Universitat de Lleida

DEGREE CURRICULUM

FUNDAMENTAL NEUROSCIENCE

Coordination: MEDINA HERNÁNDEZ, LORETA MARÍA

Academic year 2021-22

Subject's general information

<table>
<tr><td>Subject name</td><td>FUNDAMENTAL NEUROSCIENCE</td></tr>
<tr><td>Code</td><td>101532</td></tr>
<tr><td>Semester</td><td>PRIMER QUADRIMESTRE</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Biomedical Sciences</td><td>3</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Master's Degree in Biomedical Research</td><td></td><td>COMPLEMENTARY TRAINING</td><td>Attendance-based</td></tr>
</table>
</td></tr>
<tr><td>Course number of credits (ECTS)</td><td>9</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRALAB</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>1.9</td><td>1.4</td><td>5.7</td></tr>
<tr><td>Number of groups</td><td>3</td><td>2</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Coordination</td><td>MEDINA HERNÁNDEZ, LORETA MARÍA</td></tr>
<tr><td>Department</td><td>EXPERIMENTAL MEDICINE</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>No. of presencial hours: 90*
No. of non presencial hours: 135
*Depending on the situation of Covid19 pandemic, this year classes will be in face-to-face or mixed format (with part online).</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan
Spanish
English</td></tr>
<tr><td>Distribution of credits</td><td>See Tables above
Lectures: 57 hours
Seminaries: 14 hours
Lab practices: 19 hours</td></tr>
</table>

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CALDERO PARDO, JORDI	jordi.caldero@udl.cat	,7	
CANTÍ NICOLÁS, CARLES	carles.canti@udl.cat	2,3	
DESFILIS BARCELÓ, ESTER	ester.desfilis@udl.cat	,3	
GARCERA TERUEL, ANA	ana.garcera@udl.cat	3,2	
MEDINA HERNÁNDEZ, LORETA MARÍA	loreta.medina@udl.cat	5,9	
SOLER TATCHÉ, ROSA MARIA	rosa.soler@udl.cat	1,3	
TARABAL MOSTAZO, OLGA	olga.tarabal@udl.cat	,5	

Subject's extra information

This is a basic course of the third year of the Biomedical Sciences degree, scheduled during the first semester of the academic year. It pretends to provide students with basic, multidisciplinary knowledge that allows to understand the structure and function of the nervous system, as well as comprehension of the molecular and cellular processes underlying nervous system disease.

The program includes basic contents on the nervous system (development, cell and molecular biology, anatomy, physiology, as well as systems, cognitive and behavioral neuroscience). In addition to transversal competences, students should acquire competences regarding neuroscience terminology, neuroimage interpretation, and other basic concepts in neuroscience. Regarding instrumental competences, in addition to learning basic neurobiology and neurohistology techniques, we will collaborate with other courses in the Biomedicine degree for facilitating communication abilities in students, fostering their capacity to work independently as well as in group, and promoting their use of ICTs (Information and Communication Technologies) for obtaining and handling information.

Learning objectives

- Know basic concept on cellular and molecular neurobiology, and on the mechanisms underlying the development and evolution of the nervous system

- Learn the neuroanatomy of the human nervous system, as well as that in experimental models commonly used in neuroscience
- Know basic concepts of cellular neurophysiology and on the function of central and peripheral nervous systems
- Learn the basic methodology use in neuroscience for studying the nervous system
- Introduce the physiopathological processes underlying neurodegeneration and neuroinflammation, as well as the mechanisms of nervous system regeneration
- Know basic aspects of adult neurogenesis, plasticity, and the obtention of neural stem cells for its possible therapeutic use

Competences

CB1 That students have demonstrated that they have and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

CB2 That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the development and defense of arguments and problem solving within their area of study

CE62. Describe the molecular, cellular, genetic and epigenetic bases of diseases such as: cancer, diseases of the nervous system, cardiovascular diseases and related processes such as aging

CE65. Analyze scientific information through specialized publications, as well as be able to summarize and present it in different formats

CE66. Recognize the scientific methodology of research

CG5 Apply the gender perspective to the tasks of the professional field

Subject contents

LECTURES

Topic 0. Introductión to Neurocience.

Block I - General

Topic 1. Cellular biology of the nervous system

1.1. The neuron.

1.2. The nervous fiber.

1.3. Synapsis.

1.4. Introduction to neurophysiology.

1.5. Glial cells.

1.6. Meninges and cerebrospinal fluid.

Topic 2. Development of the nervous system.

2.1. Cellular basis of nervous system development.

2.2. Molecular basis of nervous system development.

2.3. Plasticity and regeneration in the nervous system.

Block II - Special: Neuroanatomy

Topic 3.Human and comparative neuroanatomy.

3.1. Principles of organization. Planes, axis and terminology.

3.2. Basic subdivisions of the Nervous System: An evolutionary developmental neurobiology approach

3.3. Spinal Cord

3.4. Brainstem and Cerebellum

3.5. Prosencephalon

Topic 4. Neuroanatomical basis of functional systems

4.1. Perception, attention and consciousness.

4.2. Systems involved in motivation and emotion. Interactions with the motor system.

4.3. Learnigns and memory.

4.4. Hormones, sex and social brain.

Block II - Special: Physiology

Introduction to neurophysiology II: electrical properties of plasmatic membrane.

Topic 5. Sensorial systems.

5.1. Basic concepts and general functional properties of sensory and motor systems.

5.2. Somatosensory system.

- Organization
- Ascending pathways
- Physiology

5.3. Visual system.

5.4. Auditory and Vestibular systems.

5.5. Chemical systems (olfaction and taste).

Topic 6. Motor system.

6.1. Microscopic organitzation and innervation of skeletal muscles.

6.2. Muscular contraction.

6.3. Descending pathways.

6.4. Physiological basis of movement and posture.

Topic 7. Vegetative nervous system.

7.1. General organitzatión and features of the vegetative nervous system.

7.2. General functions of the vegetative nervous system.

7.3. Central control of the vegetative nervous system.

PRACTICAL SESSIONS

P1 to P3 - Neuroanatomy

P5 to P6 - Neurohistology

SEMINARS

S1, S2 - Seminars of neurohistology

S3 a S6 - Seminars of neuroanatomy

S7 - Seminar of neurophysiology

Methodology

To achieve the previously described aims and competencies, the following activities will be programmed:

- **Lectures (CM)**

- To complete group of students

- **Seminars (Sem)**

- To facilitate participation, students will be divided into two groups. Mandatory. Changes of group forbidden.

- **Práctical sessions in laboratory (PL)**

- Students will be divided into groups. Mandatory. Changes of group forbidden.

- **Virtual Complementary Activities (Av)**

- These will be done through Campus virtual UdL (Sakai) and the plataform for self-evaluation 'innovacampus'.

Evaluation

The final rate will be the sum of evaluation of different parts:

- Lectures: 69%.Theoretical concepts will be evaluated in two exams:
- First exam: Cell and Molecular Biology of Nervous System (23%) and Neuroanatomy (23%)
- Second exam: Neurophysiology (23%)

(Please pay attention to the calendar to check the official dates of these two exams)

The final rate will the sum of the three parts evaluated (23% Cell&Molecular Neurobiology+23% Neuroanatomy+23% Neurophysiology=69%), but it is mandatory to obtain at least 50% in each part in order to pass.

In case of fail in one or more parts, there is the possibility to do another evaluation of the involved part(s) in July.

- Seminars i Activities of Campus Virtual: 15%. Continuous evaluation.
- Practical (Lab) Sessions: 16%: 8% neurohistology lab (continuous evaluation) and 8% neuroanatomy lab (the latter will be evaluated through a exam on images).

If the Covid19 pandemia-related exceptional situation continues, the partial and final exams might be done online, using the tools of campus virtual.

Bibliography

Neuroanatomy:

Neuroscience, 6th Edition – Purves and colleagues
Fundamental Neuroscience, 4th Edition – Squire and colleagues
The Mind's Machine: Foundations of Brain and Behavior, 2nd Edition - Watson and Breedlove
Neurobiology: A functional approach - Striedter
Oxford Handbook of Developmental Behavioral Neuroscience – Blumberg and colleagues
Neuroanatomy through clinical cases, 2nd Edition – Blumefeld

Other:

The Human Brain. An introduction to its functional anatomy. John Nolte. Mosby

Neuroanatomy. John H. Martin. Elsevier

Principios de Neurociencia. Haines. Elsevier

The human Central Nervous System. Nieuwenhuys. Voogd. Van Huijzen. Springer

Neuroanatomía. Puelles López, Martínez Pérez, Martínez de la Torre

Système Nerveux Encéphalo-Périphérique. André Leblanc. Springer

Neuroanatomy: An atlas of structures, sections, and systems. Haines

Atlas fotográfico de Anatomia Humana. Rohen-Yokochi. Doyma.

A colour atlas of the brain and spinal cord. M.A. England. J. Wakely. Wolfe Publishing Ltd.

Atlas de Neuroanatomía. Frank H. Netter. Novartis

Neurophysiology:

Fisiología. Matthew N. Levy, Bruce A. Stanton, Bruce M. Koeppen.

Fisiología celular del nervio y el músculo. Matthews, Gary G.

Fisiología médica. Ganong, William F.

Medical neurosciences : an approach to anatomy, pathology, and physiology by systems and levels. Barbara F. Westmoreland.

Cellular and Molecular Biology:

Neurobiology. Shepherd, Gordon M.

The neuron: cell and molecular biology. Levitan, Irwin B.

Neuroscience. Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, James O. McNamara, and Leonard E. White.

Neurociencia. La exploración del cerebro. Mark F. Bear, Barry W. Connors, Michael A. Paradiso.

Principios de neurociencia. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell.

Principios de neurociencia. Aplicaciones básicas y clínicas. Duane E. Haines.