UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Physiology of The Nervous System II

2526-5-H4102D091-H4102D124M

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 autonomic nervous system, the cerebral cortex, the cognitive functions, memory and consciousness. It will also examine issues related to neurocognitive development. Specific topics covered include basic principles of clinical neurophysiology. The

course will explore the behavioral, neuroanatomical, and neurophysiological basis of aforementioned cognitive functions.

Detailed program

- The Autonomic Nervous System and the Hypothalamus: Though the neural control of emotion involves several regions, including the amygdala and the limbic association areas of the cerebral cortex, they all work through the hypothalamus to control the autonomic nervous system. The hypothalamus coordinates behavioral response to insure bodily homeostasis, the constancy of the internal environment.

- The Neural Basis of Cognition: Whether it be a simple reflex response or a complex mental act, behavior results from the pattern of signaling between appropriately interconnected cells.

- Integration of Sensory and Motor Function: cognitive functions, because of their complexity, required the operation of the brain as a whole.

- From Nerve Cells to Cognition: The brain produces an integrated perception because nerve cells are wired together in precise and orderly ways according to a general plan that does not vary greatly among normal individuals

- Cellular Mechanisms of Learning and the Biological Basis of Individuality: all behavior is a function of the brain and that malfunctions of the brain give rise to characteristic disturbances of behavior. Behavior, in turn, is shaped by learning.

- Language and the Aphasias: Language appears to be a species-wide adaptation and, as we shall see, is supported by neural circuitry of considerable complexity.

- Learning and Memory: Many important behaviors are learned. Indeed, we are who we are largely because of what we learn and what we remember. We learn the motor skills that allow us to master our environment, and we learn languages that enable us to communicate what we have learned, thereby transmitting cultures that can be maintained over generations.

- Emotional States and Feelings: An emotional state has two components, one evident in a characteristic physical sensation and the other as a conscious feeling. To maintain the distinction between these two components, the term emotion sometimes is used to refer only to the bodily state (ie, the emotional state) and the term feeling is used to refer to conscious sensation.

- Motivational and Addictive States. Motivation is a catch-all term that refers to a variety of neuronal and physiological factors that initiate, sustain, and direct behavior. These internal factors are thought to explain, in part, variation in the behavior of an individual over time.

- Sexual Differentiation of the Nervous System: Studies in experimental animals strongly suggest that the human brain also undergoes hormonally induced sexual differentiation during development.

- The aging of the brain: lengthening the life span has little merit if the quality of life is not preserved. One of the principal goals of research on aging is not only to lengthen life but, equally importantly, to maintain and enhance its quality. We will review age-associated alterations in cognition, brain structure, and chemistry related to memory loss and intellectual deterioration in the elderly

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