

MASTER'S DEGREE IN SCIENCE CLINICAL AND EXPERIMENTAL NERVOUS  
SYSTEM  
2015-16

Joint Masters from the University Rovira i Virgili (URV) (Catalunya, Spain) and the University of Almería (UAL) (Andalucía, Spain).

Official master's degree recognized by the Ministry of Education of Spain.

Specialties (three possible training offers):

- Specialist in Research in Neurotoxicology and Neuropsychopharmacology
- Specialist in Invasive Neuromusculoskeletal Physiotherapy
- Specialist in Neurorehabilitation

Before accessing any of the three specialties you must complete a series of compulsory subjects common to all of them.

Core curriculum:

1. Research design and data analysis (6 ECTS credits). Introduction to the scientific method and experimental and clinical design.
2. Neurobiology and Neurophysiology (6 ECTS credits). Discloses the mechanisms and phenomena occurring during the establishment, consolidation, remodeling and function of synaptic connections that are the basis for the organization of both the central and peripheral nervous system. Introduces basic concepts of injury, neuroinflammation and repair. It also provides an overview of recent advances in the analysis of functional activity and its relationship to the behavior of the organism. Completely virtual.
3. Neuroanatomy (6 ECTS credits). Discloses the different structures and neural systems involved in the functions of the nervous system. It offers a vision of neuroimaging techniques for morphological and functional study of the nervous system. Completely virtual.

4. Master Thesis (20 ECTS credits). Is fully but not necessarily face in our laboratories. It can be done in a laboratory or an hospital depending on students professional interest and contacts.

### **1) Specialist in Research in Neurotoxicology and Neuropsychopharmacology:**

Virtual Specialty (distance learning) although some subjects have a classroom component and therefore must consult with each responsible teacher before enrolling. In other presentiality is optional and is not required to overcome the subjects' condition but to opt for higher notes. These itineraries are shared between UAL and URV universities.

1. Bases of Neurotoxicology (5 ECTS credits). This course gives basic knowledge in toxicology (Toxicokinetics and biotransformation) and presents the nervous system as a target for environmental toxicants, its structural and functional vulnerability as well as major neuroactive agents.
1. Psychopharmacology: Bases and Research. (4 ECTS credits). This course gives basic knowledge in psychopharmacology. Check the main groups of psychoactive drugs and drugs of abuse to understand the neuroadaptive changes resulting from their exposures.
2. Obesity and Addiction: Common neurochemical systems. (3 ECTS credits) Neuroimaging studies show that there are alterations in the dopaminergic pathway regulating sensitivity to reinforcement and are also involved in developing addictions to drugs of abuse in obesity. Neuropeptides that regulate energy balance through the hypothalamus also regulate dopaminergic activity which means that there is an overlap of neuropeptides that regulate systems addiction and obesity. Excessive consumption of food could be a mechanism by which the circuits and neuropeptides involved in the reinforcement altered seen as occurs with excessive consumption of drugs of abuse and the development of addictions.
3. Epigenetics and Psychopathology. (3 ECTS credits). For decades we know that psychiatric disorders are developed based on the interaction between genes and environment. Therefore, the aetiology addressing the principles of epigenetics, and so understand how the

epigenome contributes to the development of different biological endophenotypes underlying psychiatric disorder.

4. Experimental models of vulnerability to neuropsychiatric disorders (4 ECTS credits). This course aims that students are aware that the effect of neuroactive substances is different depending on the phenotypic and genotypic vulnerable subjects. It also presents the main animal models for the study of psychopathology and cognitive functions.
5. Epidemiology and Public Health. (4 ECTS credits). Its basic objective is for the student to interpret studies in epidemiology applied to neurotoxicology and drug addiction.
6. Functional assessment of the nervous system. (5 ECTS credits). Main components of routine, behavioural and cognitive neurological assessment. Main tools for neuropsychological assessment in both adults and children. Quarterly.
7. Experimental models in vitro and neurochemical techniques. (4 ECTS credits). Training in cell culture, general knowledge and culture of cells of the nervous tissue, for application to the study of Neurotoxicology.
8. Handling of animals (8 ECTS credits). Training in handling and animal studies. To train future researchers and users of experimental animals (Official accreditation)
9. Animal Models: cognitive processes and psychopathology (4 ECTS credits). Description and study of the most common models for the study of animal cognition. Animal models developed for the pharmacological and neurobiological analysis of the most common psychopathologies will also be explored.
10. Neuroendocrinology and Neuroimmunology (4 ECTS credits). The aim of this course is the study of multidirectional communication of the nervous, endocrine and immune systems. Basic, functional and applied interactions between these systems, their messengers and their involvement in the regulation of physiological and pathological processes characteristics were studied. This will be addressed from a neuroscientific perspective.

If you agree there are 2 voluntary face to face: a week in Almeria (January) and another in Reus (June). It's seminars by experts from around the world.

## **2) Specialist in Invasive Neuromusculoskeletal Physiotherapy:**

1. Diagnosis and treatment (conservative and invasive) myofascial pain syndrome. (9 ECTS credits). It is a theoretical and practical course. This is to give the knowledge and ability to identify taut bands and trigger points in all muscles, award the pain of a patient to the presence of trigger points in the corresponding muscles and treat muscles with trigger points both conservatively as invasive.
2. Neuroanatomy of pain. (4 ECTS credits). Training on the physiology of pain deeper into the anatomical structures involved.
3. Stock ultrasound. (4 ECTS credits). Evaluation of myofascial trigger points by imaging techniques. Invasive treatment image guidance.
4. Dry Needling in pelvic floor. (4 ECTS credits). This course can only take graduates or graduates in physiotherapy. This is to give the knowledge and ability to identify taut bands and trigger points in the muscles of the pelvic diaphragm. It is a theoretical and practical course.
5. Dry Needling in situations of spasticity. (4 ECTS credits). This is to give basic knowledge about the pathophysiological origin of spasticity, explore and provide the ability to treat trigger points noninvasively. It is a theoretical and practical course.
6. Dry Needling in the area of the temporomandibular joint. (4 ECTS credits). This is to give basic knowledge about the pathophysiological origin of pathologies derived from the temporomandibular joint and structures involved. And the ability to explore and treat trigger points noninvasively involved. It is a theoretical and practical course.

## **3) Specialist in Neurorehabilitation:**

1. Motor disorders: evaluation and rehabilitation. (5 ECTS credits). Introduction to the motor system. Peripheral and central motor disorders. Engine evaluation problem. Rehabilitation of motor dysfunction. Technical aids.

2. Sensory disorders: evaluation and rehabilitation. (5 ECTS credits).  
Introduction to sensory systems. Peripheral and central sensory disturbances. Evaluation of sensory problem. Rehabilitation of sensory dysfunction. Technical aids.
3. Cognitive impairment: assessment and rehabilitation. (5 ECTS credits). The ultimate goal of this course is to bring students to the knowledge of the effects of nerve function on behaviour. They will be announced in the technical evaluation and diagnosis in human neuropsychology, both theoretical and practical level, associated with major neuropsychological disorders arising from acquired brain injury in both child and adult population. Likewise, the neuropsychological rehabilitation will be addressed by providing a range of therapeutic tools that target both the recovery of such functions as the functional adaptation of the individual to its environment, analysing what the most effective neuropsychological techniques are and proposing guidelines for therapeutic actions aimed at each case.
4. Gait analysis. (3 ECTS credits). The course aims first to explain how it is acquired gait (from the fetal position to standing and walking), and its evolution from acquisition to the adult, and the characteristics and phases of which consists in the absence of pathologies (stance phase, take-off, swing ...). Characteristics of major neurological diseases (based paradigm cerebral palsy in different expressions, although other syndromes such as muscular dystrophies and other myopathies are highlighted) and secondary alterations in march and they are an expression of neuro-orthopaedic disorders. The description of normal and pathological launch will be supported with video images. Finally a description of the current means of assessing progress will be made, from direct visual examination until new technologies.
5. Robotics applied to rehabilitation. (6 ECTS credits). In the course proposed is to show students the current status of robots in general and particularly to the field of neurorehabilitation application. We will study both robot manipulators as mobile robots, specifying the cognitive robots and robots used for rehabilitation / motor assistance. The way in which the human and the robot can get feedback between them will be analysed, through bioelectric signals and force feedback.

And finally the fundamental elements of these robots will be studied and practices on these will be done in order to demystify to students the concept of robot, stressing the need for teamwork between engineers and scientists for practical implementation.

6. New technologies applied to the evaluation and rehabilitation motor. (4 ECTS credits). The Virtual Reality, Simulation, and Video are proving to be great alternatives or complements to clinical practice in neurorehabilitation. In this course students are introduced in this new technological aspect, from its purely recreational its application to the evaluation and rehabilitation of motor dysfunction conception. Moreover biological and technological bases of functional stimulation techniques and their use in the rehabilitation of motor function are exhibited.
7. New technologies applied to sensory evaluation and rehabilitation. (4 ECTS credits). New technologies are becoming a major ally of rehabilitation. Since the use of implants to the application of Virtual Reality or Video. In this course the theoretical basis of such applications will be established and the various efforts being made to apply to the assessment of sensory function and subsequent rehabilitation will be considered.
8. New technologies applied to the assessment and cognitive rehabilitation. (4 ECTS credits). The progress experienced in the field of information technology and communications have enabled the use of new tools in neuropsychological assessment and rehabilitation. Through this course the scientific evidence in assessing cognitive and neurological rehabilitation will be addressed, referring to the latest contributions from researchers worldwide on the application of new technologies to the design of assessment tests and rehabilitation programs, as well the aspects that have shown real effectiveness in clinical practice both among children and adults.
9. Neuroimaging applied to the assessment and evaluation of rehabilitation. (3 ECTS credits). Fundamentals of neuroimaging techniques. Applications in motor, sensory and cognitive assessment. Applications neurorehabilitation.

10. Development and Plasticity of the Nervous System (4 ECTS credits).

This course aims to provide a description of the main genetic and epigenetic processes that regulate the formation of a Nervous System. The most important cellular and molecular events in the process of prenatal and postnatal neurodevelopmental level will be described. Special emphasis will be placed on postnatal maturation and restructuring of the nervous system, as neurobiological basis of child plasticity. Finally the mechanisms involved in the plasticity of the system will be described.