UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Marine Molecular Biology

2627-2-F7504Q021

Aims

This course introduces the basic aspects of the molecular and cellular biology of marine organisms. Topics include the methodology and applications of molecular biology as a means of examining ecosystem-wide biological processes.

1. Knowledge and understanding.
   The student should know the methodologies that enable him to study the structure, function and biosynthesis mechanisms of DNA, cellular RNAs and proteins. He should be able to understand the applications of molecular biology and biochemical methodologies for the study and analysis of nucleic acids and proteins.
2. Applying knowledge and understanding.
   At the end of the course the student will be able to apply the knowledge acquired in point 1 in subsequent courses and in laboratory experiences and to use the ability to understand for the purposes of subsequent study and / or research activities.
3. Making judgments.
   At the end of the course the student will be able to elaborate the acquired knowledge to recognize situations and problems in which the learned knowledge can be used.
4. Communication skills.
   At the end of the course, students will be able to appropriately describe the issues concerning molecular biology, with the most appropriate language.
5. Learning skills
   At the end of the course, the students will be able to analyze the literature will be able to apply, integrate and connect the acquired knowledge with with that of other courses with particular regard to cellular, genetic and biochemical disciplines.

Contents

Principles and applications of molecular biology tools (genomics, transcriptomics and proteomics) for the study of marine ecology.

Detailed program

Introduction

- Organization and structure of genomes.
- Principles of molecular evolution of genes.
- Relationship between gene regulation and biological functions.
- Phylogenetic relationships among marine organisms

Genomics

- Genome sequencing methods: dideoxy procedure, primer walking, pyrosequencing, use of reversible chain terminators, sequencing by ligation, large-scale DNA sequencing methods: shot-gunning strategy for sequencing genomes, cyclic array
- sequencing whole genome of key organisms, genome comparison for phylogeny, genomic analysis of natural communities, genomic analysis of communities (genome ecology),
- Polymerase Chain Reaction (PCR): principles and application in marine ecology
- Species identification by barcoding.

Transcriptomic

- Northern analysis
- Quantitative real-time polymerase chain reaction (QPCR): principles and probes;
- Absolute and quantitative analyses
- DNA arrays: cDNA and oligonucleotide arrays

Proteomic

- Preparation of protein samples from bacteria, plants and animal tissues.
- SDS PAGE and protein detection by Western analysis.
- 2D gel electrophoresis: 2D protein patterns, mass spectrometry and comparative analyses.

Prerequisites

Undergraduate Molecular Biology and Ecology

Teaching form

21 two-hour lectures, in person, Delivered Didactics

Textbook and teaching resource

The students can use "Gene Cloning and DNA Analysis: An Introduction" T.A. Brown 7th Edition as general textbook. The teaching material used for the lessons is available on the e-learning platform.

Semester

The course will take place in the first semester according to a timetable that will be published.

Assessment method

Examination type:
Oral examination. Students will perform a presentation focused on a research paper based on Molecular Biology approach and they will discuss about the principles and applications of technologies introduced in this course.
During the exam the candidate must demonstrate his ability to address and critically discuss the topics.
More in detail the examination consists of a PowerPoint presentation of a scientific article.
Once you have chosen the article, please send it to the teacher for approval. The rules and suggestions for the presentation are uploaded on the e-learning of the course. The following aspectes are evaluated: (a) graphical aspects, (b) insights into the article, and (c) clarity of the presentation.

Mark range: 18-30/30

Office hours

The teacher will receive by appointment. Monday - Friday 9.00-17.00

Sustainable Development Goals

LIFE BELOW WATER