Université de Bretagne Occidentale

MASTER BIOLOGIE

PARCOURS INTERNATIONAL MASTER OF SCIENCE IN MARINE BIOLOGICAL RESOURCES (IMBRSEA)

semestre 7

Oceanography

Présentation

This course is an overview of the marine environment and the different systems from which it is composed. It introduces to the main physical, geological, chemical processes and characteristics that are relevant to understand marine biology and functioning of marine ecosystems. Hence, it constitutes a pre-requirement for the next courses.

Keywords: Marine geology, geomorphology and sediments, chemical and physical properties of seawater, ocean circulation, physics interactions with biology, biogeochemical cycles, global change and anthropogenic impacts, regional oceanography

6 crédits ECTS

Volume horaire

Cours Magistral : 38h
Travaux Dirigés : 6h
Travaux Pratiques : 4h
Autres : 4h

Objectifs

To get insight in the main oceanographic processes and characteristics
Ability to identify marine processes from oceanographic data, understanding of ocean circulation and its role on climate, biogeochemistry and ecology. Insights in main oceanographic processes including physical chemical and biological aspects.
To understand the complex interdependence of humans and the ocean.

Pré-requis nécessaires

General background on physics, biology, chemistry (B. Sc.)

Descriptif

Seafloor characteristics such as topography and bathymetry but also substrate will be introduced together with the responsible geological and water column processes yielding to marine sedimentation.
The main physical processes responsible for the most important biological and chemical features and processes in oceans and seas will be described: link with climate/radiative budget, optical properties, temperature, salinity, density, water masses, stratification, mixing processes. Main mechanisms generating motion in the ocean. Thermohaline circulation. Barotropic and baroclinic conditions. Geostrophic currents. Wind driven circulation. Convergence and divergence. Dynamics of the coastal regions - coastal upwelling and associated features. Major ocean circulation systems. Waves and tides. Regional oceanography will describe the main features of oceanic basins: circulation (equatorial circulation, cyclonic and anticyclonic gyres...), climate (ENSO, monsoon...), and particularly of Iberia. Examples of impacts of global and anthropogenic changes on oceanic circulation and mixing.
Chemical properties of seawater will be explained: salinity, sources and sinks of elements of major ions / conservative elements, nutrients, scavenged elements (riverine, volcanic and atmospheric supply, hydrothermal activity). Main important gases in the Ocean: oxygen and carbon dioxide, and interplay with biological processes. CO2, the carbonate system and alkalinity, marine carbon cycle biological, solubility and carbonate pumps. Marine biogeochemical cycles of macronutrients (N, P, Si), micronutrients and key role in biological processes, Redfield ratios. Examples of physics-biogeochemistry coupling (upwelling, OMZ...) and of impacts of global and anthropogenic changes on biogeochemistry and ecosystems will be introduced throughout the course (impact of dams, species migration, extension of OMZ, eutrophication, acidification, pollutants).

This course includes:
(i) theoretical expositive lectures, with periods for student questioning and participation, lectured in rooms equipped with video-projector
(ii) practical laboratory sessions
(iii) field work; Learning support materials are made available, on a weekly basis, at the course tutorial web site.

Bibliographie

Learning support materials, including pdf versions of the materials presented during lectures, detailed protocols of laboratory sessions and other relevant material will be made available online at the course tutorial site. Laboratory working protocols will be available in advance, and students are required to read them prior to each lab session. Recommended basic references are available at the University Library or will be provided by the teaching staff. Specific references required for the laboratory sessions will be available in the lab. Oceanographic data will be provided for analysis and interpretation. Reading assignments will be recommended for each lecture.

Open University, 1998 - Seawater: its Composition, Properties and Behavior (volume 2); Ocean Circulation (volume 3); Waves, Tides and Shallow-Water Processes (volume 4), Oceanography Course Team, Oceanographic Series, 2nd edition, Butterworth Heinemann.

Millero, F. J., 2014. Chemical Oceanography. 4th Edition CRC Press, Boca Raton - Florida, 571 pp.

Mark Denny, 2008. How the Ocean works: An introduction to Oceanography. Princetown University Press.
Chester and Jickells, 2012. Marine Geochemistry. Willey

Modalités de contrôle des connaissances

Session 1 ou session unique - Contrôle de connaissances

Nature de l'enseignement	Modalité	Nature	Durée (min.)	Coefficient	Remarques
	CT	Ecrit - devoir surveillé	180	2/3	
	CC	Ecrit - devoir maison		1/3	

Session 2 : Contrôle de connaissances

Nature de l'enseignement	Modalité	Nature	Durée (min.)	Coefficient	Remarques
	CT	Ecrit et/ou Oral		1	

Langue d'enseignement

Anglais