UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biogeosciences and Global Changes

2627-1-F7504Q041

Aims

Knowledge and understanding
Students will develop an advanced understanding of the interactions and coevolution between biosphere, hydrosphere and geosphere, with particular attention to marine systems. They will acquire knowledge of the major extinction events in Earth's history, the origin and evolution of organic calcification and biomineralisation processes, the evolution of bioconstructor associations throughout the Phanerozoic, and the distribution of present-day bioconstructions. They will understand the role of geological drivers in shaping the marine biotopes, and their sensitivity to the ongoing climate change. Students will also gain insights into photosynthesis and chemosynthesis and their role in the evolution of life and in the present-day trophic webs, and will be introduced to the relationship between ocean chemistry, biomineralisation, and biogeochemical proxies.

Applying knowledge and understanding
Students will be able to recognise, analyse, and describe bioconstructions and benthic associations, assessing their spatial and temporal distribution and linking them to the evolution of marine environments. They will identify those situations in which the lack of historical data requires the use of actualistic approaches, using modern benthic communities and their zonation and biogeochemical proxies as a key to interpreting the fossil evidence of recent past environments, for the reconstruction of long-term ecological trajectories. Furthermore, students will acquire the ability to evaluate chemical processes at the water–sediment interface and to employ biogeochemical proxies and natural archives to reconstruct past environmental changes and to assess ongoing global change and the role of the oceans within it.

Contents

La Terra come pianeta dinamico. The structure of our planet and seafloors, coevolution of geosphere and biosphere, extinctions, bioconstruction and habitat engineers, hard and soft substrates, sediment classification and components, marine erosion and deposition, benthic zonation, principles of biomineralization, introductory biogeochemistry and proxy data in natural archives, geosciences for the interpretation and reconstruction of the

ecological history of coastal environments, past and ongoing global changes, strategies of CO2 removal and mitigation of climate change.

Detailed program

Lessons: Extinctions and major events in the Earth history. The appearance of organic calcification and the biomineralization. Photosynthesis and chemosynthesis. Ocean chemistry and biomineralization. The evolution of biogenic builders in the Phanerozoic. The modern bioconstruction: structures, biological associations, ecological factors of control and distribution. Habitat engineers. Diagnosis, significance and distribution of the major benthic associations and related sediments. Biocoenoses, communities, associations and benthic zonation in the present-day oceans as model for the interpretation of recent past environments. The chemical environment at the water-sediment interface. Identification and interpretation of the most important ichnofacies. Biogeochemical proxies and natural archives. The ongoing global change and the role of the oceans.

Practical classes: Granulometrie e componenti dei sedimenti marini nel contesto della bionomia marina bentonica. Osservazioni al microscopio ottico delle più comuni strutture conchigliari/scheletriche. Osservazioni sui principali biocostruttori marini nella storia del pianeta.

Prerequisites

Fundamentals of Marine Biology, Ecology and Physical geography, or General Palaeontology

Teaching form

- 17 two-hours + 1 hour lectures, in person, Delivered didactics (35 hours, 5 cfu)
- 4 three-hours practical classes, in person, Interactive Teaching. Mandatory attendance for at least 2/3 of the total hours to access the exam.

Textbook and teaching resource

The lectures and some suggested readings provided by the teacher

Useful books: Fundamentals of Geobiology, Knoll et al (Eds) ISBN 978-1-4051-8752-7. Some copies are available at the University library.

Semester

First semester

Assessment method

Written test and optional oral examination. If the compulsory attendance for at least 2/3 of the laboratory hours is not respected, it will not be possible to take the oral exam.

The written exam of 30 closed, multiple-choice questions will test the understanding of the main concepts presented during the course. The oral is optional, aimed at clarifying one of the possible mistakes of the written test.

The final mark is composed of the written grade plus 1 point for the positive evaluation of the practicals report. At the oral (optional), a positive answer allows for the addition of 1 point to the grade of the written test.

Marks are given as n/30. Minimum positive value is 18/30.

In the event of a negative final assessment (i.e., lower than 18/30), or in case of rejection of a positive mark, the student will not be allowed to register for the immediately next exam session.

Office hours

To make an appointment, please contact me by mail: daniela.basso@unimib.it

Sustainable Development Goals

QUALITY EDUCATION | LIFE BELOW WATER