UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Biologia e Genetica

2627-1-I0106D001-I0106D00102

Aims

Students must acquire knowledge of the fundamentals of cellular and molecular biology, essential for the study and understanding of human physiology and pathology.
They will learn about the structure and function of cellular components and related molecular mechanisms; the basic concepts of hereditary transmission and evolution; and the foundations for qualitative and quantitative understanding of biological phenomena.

Knowledge and Understanding - At the end of the course, students will be able to use the information provided to understand the basic mechanisms of cellular and molecular biology.

Ability to Apply Knowledge and Understanding - At the end of the course, students should be able to apply their acquired knowledge to understand the molecular basis of human pathology.

Independent Judgment - At the end of the course, students will be able to integrate information from different fields (biology, genetics) to understand and interpret the mechanisms of human disease.

Communication Skills - At the end of the course, students will have acquired adequate scientific terminology and will be able to explain the topics covered in the course using appropriate language.

Learning skills - At the end of the course the student will be able to understand and critically evaluate the scientific literature relating to the genetics and biology of human diseases.

Contents

The course aims to provide information for understanding the organization of cells. It also aims to convey knowledge of the structure and function of the various components of eukaryotic cells, the molecular mechanisms involved in cell replication, the molecular mechanisms involved in gene expression; the concepts and mechanisms

of cell division and sexual reproduction, as well as the basis for understanding genetic variability and the evolution of living organisms.

Detailed program

BIOLOGY AND GENETICS: General Biology - Key features of living matter; the four major classes of biological macromolecules: carbohydrates, lipids, proteins, and nucleic acids; the cell as a structural and functional unit; classification of prokaryotic and eukaryotic cells. Characteristics of the various components of the cell: cell membrane, its formation and characteristics; transmembrane transport and endocytosis; structure and function of the endoplasmic reticulum and the Golgi apparatus; structure and function of mitochondria and lysosomes; cytoskeleton, intermediate filaments microfilaments, microtubules; structure of nuclear membrane. DNA replication: the various protein components that are involved in DNA replication; the processes that take place at the level of the filament and filament delayed of replicative senescence fork. The genome organization in prokaryotes and eukaryotes: in the eukaryotic organisms, the genetic information is divided among multiple DNA molecules (chromosomes); the problem of compaction of DNA in the nucleus of eukaryotic cells; the information contained in DNA is divided into discrete units (genes) that specify the individual macromolecules structure RNA or proteins). Regulation of gene expression in prokaryotic and eukaryotic cells. The main types of RNA present in cells; differences compared to DNA: the mechanism of synthesis of RNA (transcription); the problem of deciphering the genetic code: general characteristics and biological implications. The mechanism of protein synthesis: the strategy of polymerization of amino acids: amino acid recognition by the messenger RNA and the source of the energy necessary for the formation of eptide bonds; the biological role and structure of ribosomes; the different stages of the translation process. The cell cycle and metabolic events that characterize its phases: control the progression along the cell cycle; consequences of mutations affecting genes for different proteins involved. Cell reproduction and agencies: mitosis as maintenance of genetic information. Meiosis and the crossing-over in the process of genetic variability. The gene mutation at the cellular level: the effects of mutations on the gene product. Communication between cells in the multicellular organisms: notes on exchanging chemical signals with autocrine and paracrine action: overview of general mechanisms of signal transduction within cells.

Prerequisites

Teaching form

Lectures.
Live at Monza campus. Via web-conference (live streaming) for Bergamo, Lecco, Sondrio.

Textbook and teaching resource

- Bonaldo P., Crisafulli C., D'Angelo R., Francolini M., Grimaudo S., Rinaldi C., Riva P., Romanelli M.G. (2019) Elementi di Biologia e Genetica. Edises, Napoli.
- Chieffi G., Dolfini S., Malcovati M., Pierantoni R., Poli M., Tenchini M.L. (2013) Biologia e Genetica. (IV ed.) Edises, Napoli.
- Donati C., Stefani M., Taddei N. (2019) Biologia e Genetica. Zanichelli, Milano.

Semester

1 Year - 1 Semester

Assessment method

Written exam: multiple-choice quiz. The 8 questions related to the Biology module (1 credit) are included in the joint Biology, Genetics and Biochemistry exam, consisting of a total of 32 questions.

Office hours

By appointment

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | GENDER EQUALITY