
«The moving ocean» (3x2h + BE2) Surface waves. Barotropic tides. Internal waves and tides. Gravity currents. Inertial waves, Rossby and Kelvin waves. Ekman layers and pumping. Vorticity. Global circulation. Stommel, El Niño.
«The living ocean» (1x2h) Ecosystems. Nutriments, turbulence biologic activity.
«The energetic ocean» (2x2h + BE3) Energy budget, forcings and dissipation. Parametrization. Thermal and hydrokinetic energy. Mining and drilling.

## Learning outcomes

- Understanding of the basic concepts in physical oceanography, in relation with the generic scientific background of the students.
- Make use of institutional databases to understand the physical environment in a given region of the oceans.
- Analyse and interpret in situ measurements, in regard with the present course materials, as well as with other sources of information.
- Garantee a global vision of the maritime environment, with the different physical, chemical, and biological factors to be involved.

## Independent study

Objectifs : [BE1] «The planetary ocean» : each group gets a different geographical region to study (topography, water masses, currents, tides).
[BE2] «The moving ocean» : students focus on a physical process in the region.
[BE3] «The energetic ocean» : the energetic aspects of the region are quantified, from a local or a global point of view depending on the region.

Méhodes : The BE will be held in the SkyLab rooms in order to easily visualize field data on large screens and to initiate collaborative work. Sutends will learn on the first module how to access public datasets (topography, currents, tides, water column) and to display them, before analyzing one region in details.

## Core texts

[1] Adrian E. Gill, *ATMOSPHERE-OCEAN DYNAMICS*, Academic Press (London), 1982
[2] Michèle Fieux *THE PLANETARY OCEAN*, EDP Sciences, Les Ulis, France, 2017
[3] Mark W. Denny*HOW THE OCEAN WORKS : AN INTRODUCTION TO OCEANOGRAPHY*, New Jersey : Princeton University Press, 2011

## Assessment

Final mark = 60% Knowledge + 40% Know-how
- Knowledge = 66% final exam + 34% continuous assessment (MCQ)
- Know-how = 100% continuous assessment (three reports of BE)