

**Neurobiology of Cognition and Behaviour**

Code: 42911  
ECTS Credits: 9

Degree	Type	Year	Semester
4313792 Neurosciences	OB	0	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

### Contact

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### Teachers

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Raul Andero Gali

Beatriz Molinuevo Alonso

### Use of Languages

Principal working language: spanish (spa)

### Prerequisites

None special, except those established by the Master of Neurosciences.

### Objectives and Contextualisation

The subject explores the brain, the central nervous system and its interaction with neuroendocrine and immune systems, always in relation to complex psychological processes, such as emotions, stress and the multiple aspects of cognitive functions. The neurobiology (and Neurogenetics) of the main psychopathologies (psychiatric pathologies) and brain aging are also studied, with emphasis on basic research in both laboratory and human animals, and in the translation of this research to the clinic.

## Competences

- Conceive, design, develop and synthesise scientific projects in the field of neurosciences.
- Continue the learning process, to a large extent autonomously
- Explain the basis of treatments for pathologies of the nervous system.
- Identify and use the techniques for studying the neurobiological substrate of behaviour, neurodegenerative processes, neuroprotective strategies and strategies of plasticity of the nervous system.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

## Learning Outcomes

1. Continue the learning process, to a large extent autonomously
2. Describe the evolutionary, neural and molecular mechanisms of emotions, learning and memory.
3. Describe the psychoneuroendocrine bases of psychopathology.
4. Develop a deep sense of responsibility and respect for those affected by diseases of the nervous system and their families.
5. Explain the cellular and molecular bases of addictive behaviours.
6. Recognise the degree and nature of the genetic and environmental contribution to both normal and pathological behaviour.
7. Seek out information in the scientific literature using appropriate channels, and use this information to formulate and contextualise a research topic.
8. Understand the effect of behaviour on the immune system.
9. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

## Content

CONTENTS "NEUROBIOLOGY OF COGNITION AND BEHAVIOR" "\*\*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents."

### BLOCK 1

#### BLOCK 1A: LEARNING & MEMORY

1-LEARNING PROCESSES (I). Non-associative learning. Associative learning: Appetitive and Aversive Classical conditioning. Neurobiology of some forms of classical conditioning. (2 hours)

*Alberto Fernández Teruel*

2-LEARNING PROCESSES (II). Associative learning: Instrumental conditioning. Spatial and other forms of learning. Neurobiology of some forms of instrumental conditioning and spatial learning. (2 hours)

*Alberto Fernández Teruel*

3- MEMORY PROCESSES AND TEMPORAL DYNAMICS. Encoding, consolidation, reconsolidation, forgetting. (2 hours)

*Meritxell Torras*

4- MEMORY SYSTEMS IN THE BRAIN (I). Implicit and explicit memories. Working memory (2 hours)

Anna Vale

5- MEMORY SYSTEMS IN THE BRAIN (II). Implicit and explicit memories. Working memory. (2 hours)

Laura Aldavert

6- SYNAPTIC PLASTICITY AND MEMORY. (2hours)

David Costa

7- MEMORY MODULATION: EMOTIONS AND MOTIVATION (2 hours)

Margarita Martí

8-MEMORY MODULATION: SLEEP AND AROUSAL. (2 hours)

Isabel Portell

9-WORKSHOP: practical evaluation of Block 1A (2 Subgroups). (2 hours)

Pilar Segura and Margalida Coll

#### BLOCK 1B: NEUROENDOCRINOLOGY & NEUROBIOLOGY OF STRESS

10-NEUROENDOCRINOLOGY & NEUROBIOLOGY OF STRESS (I). Hormone action mechanisms in the CNS. Neuroendocrine regulation of hypophyseary hormones. (2 hours)

*Juan Hidalgo*

11- NEUROENDOCRINOLOGY & NEUROBIOLOGY OF STRESS(II). Neurosteroids. (2 hours)

*Marc Pallarés*

12- NEUROENDOCRINOLOGY & NEUROBIOLOGY OF STRESS (III). Neurobiology of stress: Concepts, types and physiological markers. Processing stressing stimuli in CNS: Chronic stress and adaptation. Stress and pathological processes . (2 hours)

*Antonio Armario*

#### BLOCK 1C: NEUROBIOLOGY OF CONSCIOUSNESS

13-NEUROBIOLOGY OF CONSCIOUSNESS. Nature and basic concepts. Neural mechanisms of consciousness. ( 2 hours)

*Ignacio Morgado*

#### BLOCK 2

#### BLOCK 2: MENTAL DISORDERS AND BRAIN AGING: FROM BASIC RESEARCH TO HUMAN SUFFERING

14-ANIMAL MODELS IN NEUROSCIENCE AND PSYCHIATRY RESEARCH. Overview on animal models of neuro-psychopathology. Validity criteria. Representative examples. (2 hours)

*Rosa M<sup>a</sup> Escorihuela*

15. ANXIETY AND ITS DISORDERS. Definition of anxiety and fear. Essential neurobiology and neuropharmacology of anxiety and fear. Basic research with animal models. Main anxiety disorders. Pharmacological and non-pharmacological treatments. (2 hours )

*Rosa M<sup>a</sup> Escorihuela*

16-NEUROBIOLOGY OF DEPRESSION AND AFFECTIVE DISORDERS (I). Definition of depression. Stress and depression. Essential neurobiology and neuropharmacology of depressive disorders. (2 hours)

*Antonio Armario*

17-NEUROBIOLOGY OF DEPRESSION AND AFFECTIVE DISORDERS (II). Basic research with animal models. Main depressive disorders. Pharmacological and non-pharmacological treatments. (2 hours)

*Antonio Armario*

18- NEUROBIOLOGY OF SCHIZOPHRENIA (I). Definition of schizophrenia. Essential neurobiology and neuropharmacology of schizophrenia. (2 hours)

*Alberto Fernández Teruel*

19- NEUROBIOLOGY OF SCHIZOPHRENIA (II) Basic research with animal models. Pharmacological and non-pharmacological treatments. (2 hours)

*Alberto Fernández Teruel*

20-ADDICTIVE BEHAVIOR (I). Motivation. Definition of addiction, tolerance and dependence. Role of animal models to study addiction. (2 hours)

*Jordi Ortiz*

21-ADDICTIVE BEHAVIOR (II) Neuroanatomy and neurochemistry of cerebral circuits of addictive behaviour. Addictive drugs.(2 hours)

*Jordi Ortiz, Roser Nadal*

22-ADDICTIVE BEHAVIOR (III) Stress and addiction. Individual differences in addictive behaviour. Non pharmacological addictions. (2 hours)

*Roser Nadal*

23-NEUROBIOLOGY OF AGRESSIVE BEHAVIOR (I). Basic concepts. Classifications of aggressive behaviours. Development of aggressive behaviour. Basic research and animal models. Learning, maintenance and control of aggressive behaviour. (2 hours)

*Beatriz Molinuevo*

24-NEUROBIOLOGY OF AGRESSIVE BEHAVIOR (II). Triggers of aggressive behaviour. Nature and upbringing. Neurobiology of aggressive behaviour. Psychiatric disorders and violence. (2 hours)

*Rafael Torrubia*

25- THE AGING BRAIN (I). Health aging and age-related cognitive and functional decline. (2 hours)

*Lydia Giménez*

26- THE AGING BRAIN (II). Pathological aging: Sensory, motor, cognitive, emotional and social impairments in the older people. Clinical and translational research in neurodegenerative diseases (Dementia, Parkinson, Huntington Corea) and Accelerated aging (2 hours)

*Lydia Giménez*

## **Methodology**

Master classes / expositions.

Discussion of some cases and / or scientific articles and experimental designs.

"\*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities."

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Clases magistrales	50	2	7, 8, 2, 3, 4, 5, 1, 6, 9
Workshop	2	0.08	7, 2, 4, 1, 6, 9
Type: Autonomous			
Actividades autónomas	167	6.68	7, 4, 1, 9

## Assessment

To pass this module it will be necessary to get at least a 5.0 / 10.0 mark after averaging the mark of both blocks.

In order to be able to calculate this average it will be necessary to get a minimum of 4.0 both in BLOCK 1 (Theoretical exam 1st parte + Practical evaluation) and in BLOCK 2 (Theoretical exam 2nd parte).

The students will have a second opportunity to pass the module by undertaking final exam including the contents of the whole module.

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practical evaluation (1st part)- Ejercicio práctico evaluativo (1a parte)	15	2	0.08	7, 8, 3, 4, 1, 6, 9
Theoretical exam- 1st part / Examen Teórico (1a parte)	35	2	0.08	7, 2, 4, 1, 6, 9
Theoretical exam-2nd part / Examen teórico (2a parte)	50	2	0.08	7, 8, 2, 3, 4, 5, 1, 6, 9

## Bibliography

### GENERAL

Bear, M.F., Connors, B. i Paradiso, M. (2008) Neurociencia: la exploración del cerebro (3ª edición). Barcelona: Wolters Kluwer.

NR Carlson "Fisiología de la Conducta", (8 Ed.) Barcelona: Ariel, 2005.

Kandel E. (2012) Principles of neural science. 5th ed. Ed. McGraw Hill.

MR Rosenzweig, AL Leiman y SM Breedlove, Psicobiología, Barcelona: Ariel, 2005.

Squire LR, Bloom FE, Spitzer NC, Du Lac S, Ghosh A and Berg D (Eds)

"Fundamental Neuroscience" (3rd. Edit), New York Elsevier, 2008.

Stahl SM. Psicofarmacología esencial. Bases neurocientíficas y aplicaciones clínicas. Barcelona: Ariel. 2002.

Vallejo Ruiloba J, Leal Pérez C. Tratado de Psiquiatría (Volúmenes I y II). Barcelona: Ars Médica, 2010.

#### ESPECÍFICA

A Fernández-Teruel "Farmacología de la conducta: De los psicofármacos a las psicoterapias", Bellaterra: Servei de Publicacions de la UAB, 2008.

Ch. Koch "The quest for consciousness: a neurobiological approach", Colorado: Roberts and Co, 2004 (Ed. española. Barcelona: Ariel).

GF Koob and ML LeMoal, "Neurobiology of addiction", New York: Academic Press, 2005

Morgado Bernal, I. (2007) Emociones e inteligencia social: las claves para una alianza entre los sentimientos y la razón. Barcelona: Ariel.

Morgado-Bernal, I: (2014) Aprender, recordar y olvidar: Claves cerebrales de la memoria y la educación. Barcelona: Ariel.

ET Rolls ET "Emotions explained", New York: Oxford University Press., 2005.

Sandi C, venero C, Cordero MI. Estrés, Memoria y trastornos asociados. Implicaciones para el daño cerebral y el envejecimiento. Barcelona: Ariel. 2001.

A Tobeña "Anatomía de la agresividad humana", Barcelona: Galaxia Gutenberg, 2001.

More specific bibliography on the different sessions / topics of this subject will be indicated by the respective professors and teachers at the time

#### **Software**

No specific programs are needed