UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Fundamentals of Marine Physical Geography

2425-1-F7401Q099

Aims

Provide knowledge regarding the main processes that generate and model the different landforms and landscapes that typify the coastal and the submarine environemts, and that control their evolution over time in the short, medium and long term. Additional objective is to develop practical skills regarding techniques for implementing data derived from the use of seafloor mapping techniques in geographic information systems (GIS) for the creation of thematic maps for the marine environment.

Contents

- Oceanography and marine physical geography in the context of the Blue Economy.
- Research methods in submarine geomorphology: seafloor mapping, sampling and visual inspections: tools and survey planning.
- Submarine landforms and landscapes: continental shelves, submarine landslides, canyons, channel and levees complexes in submarine fans, contourites, oceanic ridges, seafloor expression of seabed fluid flows, abyssal plains, oceanic trenches, extreme environments and bioconstructions.
- Geomorphic processes in submerged environments: tectonics, sedimentology, oceanography, (bio)geochemistry and geobiology.
- Coastal geomorphology: beaches and dunes, deltas and estuaries. Rocky shores and coral reefs.

Detailed program

14 two-hour lectures, in person, Delivered Didactics (4 CFU - 28 hours in total): borrowed from the marine sciences course

Introduction: Marine Phyisical Geography, Oceanography and Marine Geomorphology.

Research methods in submarine geomorphology. Seafloor mapping, seafloor sampling and visual surveys: tools and survey design

Geomorphology of the ocean seafloor. A global map of the ocean seafloor and classification of large-scale submarine landforms (continetal margins, oceanic islands and seamounts, mid-ocean ridges, abyssal hills and plains, trenches).

Drivers of seafloor geomorhpic changes in submarine environments. Winds and ocean circulation (effects on coastal and submarine landforms). Waves and tides. Sea-level changes (geomorphological indicators). Submarine sedimentary processes, environments and landforms: Continental shelf landforms, Contourites, sediment waves and bedforms, resedimentation processes, submarine slides, submarine canyons and gullies, channel and fans. fluid escape features.

Coastal systems: terminolgies and classification of coastal systems. Delta, estuaries and beaches. Rocky coasts and coral reefs.

8 three-hour lab activities, in person, Interactive Teaching (2 CFU - 24 hours in total): techniques for implementing remote data in geographic information systems (GIS) - borrowed from the marine sciences course

Laboratory activities will be carried out in university labs equipped with workstations and software provided by the university (ArcGIS pro) to create thematic maps of the marine environment using marine Digital Terrain Models (DTMs), backscattering data, and vector data related to survey and sampling operations at sea. The main techniques of geospatial analysis of data implemented in ArcGIS Pro will also be tested.

8 three-hour practical classes, in person, Interactive Teaching (2 CFU - 24 hours in total): Seafloor mapping technicques: Interpreting remote data acquired in the marine environment and presentation of instruments
Data acquired in the marine environment using acoustic geophysical devices will be presented to students with the aim of introducing the main approaches used for their interpretation. Some of the most commonly used technicques, such as multibeam echosounders and remotely operated vehicles will also be shown.

Prerequisites

Fundamentals of Mathematics, Physics and Chemistry.

Teaching form

14 two-hour lectures, in person, Delivered Didactics (4 CFU - 28 hours in total)

8 three-hour lab activities, in person, Interactive Teaching (2 CFU - 24 hours in total)

Textbook and teaching resource

Alan P. Trujillo & Harold V. Thurman. Essential of Oceanography. Pearson

Savini A., Krastel S and Micallef A (2021). Perspectives on Submarine Geomorphology: An Introduction. Reference Module in Earth Systems and Environmental Sciences, Elsevier, ISBN: 9780124095489 - https://doi.org/10.1016/B978-0-12-818234-5.00192-9

Micallef A., Krastel S., Savini A. Submarine Geomorphology. Springer

D.A.V. Stow, H.G. Reading, Collinson J.D – Deep Seas. In: H.G. Reading, Sedimentary environment: Processes, Facies and Stratigraphy (Cap. 10). Blackwell Science.

NC Mithcell. Submarine Geomorphology. Elsevier

G. Masselink & Hughes M.G. An introduction to coastal processes and geomorphology. Cambridge

A selection of scientific journal articles will be provided by the teachers.

Semester

First semester

Assessment method

Written and oral examination
The written test will consist of a questionnaire of 60 questions with multiple-choice answers focusing on the topics covered during the oral lessons.
The oral test will consist of a short discussion on a thematic map or a seismic profile or a graphic elaboration of data acquired by means of acoustic geophysical instrumentation, to test the acquired knowledge on marine exploration and seafloor mapping techniques.
The tests will be held on 2 consecutive days.
Grades are expressed as n/30. The minimum grade for admission is 18/30. Specifically, the final grade will be given by the average obtained from the evaluation of the written test and the result obtained in the oral test.

Office hours

To make an appointment, please contact the teachers by e-mail

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE | LIFE BELOW WATER