UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# SYLLABUS DEL CORSO

# Physiology of The Nervous System II

**2425-5-H4102D032-H4102D124M**

## Aims

This course has been designed to cover basic functional aspects of the central nervous system. At the end of the course, the students should be able to summarize our understanding of the functional organization of the human brain.

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.

## 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

The exam consists in an oral test. 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. 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.

Oral exam, 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