UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Marine Geology

2425-2-F7502Q040

Aims

To provide advanced knowledge on technological solutions for collecting high-resolution terrestrial and marine geo-spatial dataset for geo-environmental studies in coastal and marine regions. To provide knowledge of the main activities carried out at sea by the industrial sector both with regard to exploration and exploitation of marine resources and to monitoring and assessment of geological risk at sea.

Contents

The course will provide basic knowledge on methods and techniques adopted to perform assessment of marine geohazard and on the recent progress in 3D geological mapping and computer vision that allows a seamless combination of terrestrial and marine geo-spatial dataset in coastal regions.

Detailed program

7 two-hour lectures, in person, Delivered Didactics

The main topics covered during the lectures of frontal teaching (delivered didactic) include:

- Main offshore activities carried out by the industrial sector. Introduction to marine geology studies applied to the feasibility assessment of major offshore and coastal activities exploiting the resources of the marine environment.
- Geological risk at sea: causes and procedures adopted for risk assessment studies for offshore development. Marine geohazard along the Italian coasts: the experience of the MAGIC project.
- Land and marine geospatial data integration along the coastal areas: problems and solutions depending on

the geomorphological context of the areas of interest. Case studies from tectonically and climatically sensitive coastal areas of the Mediterranean region.

10 four-hour lab activities, in person, Interactive Teaching
Practical activities carried out during laboratory hours include:

- implementation in geographical information systems (GIS) of satellite data and georeferencing techniques
- procedures for processing data acquired by multibeam echosounder
- photogrammetry techniques applied to RGB images acquired from aerial and underwater platforms in marine areas.
- integration of multisource and multiscale geospatial data into geographic information systems
  The students will engage in tutorial activities to learn how to manage and process data obtained through optical and acoustic remote sensing platforms in marine and coastal regions with varying geomorphological contexts. They will also learn how to retrieve satellite data from online databases, which can be used to monitor extensive marine environments. The obtained data will be utilized to produce Satellite-Derived Bathymetry (SDB) in specific coastal areas.
  Marine nearshore environments will be reconstructed using images collected with drones and underwater cameras and processed using Structure from Motion (SfM) techniques.
  Acoustic remote sensing data, collected with multibeam echosounders and ROV videos, will be used to map and categorize deep marine environments.

1 eight-hour field activity, in person, Interactive Teaching
There will be a dedicated day for a field trip at the end of the course. This trip will involve using some of the instruments studied in the tutorials and collecting data on coastal environments with the methodologies described.

Prerequisites

Physics of the Sea; Fundamentals of Marine Physical Geography; International Law of the Sea

Teaching form

2 credits (CFU) of delivered didactic (Prof. A. Savini) - **7 two-hour lectures, in person, Delivered Didactics**

3 credits (CFU) of laboratory activity (Dr. Luca Fallati) - **10 four-hour lab activities, in person, Interactive Teaching**

1 credit (CFU) field activity (Dr. Luca Fallati) - **1 eight-hour field activity, in person, Interactive Teaching**

Textbook and teaching resource

The Sea Floor: An Introduction to Marine Geology. E. Seibold, W.H. Berger - Springer

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

Remote Sensing and Image Interpretation, 7th Edition Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman ISBN: 978-1-118-34328-9 February 2015 736 Pages

Offshore Operation Facilities: Equipment and Procedures. Fang and Duan, 2014. Elsevier

Submarine Power Cables: Desing, Installation, Repair and Environmental Aspects. Worzyk, 2009. Springer.

A selection of scientific journal articles and the lesson slides will be provided by the teacher

Semester

First semester

Assessment method

Oral examination and practical tests that will be performed during the tutorials.
The oral examination will focus on a brief discussion on one of the topics covered by delivered didactic.
The practical tests will be done during the laboratory activities and will be finalised in the delivery of a final report to be sent to the lecturers before 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 final report on the laboratory activities carried out but the students and the result obtained in the oral test.

Office hours

By reservation by sending an email to the teachers

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE | LIFE BELOW WATER