

Course guide 240311 - 240NR011 - Anatomy And Physiopathology

Unit in charge: Teaching unit:	Barcelona School of Industrial Engineering 1022 - UAB - (ANG) pendent.
Degree:	MASTER'S DEGREE IN NEUROENGINEERING AND REHABILITATION (Syllabus 2020). (Compulsory subject).
Academic year: 2023	ECTS Credits: 4.5 Languages: Spanish, English
	AAVIER WAVARRO ACEBES
Others:	GUILLERMO GARCÍA ALÍAS JOAQUIM HERNANDEZ MARTIN MIREIA HERRANDO GRABULOSA

PRIOR SKILLS

Basic knowledge and competences in Biology and Physiology.

REQUIREMENTS

No official prerequisites are defined for this subject. However, it is recommended that the student has acquired basic knowledge and competences in Biology and Physiology.

TEACHING METHODOLOGY

• Theory classes with systematic explanations of the subject topics, giving relevance to the most important concepts.

• The student will acquire the basic scientific knowledge of the subject, which will be complemented by self-study of the themes of the subject program.

• Practical sessions for the observation and performance of procedures for electrophysiological techniques and their biomedical application.

LEARNING OBJECTIVES OF THE SUBJECT

• To learn the basic structure and function of the body systems, with particular focus on the nervous system.

• To integrate the physiology knowledge with concepts learned in other subjects that deal with the analysis and application of physiological parameters.

• To train the student to apply the physiological knowledge in deducting the consequences of injuries and diseases.



CONTENTS

General concepts of Neurobiology

Description:

Electrical phenomena in neurons. Action potentials. Synaptic transmission

Specific objectives:

Acquire the basic knowledge about the electrical and transmission mechanisms of the nervous system.

Related activities: Theoretical classes 5h Self-study 9h

Full-or-part-time: 14h Theory classes: 5h Self study : 9h

Physiology of the muscle

Description:

Skeletal muscle structure and function Cardiac muscle structure and function Smooth muscle structure and function

Specific objectives:

Acquire the basic knowledge about the structure and the contraction of the different types of muscles.

Related activities: Theoretical classes 3h Self-study 6h

Full-or-part-time: 9h Theory classes: 3h Self study : 6h

Segmentary control of motion and posture

Description:

Spinal cord and motoneurons Spinal motor reflexes Gamma motor system Central pattern generator and locomotion

Specific objectives:

Acquire the basic knowledge about the structure and the function of the motor units. Learn the function of the spinal motor circuits and the spinal control mechanisms.

Related activities: Theoretical classes 3h Self-study 6h

Full-or-part-time: 9h Theory classes: 3h Self study : 6h



Suprasegmentary control of motion and posture

Description:

Organization of the central motor pathways Motor brain cortex Brainstem motor functions Cerebellum and basal ganglia

Specific objectives:

Acquire the basic knowledge about the structure and the function of the neural systems of motor control. Learn the function and circuitry of the different central systems involved in motor control.

Related activities: Theoretical classes 4h Self-study 7h

Full-or-part-time: 11h Theory classes: 4h Self study : 7h

Somatosensory system

Description:

Introduction to the sensory system Tactile sensations: Pathways and functions Proprioception: Pathways and functions Thermal sensations: Pathways and functions Pain: Pathways and functions

Specific objectives:

Acquire the basic knowledge about the structure and the function of the neural systems for the somatic sensations. Learn the physiology and circuitry of the sensory systema for touch, proprioception, temperature and pain sensations.

Related activities: Theoretical classes 3h Self-study 6h

Full-or-part-time: 9h Theory classes: 3h Self study : 6h



Special sensory systems

Description:

Auditory sensibility Vestibular sensibility Visual sensibility Gustative and olfactory sensibility

Specific objectives:

Acquire the basic knowledge about the structure and the function of the neural systems for vision, audition, position sense, taste and olfaction. Learn the physiology and circuitry of the sensory systems for the special senses.

Related activities: Theoretical classes 5h Self-study 10h

Full-or-part-time: 15h Theory classes: 5h Self study : 10h

Body functional systems

Description:

Cardiovascular system Respiratory system Urinary system Digestive system

Specific objectives:

Acquire the basic knowledge about the structure and the function of the main body functional systems. Learn the structure and physiology of the cardiovascular, respiratory, digestive and excretory systems.

Related activities: Theoretical classes 8h Self-study 14h

Full-or-part-time: 22h Theory classes: 8h Self study : 14h



Autonomic nervous system

Description:

Structure of the ANS Peripheral autonomic pathways Autonomic reflex responses Central control of visceral functions

Specific objectives:

Acquire the basic knowledge about the structure and the function of the autonomic nervous system. Understand the coordinated visceral responses to physiological changes.

Related activities: Theoretical classes 3h

Self-study 7h

Full-or-part-time: 10h Theory classes: 3h Self study : 7h

Electrophysiological signals and tests

Description:

Basis of the electrophysiological signals Electroencephalography. Sleep and awakeness Lab practice: EMG Lab practice: EEG Lab practice: ECG

Specific objectives:

Acquire the basic knowledge about the most relevant electrophysiological tests evaluating the nervous system. Learn the procedures to perform EEG, EMG and ECG. Understand the use of electrophysiologic signals in bioengineering applications.

Related activities:

Theoretical classes 2h Laboratory practice – 4h Self-study -- 6h

Full-or-part-time: 12h Theory classes: 2h Laboratory classes: 4h Self study : 6h

GRADING SYSTEM

Final examination will consist in:

- Multiple-choice questions to evaluate the theoretical concepts of the subject, representing 70% of the overall grade.
- Short written questions from practical concepts and applicability, representing 30% of the overall grade.

A recovery examination will be offered under the same conditions to students who had not passed the final exam.

EXAMINATION RULES.

- Multiple-choice questions to evaluate the theoretical concepts of the subject. Presential exam.

- Short written questions from practical concepts and applicability. Online questionnaires.



BIBLIOGRAPHY

Basic:

- Koeppen, Bruce M. [et al.]. Berne & Levy physiology. 8th ed. Philadelphia: Elsevier, 2024. ISBN 9780323847902.
- Purves D. [et al.]. Neuroscience. 7th ed. New York: OUP, 2024. ISBN 9780197572511.
- Luo L. Principles of Neurobiology. 2nd ed. Boca Raton: CRC Press, 2021. ISBN 9780815346050.

RESOURCES

Audiovisual material:

- ELECTROCARDIOGRAM (ECG) PRACTICE. ElectroCardioGram (ECG) learning video
- ELECTROENCEPHALOGRAM (EEG) PRACTICE. ElectroEncephaloGram (EEG) learning video
- ELECTROMYOGRAPHY (EMG) PRACTICE. ElectroMyoGraphy (EMG) learning video

Other resources:

Neuroscience Online. U Texas Health. <u>https://nba.uth.tmc.edu/neuroscience/s1/index.htm</u> /> Neuroanatomy Online open-access, interactive electronic laboratory for the study of neuroanatomy. <u>https://nba.uth.tmc.edu/neuroanatomy/index.html</u> />