UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physiology of The Nervous System I

2526-4-H4102D028-H4102D102M

Aims

The aim of this course is to provide basic concepts and knowledge on the neurosciences. The student will be introduced to the main categories of disorders of the nervous system, focusing mainly on the physio-pathological mechanisms. This course has been designed to cover basic functional aspects of the central nervous system. At the end of the Neuroscience 1 and Neuroscience 2 courses, the students should be able to summarize our understanding of the functional organization of the human brain.

1. Knowledge and Understanding: It is essential that all medical students receive sufficient exposure to the physiological concepts underlying the functions of the central nervous system

2. Applied Knowledge and Understanding: The curricular objectives are primarily focused on the normal function of the organism, however, the material is presented in a context that prepares students for their role as physicians. Therefore, whenever possible, clinical examples will be used to illustrate the basic physiological principles.
3. Autonomy of judgment: Correlate the structure and normal function of the central nervous system as a complex system in continuous adaptation, interpreting the morpho-functional anomalies that occur in different diseases
4. Communication skills: Acquisition of the set of skills that allow one to interact effectively with others, both verbally and non-verbally.
5. Learning ability: acquisition of the physiological concepts underlying the functions of the central nervous system which will provide the necessary foundation for further studies in pharmacology, pathology, pathophysiology and clinical medicine and surgery.

Contents

The course will explore the neuroanatomical and neurophysiological basis of the spinal cord, the brainstem, the visual perception, the auditory perception, the vestibular functions.

Detailed program

- Spinal Reflexes: during normal movements the central nervous system uses information from a vast array of sensory receptors to ensure the generation of the correct pattern of muscle activity; The Control of Gaze: as we explore the world around us these motor systems act to stabilize our body, particularly our eyes, in space.

- Brain Stem, Reflexive Behavior, and the Cranial Nerves: we shall review the cranial nerves and their origin in the brain stem as well as the ensembles of local circuit neurons in the brain stem that organize the simple behaviors involving the face and head

- Brain Stem Modulation of Sensation and Movement: we will examine the groups of interneurons surrounding cranial nerve nuclei in the reticular formation of the brain stem. These reticular interneurons have local projections that mediate reflexes and simple stereotyped behaviors, such as chewing and swallowing. In this chapter we shall explore the long projection systems of the reticular formation

- Visual Processing by the Retina: visual perception begins in the retina and occurs in two stages. Light entering the cornea is projected onto the back of the eye, where it is converted into an electrical signal by a specialized sensory organ, the retina. These signals are then sent through the optic nerve to higher centers in the brain for further processing necessary for perception; Constructing the Visual Image, Central Visual Pathways, Perception of Motion, Depth, and Form, Color Vision: the brain recognizes form, motion, depth, and color using strategies that no computer can achieve.

- Hearing, Sensory Transduction in the Ear, The Vestibular System: human experience is enriched by our ability to distinguish a remarkable range of sounds—from the complexity of a symphony, to the warmth of a conversation, to the dull roar of the stadium. This ability depends upon the almost miraculous feats of hair cells, the receptors of the internal ear. Similar hair cells are also responsible for our sense of equilibrium. Human hearing commences when the cochlea, the snail-shaped receptor organ of the inner ear, transduces sound energy into electrical signals and forwards them to the brain.

Prerequisites

Sound knowledge of anatomy and biochemistry.
To take the exams relating to the vertical tracks and integrated courses of years 3 to 6 it is necessary to have passed the Basic Pathology, Basic Pharmacology, Image Diagnostics, Basic Clinical Skills exam.

Teaching form

All lessons are held in person in delivery mode (direct instruction): the teacher begins with a first part in which concepts are exposed (direct mode) and then an interaction opens with the students which defines the next part of the lesson (interactive mode).
The teaching methods will include lectures, videos, and class discussions. Whenever possible, clinical case analyzes will be proposed for the evaluation of the specific physiological parameters.
Lessons in attendance, subject to any ministerial changes.
In case of pandemic restrictions, the courses will be delivered in mixed mode from asynchronous remote with synchronous videoconferencing events (WEBEX)

Textbook and teaching resource

- Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Richard D. Mooney, Michael L. Platt, Neuroscience (6th Edition) – eBook - Sinauer Associates (Oxford University Press); 6th edition

- E. R. Kandel, J. H. Schwartz, T. M. Jessel, S. A. Siegelbaum, A. J. Hudspeth, Principles of neural science, Mc Graw Hill Medical

- Susan E. Mulroney, Adam Myers, Netter's Essential Physiology, Elsevier

Semester

First semester

Assessment method

There will not be ongoing test.
The exam consists in a written test. Open and closed questions will be posed to the student in order to evaluate the general knowledge of the topics. Moreover, the student will be asked to answer to questions that require the analysis of a complex phenomenon, its rationalization and the application of specific physiology principles and to solve simple exercises. Finally, a clinical case may be presented which will require the analysis of the interconnections between different physiological variables in the light of the theoretical paradigms.

Exams written, in case of pandemic restrictions, will be provided by the platform https://esamionline.elearning.unimib.it, access to which will be activated for the date and time of the exam.

Office hours

By appointment, subject to notification to be sent to giulio.sancini@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING