## **Neuropsychology and anatomofunctional Basis of Cognitive Processes**

## Prof. Lucia Maria Sacheli; Prof. Davide Quaranta

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The student will acquire knowledge in the following areas:

- the neurofunctional bases that support cognitive functions (i.e., elements of neuroanatomy and neurophysiology);

- the cognitive models that describe the mechanisms underlying the main cognitive/behavioural syndromes related to brain damage;

- the methods and tools to investigate cognition in health and pathology (neuropsychological tests and batteries; behavioural scales; neuroimaging and electrophysiological techniques applied to clinical neuropsychology).

At the end of the course, the students will be able to identify the features characterizing the cognitive/behavioural syndromes and disorders due to brain lesions. Students will be also able to interpret the disorders of the various cognitive functions on the basis of the relative models that describe their functional organisation, also in the light of possible rehabilitative interventions.

***COURSE CONTENT***

*Module 1, Functional neuroanatomy:*

- General principles: macroscopic anatomy; organisation of afferent and efferent pathways.

- Functional anatomy of episodic memory: anatomo-functional subdivisions of the medial temporal structures, the thalamus and the basal forebrain.

- Functional anatomy of attention and executive functions: anatomo-functional subdivisions of the frontal lobe and basal nuclei; cortico-subcortical connections.

- Functional anatomy of visual-spatial skills: anatomo-functional subdivisions of the parietal lobe; neuroanatomical and neurophysiological substrates of visual processing: optic pathways, occipital lobe.

- Functional anatomy of language: neuroanatomy of the perisylvian regions, the temporal lobe and the related cortico-cortical connection bundles.

- Functional anatomy of the cerebellum: organisation of the cerebellar cortex and of the afferent and efferent pathways; functional subdivisions.

- Functional anatomy of emotions: organisation of the limbic system.

*Model 2, Neuropsychological and behavioural syndromes:*

*-* Introduction to neuropsychology and cognitive neuroscience, definitions and methods.

- Perception and agnosia.

- Disturbances in spatial attention and awareness (hemi-attention).

- The functional organisation of the memory systems.

- Episodic memory, semantic memory, and working-memory disorders.

- The functional organisation of language: neuro-anatomical and cognitive bases.

- Speech disorders (aphasia, dyslexia, dysgraphia).

- Calculation disorders.

- Praxis disorders.

- Cognitive-behavioural syndromes in damage of the basal ganglia.

- The consequences of cerebellar damage and the cognitive-affective syndrome.

- Attention, executive function, default mode network and salience.

- Neuropsychology of emotions.

- Behaviour and social cognition.

- Dementia.

- Neuropsychology in childhood.

- Rehabilitation of cognitive functions.

***READING LIST***

Kenneth M. Heilman & Edward Valenstein, *Clinical Neuropsychology*. 2011, Fifth edition, Oxford University Press.

Quaranta D, Silveri MC, Marra C., *Introduzione alla neuroanatomia funzionale dei processsi cognitivi*- Vita e Pensiero, Milano 2022, ISBN 9788834351147.

David L. Clark, Nash N. Boutros, & Mario F. Mendez, *The Brain and Behavior: An Introduction to Behavioral Neuroanatomy*, 2010, Fourth Edition, Cambridge University Press. (For consultation only).

***TEACHING METHOD***

Lectures. Seminars.

Practical demonstrations via video.

Small group activities.

***ASSESSMENT METHOD AND CRITERIA***

A written exam with the possibility, at the request of the Exam Commission and/or the student, of a more in-depth supplementary oral exam to be carried out according to the procedures established by the Commission.

The written exam will consist of four open-ended questions.The exam will focus on the texts and topics indicated in the Faculty Guide, to be found in the appropriate section on the website www.unicatt.it, and on the slides discussed during the lectures.

Consistency of the answers will be assessed in terms of: (i) knowledge of the topic, (ii) ability to summarise and focus on the specific question, (iii) use of the correct terminology, and (iv) syntactic and conceptual organisation of the paper. Each answer will be given a mark from 17 (insufficient) to 30 with distinction; the average of the four marks will constitute the exam mark. The exam will be considered passed if an average of 18 is achieved and if a sufficient mark has been achieved in at least three out of the four questions.

***NOTES AND PREREQUISITES***

A basic knowledge of the functional organisation of the brain is considered a prerequisite to the course topics.

*Should the current Covid-19 health emergency not allow face-to-face teaching, remote teaching in synchronous or asynchronous mode will be guaranteed; this will be communicated in good time to students.*

Further information can be found on the lecturer’s webpage at *http://docenti.unicatt.it/web/searchByName.do?language=ENG* or on the Faculty notice board.