UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Fundamentals of Marine Physical Geography

2526-1-F7504Q004

Aims

The course offers a first introduction to marine geosciences and aims to provide students with (D1) knowledge about the main processes that generate and shape the various landforms and landscapes that typify the coastal and submarine environments, as well as those that control their evolution over short, medium, and long timescales. Particular emphasis will be placed on providing students with (D1) knowledge of how submerged landforms and landscapes respond to climate change and environmental impacts.
An additional objective is to (D2) develop practical skills related to the management of data derived from geomorphological survey techniques of submerged areas, for their (D4) visualization within Geographic Information Systems (GIS) and for the (D2-D3) creation of thematic maps for the marine environment.
The course also aims to foster (D3) independent judgment in the analysis of geophysical and geomorphological data, and to stimulate (D5) autonomous learning abilities in the use of digital tools and advanced survey methods.

Contents

- Oceanography and marine physical geography in the context of the Blue Economy.
- Research methods in marine geology and 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: Climate and sea lavel change, tectonics, sedimentology, oceanography, (bio)geochemistry and geobiology.
- Coastal geomorphology: beaches and dunes, deltas and estuaries. Rocky shores and coral reefs. Geomorphological indicators of past sea level changes.

Detailed program

14 two-hour lectures, online via webex, Delivered Didactics (4 CFU - 28 hours in total):

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-hours lab activities, online via webex, Interactive Teaching (2 CFU - 24 hours in total):

Laboratory activities will be based on the use of 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. Attendance to the online sessions of the practical activities is mandatory.
Recordings of the lectures will be made available on the e-learning platform; however, mandatory attendance implies that assistance for solving technical issues (such as the activation of ArcGIS Pro on a personal computer or the use of ArcGIS Pro on a virtual machine) will be provided only during the official teaching period (first semester). Technical support or individual assistance cannot be guaranteed outside the course delivery period.

Prerequisites

Fundamentals of Mathematics, Physics and Chemistry.

Teaching form

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

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

Textbook and teaching resource

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

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

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 exam will consist of a brief discussion based on one of the following materials: a thematic map, a seismic profile, or a graphical representation of data acquired through acoustic geophysical instrumentation. The aim is to assess the student's understanding of geomorphological exploration and survey techniques in the marine environment. Alternatively, the discussion may focus on a theoretical topic, at the teacher’s discretion.
The exam is conducted over two days, which can be scheduled either on consecutive days or with an interval of up to one week between them, depending on the number of students enrolled. The results of the written tests will be communicated on the same day as the exam, together with the schedule of the oral examination.
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.
In order to be eligible for the written exam, you must have delivered by the day before the exam all the exercises assigned during the labs via email to the tutor and the course professor.

Office hours

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

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE | LIFE BELOW WATER