UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

General Physiology

2627-2-E1302Q074

Aims

The course has the following main objectives:

1. Knowledge and understanding. The course brings the students to understand the fundamental physiological mechanisms of the animal organism (with special reference to mammalian and human physiology).

2. Applied knowledge and understanding. The above concepts are indispensable for further studies in Systems Physiology, Pathology and Pharmacology. Reference is made to these disciplines, during the course. Moreover, the fundamentals of Physiology are necessary to design and interpret experimental work on cells and organs, in different context (basic, applied or industrial research).

3. Making judgements. The student will learn to apply the fundamental physiological knowledge to the different pathophysiological contexts, beyonf the specific topics of the course. Such critical skills are developed with the personal study, the comparison of recent articles and reviews distributed during the course, and the discussion with the teacher.

4. Communication skills. The student will become able to properly explain the basic physiological concepts, as will be verified during the oral exam.

5. Learning skills. The acquired physiological concepts and notions will enable the student to further pursue personal studies.

Contents

1. Fundamentals of biophysics and transmembrane transport mechanisms.

2. Cell physiology and neurophysiology.

3. Muscle physiology.

4. Sensory systems.

5. Sensorimotor integration in the central nervous system.

6. Introduction to the functions of the autonomic nervous system, the hypothalamic-pituitary axis and the endocrine systems.

Detailed program

1. Fundamentals of biophysics and cell physiology, diffusion and transmembrane transport (active and passive, osmotic fluxes, volume and pH control).

2. Mechanisms of excitability and chemical and electric communication intra- and intercellular. Action potential and synaptic function.

3. Function and regulation of the muscle tissue with special reference to the skeletal muscle. Introduction to cardiac physiology.

4. Mechanisms of transepithelial transport.

5. Sensory systems physiology (somatosensory, visual, olfactory, auditory and taste).

6. Neuromuscular physiology: reflex arc, central synaptic integration, introduction to motor control.

7. Organization of the global nervous and endocrine control of organic functions (autonomic nervous system, hypothalamus and hypophysis).

Prerequisites

Propedeutic exams: Citology and Anatomy; Physics.

Moreover, a general understanding of cellular biochemistry is a prerequisite (fundamentals of protein structure; cellular metabolism; main mechanisms of regulation of the protein function; intracellular signalig pathways: second messengers, cyclic nucleotides, IP3).

Teaching form

Oral lessons (in italian).

24 lessons (2 hours each): in lecture modality, in-person.

No student activity (such as presentations of scientific papers, etc.) is planned.

Textbook and teaching resource

Randall et al. Animal Physiology. V edition, Freeman.
Blaustein, Kao, Matteson. Cellular Physiology and Neurophysiology. Mosby Physiol. Series. III edition.

For consultation:

Kandel et al., Principles of Neural Science, VI edition, 2021 McGraw-Hill (or previous editions).
Guyton & Hall Textbook of Medical Physiology, XIV edition (or previous editions), Elsevier.
Swanson, Brain Architecture, II edition, 2012 Oxford University Press.
Martin et al., From Neuron to Brain, VI edition, 2021 Sinauer-Oxford University Press

Further books and review articles will be mentioned during the course and distributed through e-Learning, whenever possible.

Slides and video recordings of all the lessons will be made available by e-Learning.

Semester

Second semester

Assessment method

There are no in itinere tests.

The exam is oral. The student is interviewed about the course's topics.

The exam consists of 2-3 general questions aimed at verifying the student's comprehension of the basic physiological concepts and mechanisms. Generally, the first question regards cell physiology and biophysics (transport mechanisms; action potential; synaptic mechanisms, etc.). The exam then proceeds with topics more related to system aspects (e.g., sensory mechanisms; motor control; autonomic nervous system).

Office hours

Appointment by E-mail (andrea.becchetti@unimib.it)

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | LIFE BELOW WATER | LIFE ON LAND