UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Molecular and Cellular Biotechnologies

2627-1-F0803Q073

Aims

Knowledge and understanding:
At the end of the course, students will gain knowledge of the topics and advanced molecular and cellular biology techniques and their possible biotechnological applications.

Ability to apply knowledge and understanding:
At the end of the course, students will gain the ability to read and understand scientific papers dealing with innovative aspects of biotechnology and to develop applications based on this knowledge.

Making judgements
At the end of the course, students will be able to process what they have learned and to recognize the contexts of application of the advanced molecular and cellular biology techniques of the course. Autonomy will be encouraged throughout the course through the promotion, by the teacher, of classroom discussions and interactive teaching methods, aimed at summarizing the different topics covered in the lectures.

Communication skills
At the end of the course, students will be able to express themselves appropriately, using a proper vocabulary in the description of the treated topics.

Learning skills
At the end of the course, students will be able to read and understand the literature on the treated topics.

Contents

The course aims at deepening topics of molecular biology and cellular biology, giving space to the molecular details and to the practical applications of cellular and molecular knowledge. During the course, original data will also be presented and discussed through the analysis of scientific papers.

Molecular Biotechnology: Sequencing of DNA and genomes
Mechanisms of biogenesis, processing and functions of non-coding RNAs
Aptamers of nucleic acids (RNA and DNA)
Cellular Biotechnology: The yeast S. cerevisiae.
Stem cell technology.

Detailed program

Molecular Biotechnology: Sequencing of DNA and genomes with particular regard to the latest generation methods (NGS Illumina, Ion Torrent, Oxford nanopore, etc.); RNAsequencing, methods and applications. Analysis of sequences based on isothermal amplification methods (LAMP) and development of diagnostic kits.
Mechanisms of biogenesis, processing and functions of non-coding RNAs (ncRNAs and microRNAs) involved in the regulation of gene expression in eukaryotes and prokaryotes. Modulation of ncRNAs expression in human pathologies and potential role as biomarkers and as potential drugs. Molecular strategies to target ncRNAs in human diseases.
Aptamers of nucleic acids (RNA and DNA), selection procedures and their application for sensor development.
Cellular Biotechnology: The yeast S. cerevisiae: synthesis of the basic concepts (vectors, markers, gene targeting, gene inactivation, etc.). S. cerevisiae as a model system for the study of diseases (e.g. neurodegenerative diseases) and important cellular processes (apoptosis, ageing). Stem cell technology. Synthesis of the basic concepts related to stem cells (classification, cultivation methods, etc.). Induced pluripotent stem cells (IPS) and reprogramming processes. Tumor stem cells: definition and detection in some tumors. Development of methods of analysis on single cells.

Prerequisites

Backgrounds. Basics of Molecular Biology.
Prerequisites: none.

Teaching form

21 two hours-lectures composed by delivered didactics (Didattica erogativa, DE). Didactic activities are conveyed by means of face-to-face lectures. Teaching language: Italian.

Textbook and teaching resource

Slides and scientific papers. Available at the e-learning platform of the course. Course recordings made in previous academic years will be available on the e-learning site.

Semester

Second semester

Assessment method

The assessment consists of an oral examination, and no mid-term assessments will be scheduled. The oral examination comprises three questions covering the entire course syllabus.
The assessment is designed to evaluate the accuracy and completeness of the answers, the ability to establish meaningful connections among the different course topics, the appropriate use of disciplinary terminology, and clarity of presentation.
The Examination Committee will assign the final grade based on the level of proficiency demonstrated in each of the above-mentioned competencies. Higher grades will be awarded to students who demonstrate comprehensive and in-depth knowledge of the course content, strong analytical and integrative skills, appropriate use of disciplinary language, and clear and effective communication.

Office hours

Contact. On demand by email to the lecturer.

Sustainable Development Goals

QUALITY EDUCATION