



Course title: Neuroscience Applied to Human Health/ Neurociencia Aplicada a la Salud Cerebral (45 lecture hours)

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Language: Spanish/English

Brief course presentation

This course introduces the foundations of neuroscience as applied to the understanding, promotion, and preservation of brain health through the structure and functioning of the central nervous system (CNS). It examines the neurobiological mechanisms underlying cognitive, emotional, and behavioral processes, and their relationship to well-being, disorder prevention, and psychological intervention.

Building on this foundation, the course explores neural plasticity and the influence of lifestyle, learning, and environmental factors in the development of cognitive reserve, highlighting its protective role in resilience, adaptive functioning, and healthy brain aging. The approach is integrative, combining theoretical frameworks, scientific evidence, and practical applications in clinical and health-related contexts.

Objectives

Conceptual learning objectives:

By the end of this course, students will be able to:

- Demonstrate a comprehensive understanding of the neurobiological foundations of human cognition, emotion, and behavior.
- Explain the principles underlying brain organization, neural communication, and neuroplasticity in relation to brain health.



- Understand the scientific basis of brain health promotion, prevention of disorders, and psychological intervention.
- Recognize the interaction between biological, psychological, and behavioral processes in the maintenance of mental well-being.
- Describe the neuroscientific foundations of evidence-based interventions aimed at preserving and enhancing brain health.

Procedural learning objectives:

- Apply neuroscientific knowledge to the analysis of cognitive, emotional, and behavioral processes.
- Interpret and critically evaluate scientific evidence in neuroscience and brain health.
- Integrate neurobiological principles into the understanding of prevention and intervention strategies.
- Analyze clinical and health-related cases from a neuroscience-informed perspective.
- Formulate reasoned arguments supported by empirical evidence in the field of applied neuroscience and brain health.

Course Content

UNIT 1: Neurodevelopment and functional organization of the brain

- Analyze the development of the nervous system: Students will be able to describe the ontogenetic and phylogenetic development of the central nervous system.
- Understand brain maturation: Students will be able to explain the processes of neural maturation and their relationship to the development of basic psychological processes.
- Identify brain organization: Students will be able to identify the structural and functional organization of the human brain.



- Relate neurodevelopment to brain health: Students will be able to analyze how alterations in neurodevelopment impact brain health across the lifespan.

UNIT 2: Functional connectivity and cerebral asymmetry

- Define functional connectivity: Students will be able to define the concept of functional connectivity and explain its relevance to brain functioning.
- Analyze neural networks: Students will be able to identify the main brain networks involved in basic psychological processes.
- Understand cerebral asymmetry: Students will be able to explain functional lateralization and its role in cognition and behavior.
- Evaluate clinical implications: Students will be able to analyze the implications of alterations in functional connectivity and cerebral asymmetry for mental health.

UNIT 3: Neurobiology of attention

- Identify attentional systems: Students will be able to identify the main neural systems involved in attention.
- Explain neurobiological mechanisms: Students will be able to describe the neurobiological mechanisms underlying attentional processes.
- Analyze types of attention: Students will be able to differentiate between different types of attention and their neural correlates.
- Relate attention to health: Students will be able to analyze attentional alterations in various neurological and psychological disorders.
- Understand intervention techniques: Students will be able to describe the scientific foundations of biofeedback and neurofeedback as applied to the enhancement of attention.

UNIT 4: Neuroscience of memory

- Describe memory circuits: Students will be able to describe the neural circuits involved in memory.



- Explain neurophysiological mechanisms: Students will be able to explain the neurophysiological mechanisms underlying mnemonic processes.
- Differentiate memory systems: Students will be able to distinguish between different memory systems and their functions.
- Analyze memory impairments: Students will be able to analyze memory deficits in the context of neurological and neurodegenerative disorders.

UNIT 5: Neural bases of language

- Identify brain areas involved in language: Students will be able to identify the main brain regions involved in language production and comprehension.
- Explain linguistic circuits: Students will be able to describe the neural circuits underlying language processing.
- Analyze language disorders: Students will be able to analyze disorders affecting language production and comprehension from a neurobiological perspective.
- Relate language to brain health: Students will be able to evaluate the impact of language impairments on functional abilities and quality of life.
- Understand clinical interventions: Students will be able to understand the neuroscientific foundations of clinical interventions such as awake brain surgery.

UNIT 6: Emotional regulation, physical activity, and neurocognitive practices applied to brain health

- Understand the neurobiological bases of emotion: Students will be able to identify the main structures of the limbic system and explain their role in emotion, motivation, and affective regulation.
- Analyze the relationship between emotion and brain health: Students will be able to analyze how emotional processes influence cognition, behavior, and psychological well-being.
- Evaluate the effects of physical exercise on the brain: Students will be able to explain the effects of sport and physical activity on neuroplasticity, cognition, and brain health.



- Apply neurophysiological self-regulation techniques: Students will be able to understand and describe the principles of biofeedback and neurofeedback as tools for emotional and cognitive regulation.
 - Analyze mind–body practices from a neuroscience perspective: Students will be able to analyze, from a neuroscientific perspective, the effects of yoga and other contemplative practices on the nervous system and brain health.
 - Integrate applied approaches to well-being promotion: Students will be able to integrate neurobiological knowledge to evaluate non-pharmacological interventions aimed at promoting brain health.
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Teaching and learning methodology

The course will be delivered through an active and participatory methodology aimed at integrating theoretical knowledge with its practical application in the field of brain health. Sessions will combine lectures with case analysis and guided discussions, promoting meaningful learning grounded in scientific evidence.

Active student participation will be encouraged, fostering critical thinking, reflection, and the application of neuroscientific knowledge to real-world contexts related to well-being promotion, prevention strategies, and brain health interventions.

Planned learning activities

The development of this course involves the review and guided study of a series of core conceptual frameworks related to the topics covered in class. These frameworks will be presented and discussed during the sessions to support students' progressive understanding of the subject matter.

In addition, several assessment activities will be conducted (Participation and Analysis Tests, and Continuous Assessment Exercises) to monitor progress and provide specific feedback on each student's ongoing assimilation of the course content.



Assessment system and grading criteria

Assessment Procedures:

The course will be assessed through a **continuous assessment system** designed to progressively evaluate the acquisition of the established knowledge and competencies.

The final grade will be determined based on the following components:

1. Attendance (30%)

Regular and consistent attendance at face-to-face sessions will be assessed, as it is considered a fundamental requirement for the proper completion and follow-up of the course.

2. Continuous assessment activities (70%)

Completion and successful performance in the continuous assessment activities scheduled throughout the course will be evaluated. These activities are designed to promote the application of both the theoretical and practical content of the course.

For these components to be considered in the final grading, **students must demonstrate attendance of at least 80% of the total scheduled sessions**, as well as **active participation in the continuous assessment activities** carried out throughout the course.

Alternatively, students who do not opt for the continuous assessment system may undertake a **final assessment** consisting of a comprehensive **final exam** covering the entirety of the course content. In this case, the examination grade will account for **100% of the final mark**.

Assessment Criteria:

The final grade for the course will, generally, be determined through the **continuous assessment system**.

To pass the course under this system, students must:



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- Demonstrate **attendance of at least 80%** of the face-to-face sessions.
- Complete and successfully pass the **continuous assessment activities** scheduled throughout the course.

If students do not opt for the continuous assessment system or fail to meet the established requirements, they may sit a **final exam** covering the entirety of the course content. In this case, the examination grade will account for **100% of the final mark**.

Course start and end dates: To be confirmed. The course will be delivered during the first semester of the 2026–2027 academic year.

Class schedule: To be confirmed.

Distribution of teaching hours by activity type

LH	TPS	EPH	OIA	SH	PH
2	6	2	0	0	0

LH: Lecture Hours

TPS: Teaching Practical Sessions

EPH: Experimental Practical Hours

OIA: Other Instructional Activities

SH: Seminar Hours / Coursework

PH: Project Hours

References

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