UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biology and Genetics

2627-1-E2403P002

Learning area

INTERDISCIPLINARY COMPETENCES

Learning objectives

Knowledge and understanding

- Introduction to the study of biology, genetics and behavioral genetics
- Description of the structure and function of the various components of neuronal eukaryotic cells
- Analysis of the fundamental principles of inheritance and expression genetic information
- Analysis of interaction mechanisms among genetic and environmental factors in the determination of normal or pathological behavior

Applying knowledge and understanding

- Ability to correlate structure and function
- Ability to contextualize concepts of biology and genetics to everyday life and to health
- Ability to assess critically studies that compare human to animal behavior

Making judgements

Through practical exercises, students develop the ability to independently evaluate the methodological coherence of problem solving and critically interpret, among multiple possible options, the most suitable approach to the problem. The exam format, which includes practical exercises and open questions, stimulates independence of judgment and critical thinking in the application of theorical knowledge.

Communication skills

The course promotes the development of communication skills through classroom discussion of exercises and analytical procedures. The exam includes open questions that require the use of appropriate technical language and the ability to clearly and coherently convey the results.

Learning skilss

The course provides a solid theoretical and practical foundation and allows the development of an active and autonomous study methodology, which is also useful for subsequent courses with greater specialization, as well as in future professional or research practice.

Contents

The course will be focused on the discussion of: the properties of living matter; the cellular organization; processes of cell reproduction and inheritance as well as their associated molecular mechanisms; the genetic bases of both human diseases and normal / pathological human behaviour.

Detailed program

LECTURES

- General properties and evolution of living beings; chemical composition of living matter; structure and function of biological macromolecules; mono and multi-cellular organisms.
- Cellular organization: structure of prokaryotic and eukaryotic cells; compartmentalization of eukaryotic cells; structure and function of plasma membranes; transport mechanisms through the membranes; communication between eukaryotic cells.
- Viruses: intracellular obligate parasites.
- Asexual and sexual reproduction; the chromosome theory of inheritance; chromosomes and the normal human karyotype; cell cycle and mitosis; meiosis and gametogenesis.
- Information flow in living matter: the DNA as the depositary of genetic information; the "central dogma" of biology; structure of eukaryotic gene; DNA replication; RNA and protein synthesis; the genetic code; Mendel's laws and exceptions; autosomal and sex-related inheritance; multifactorial inheritance. Diversity of living beings: recombination and crossing-over; gene mutations, chromosomal and genomic.
- Relations between heredity and environment in determining behavior; quantitative genetics and behavior; heritability; artificial breeding techniques; genetic analysis of normal and pathological behavior in humans; genotype / environment correlation

LAB

•application of learned theories to solve genetic problems

Prerequisites

Nothing specific. A minimal basic knowledge of the biology obtained in previous school levels may allow a smoother use of the course contents. At the beginning of the course all basic notions will be provided to allow the understanding of the course contents also to students without this basic knowledge.

Teaching methods

Teaching with different didactic methods:
21 two-hour lectures in delivery mode in person (ED);
8 two-hour laboratory activities in interactive mode in person (ID).

The lectures will be complemented by a laboratory with guided exercises, practical exercises, and theoretical insights.

These methods, along with classroom discussions, aim to make the course content more accessible and facilitate the acquisition of specific skills.

All material (lecture notes and exercises with solutions) will be made available on the course's e-learning website, so that it is also accessible to non-attending students.

Assessment methods

The written exam will consist of thirty multiple-choice questions and two open-ended questions on the course topics. The two open questions will focus one on the biology of the cell and the other on topics/exercises of genetics.

There will not be in itinere examinations.

The questions are aimed at ascertaining the effective acquisition of both theoretical knowledge and the ability to carry out practical exercises of genetics similar to those presented during the course.

The evaluation criteria are the followings: the correctness of the answers, the ability to understand the text of the open questions, to argue the answer and to synthesize.

Scores will be assigned based on the above criteria and the following scale (grades out of 30):
30 with honors: excellent preparation
27–30: distinguished preparation
24–27: good preparation
21–23: fair preparation
18–21: sufficient preparation

Although this course is held in Italian, for Erasmus students, course material can also be available in English, and students can take the exam in English if they wish to do so

Textbooks and Reading Materials

Solomon E. P., Berg L. R., Martin D. W. *Elementi di biologia*. VIII edizione. Napoli: Edises (except chapters 9 and 17).

The text is an Italian translation of an extract from a more extensive english book: Solomon E. P., Berg L. R., Martin D. W. Biology. Cengage Learning, Inc

Detailed information on other teaching materials will be published on the relevant e-learning site page.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING