



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Marine Environmental Microbiology

2021-1-F7502Q035

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#### Aims

The course aims to provide in-depth knowledge on the the microbial communities in marine environments. **1. Knowledge and understanding.** At the end of the course the student must know: the main microbial populations inhabiting the marine habitats; the impact of microbial metabolism on geochemistry of marine environments; the interaction between marine microorganisms and other organisms; the characterization and monitoring methods of microbial communities. **2. Applying knowledge and understanding.** At the end of the course the student must be able to apply the knowledge acquired during the course to real cases to evaluate the impact a certain disturbance (human impact, climate change,...) on marine microbial metabolisms and its possible consequences **3. Making judgments.** The student must be able to critically read scientific papers about marine microbiology. **4. Communication skills.** At the end of the course the student will be able to describe appropriately the topics studied using the correct specific vocabulary. **5. Learning skills.** At the end of the course the student will be able to consult the literature on the topics covered and autonomously integrate the knowledge acquired with others related to marine sciences, with a multidisciplinary approach.

#### Contents

1. Microbial metabolisms and diversity in marine environments: diversity of bacteria and archea in marine environments, metabolic diversity of microbes in marine environments
2. Roles of microbes in ocean processes

3. Techniques for the characterization of microbial communities in marine environments
4. Microbial marine habitats
5. Microbial aspects of environmental issues in marine environments

## **Detailed program**

### **1. Microbial metabolisms and diversity in marine environments: diversity of bacteria and archaea in marine environments, metabolic diversity of microbes in marine environments**

- Microbial molecular phylogeny
- Phototrophy
- Microbial respiration
- Main microorganisms in marine environment

### **2. Roles of microbes in ocean processes:**

- Carbon cycle
- Sulfur cycle
- Iron cycle

### **3. Techniques for the characterization of microbial communities in marine environments**

- Phylogenetic markers
- Libraries of gene 16S rRNA
- Metagenomics
- Microscope analyses

### **4. Microbial marine habitats**

- Coastal environments
- Open ocean
- Cold seeps

- Hydrothermal vents

#### **5. Microbial aspects of environmental issues in marine environments:**

- Aerobic and anaerobic biodegradation of aliphatic and aromatic hydrocarbons

- Biological treatments of contaminated sediments

#### **6. Bioinformatic analysis of metagenomic data for microbial community characterization**

### **Prerequisites**

Basic knowledge of microbiology

### **Teaching form**

Lessons, Seminars: 5 credits (35 hours) - During the COVID-19 restrictions the lessons will be recorded and available online, with some live events that will be planned and communicated on e-learning.

Bioinformatic laboratory: 1 credit (12 hours) - During the COVID-19 restrictions, the laboratory will be carried out with live events. Each student will be connected to a computer virtual machine provided by the university.

### **Textbook and teaching resource**

1. "Marine Microbiology: ecology and applications" (2011), 2nd edition di Colin Munn. GS, New York

1. "Bioremediation and Natural Attenuation" (2006) di P. J. J. Alvarez, W. A. Illman. Ed Wiley & Sons, New Jersey

2. "Brock - Biology of Microorganisms" (2007) di M. T. Madigan, J. M. Martinko Brock. Ed. CEA Milano.

4. "Molecular Microbial Ecology". Ed. A.M. Osborn, C. J. Smith (2005) Taylor & Francis Group – New York NY

Scientific articles provided by the teacher

### **Semester**

First semester

### **Assessment method**

The acquired knowledge about environmental microbiology concepts applied to marine environments will be tested

by an oral exam. A report about laboratory activities will allow testing the bioinformatic competencies applied to environmental microbiology.

During the Covid-19 restrictions the oral exams will be exclusively through the WebEx platform. A public link will be posted on the e-learning page for the access of virtual public.

## **Office hours**

To be arranged with the teacher [andrea.franzetti@unimib.it](mailto:andrea.franzetti@unimib.it)

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