

## 26802 - Ocular and Visual System Physiology

### Syllabus Information

**Academic Year:** 2020/21

**Subject:** 26802 - Ocular and Visual System Physiology

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 297 - Degree in Optics and Optometry

**ECTS:** 6.0

**Year:** 1

**Semester:** First semester

**Subject Type:** Basic Education

**Module:** ---

## 1.General information

### 1.1.Aims of the course

The subject of Ocular and Visual system Physiology aims for the student to learn the normal functioning of the body, deepening in the human eye and the role that each one of its structures performs. It also allows to know how the information is sent to the brain and the mechanisms of formation of image in the cerebral cortex. Knowledge of normal functioning also allows analyzing the variations that occur in concurrent situations with poor visual function.

The objectives to achieve are:

- To know and to understand the normal structure and function of the systems (nervous, blood, circulatory, digestive, respiratory, renal, endocrine and reproductive) of the human body.
- To integrate the functions of the different systems of the human body.
- To know the function of each part of the human eye, as well as, the function as a whole of it and its possible physiological alterations.
- To acquire skills in the Physiology laboratory. To resolve Physiology problems.

### 1.2.Context and importance of this course in the degree

### 1.3.Recommendations to take this course

## 2.Learning goals

### 2.1.Competences

### 2.2.Learning goals

### 2.3.Importance of learning goals

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

## 4.Methodology, learning tasks, syllabus and resources

### 4.1.Methodological overview

The subject has a basic orientation so the proposed activities focus on the understanding and assimilation of the functioning of the visual system.

For this reason, the main methodology is based on participatory lectures in large groups, as well as through the monitoring of their learning process through conventional tutorials. For a better acquisition of competences, a methodology based on solving problems and issues in smaller groups will also be used. In addition, laboratory practices will also be carried out,

aimed at the application of the theoretical knowledge learned and the acquisition of skills and abilities in the field of Physiology.

## 4.2. Learning tasks

The learning process that has been designed for this subject is based on the following:

### Training activity 1: Acquisition of theoretical knowledge of General and Ocular Physiology.

Methodology:

- Master classes in participatory mode (discussion, questions, summary, conclusions) for the whole class.
- Self-learning: visualization of videos and web pages of the subject.
- Tutorials

### Training activity 2: Problem solving and case analysis.

Methodology:

- Learning based on the solving of theoretical-practical problems, in groups of half class.
- Teamwork: debate with the problems raised moderated by the teacher. And presentation of the case summary.

### Training activity 3: Acquisition of practical knowledge, skills and abilities in Physiology.

Methodology:

- Laboratory practices in groups of 12 students that will be of practical application of the general part and of the specific part of the subject.

### Training activity 4: Directed work

Methodology:

- Directed work and oral presentation or preparation of poster or conceptual map.
- Group tutorials scheduled by the teacher in addition to those requested by the students.

## 4.3. Syllabus

### THEORETICAL PROGRAM

#### GENERAL HUMAN PHYSIOLOGY.

Topic 1. Concept of Physiology. Characteristics of living beings. Internal environment concept: Homeostasis. Control systems.

Topic 2. Cellular physiology. Transport of substances through the membrane: Diffusion simple: concept, osmosis. Facilitated diffusion: concept, types. Active transport: concept, Sodium-Potassium Pump.

Topic 3. Membrane potentials. Structure of the neuron. Nerve transmission and synapses. Types and properties of receptors. Topic 4. Muscular Physiology. Cardiac, smooth and skeletal muscle.

Topic 5. Circulatory physiology. Physical characteristics Structure of the microcirculation. Blood flow in the capillaries: vasomotility. Exchange of nutrients. Mechanisms of control of local blood flow.

Topic 6. Respiratory physiology. Transport of oxygen and carbon dioxide. Properties of the red blood cells: origin and structure. Hemoglobin. Iron. Tissue respiration. Regulation of gas transport: peripheral and central level.

Topic 7. Immunity. Leukocytes: origin and classification. Antibodies: structure. Types of immunity. Allergy and hypersensitivity. Blood groups. Transplants: HLA system.

Topic 8. Blood coagulation. Platelets: origin and structure. Mechanisms of coagulation: factors and pathways. Fibrinolysis. Anticoagulants

Topic 9: General principles of the endocrine system. Main functions of hormones. Topic 10. Nervous system. Organization of the nervous system. Neuroglia

Topic 11: Autonomic Nervous System.

Topic 12: Sensitive nervous system: receptors. Nervous motor system. Functioning of the central nervous system: medullary, subcortical and cortical. Physiology of pain.

#### PHYSIOLOGY OF THE VISUAL SYSTEM.

Topic 13. The eye. Generalities Types of exploratory devices. Ocular external examination. Semiology: general concepts.

Topic 14. Eyelids. Morphofunctional structure. Eyelid movement. Central control of the movement of the eyelids. Introduction to palpebral pathology.

Topic 15. Conjunctiva. Morphofunctional bases. Function of the conjunctiva in eye movements. Exploration. Conjunctival inflammation

Topic 16. Lacrimal apparatus. Composition and function of the tear film. Regulation of secretion. Lacrimal drainage mechanism.

Topic 17. Sclera. Morphofunctional characteristics. Hydration of the sclera. Permeability of the sclera.

Item 18: Cornea. Structure and composition Physiology of epithelium and corneal stroma. Nutrition and corneal metabolism.

Transparency. Mechanisms of corneal repair. Effects of contact lenses.

Topic 19. Aqueous humor. Training and composition. Drainage mechanisms. Intraocular pressure. Factors that regulate the formation and secretion. Glaucoma.

Topic 20. Iris and Pupil. Functions Clinical importance of the pupil. Photomotor reflex.

Topic 21. Crystalline. Differentiation of the lens cells. Cellular biochemistry Cellular metabolism. Transparency and refraction. Accommodation. Presbyopia.

Item 22. Vitreous body. Biochemical and biophysical aspects of its composition. Physiological functions Aging.

Topic 23. Eye circulation. Irrigation of the eye: retinal vessels and uveal or ciliary vessels. Function of the choroid. Measurement of ocular blood flow. Control of circulation.

Topic 24. Retina. Histological and functional organization. Photoreceptors: rods and cones. Retinal pigmentary epithelium. Biochemical mechanisms and visual cycle. Response to the light of retinal neurons.

Topic 25. Optic nerve. Axons, oligodendrocytes, Schwann cells, astrocytes. Irrigation. Synaptic transmission of the ganglion cells of the retina. Destination of axons of the optic nerve. Axonal injury Regeneration of the optic nerve.

Topic 26. Central neurophysiology of vision. Geniculate-cortical pathway. Primary visual cortex. Extrastriate cortical visual areas. Extrageniculated path. Binocular vision Color vision Neuropsychology

## **PRACTICAL PROGRAM**

P1-Seminar: Research in Ocular and Visual System Physiology

P2-Computer: Simulation Formation of aqueous humor. Mechanisms of transport and ocular permeability.

P3-Computer: Simulation Nervous Impulse and Cardiovascular Physiology.

P4-Seminar: Problem Based Learning (PBL)- Neuromuscular junction

P5-Seminar: PBL-Endocrine

P6-Seminar: PBL- Superior coordination of movement.

P7-Computer: Escape Room-Oculomotor movements

P8-Laboratory: Neurosensory exploration of the head and face.

P9- Seminar: PBL-Cornea and Crystalline.

P10-Laboratory: Corneal, pupillary, convergence and optokinetic reflex. Saccadic movements.

P11-Laboratory: Vestibular nystagmus. Oculovestibular and oculocephalic reflex.

P12-Laboratory: Physiology of cones and rods. Binocular vision.

P13-Seminar: PBL-Visual perception.

P14-Laboratory: Preparation of evaluation report of the visual system in physiological conditions. Objective structured clinical examination (OSCE).

## **4.4.Course planning and calendar**

Check on the website of the School of Sciences (<https://ciencias.unizar.es>) or on subject website in the Digital Teaching Ring at the following address <https://add2.unizar.es>

## **4.5.Bibliography and recommended resources**

- BB** Adler, Francis H.. Adler fisiología del ojo : aplicación clínica / editado por Paul L. Kaufman, Albert Alm . - 10ª ed. Ma cop. 2004
- BB** Guirao Piñera, Antonio. Óptica visual / Antonio Guirao Piñera . 1ª ed. Murcia : DM, 2004
- BB** Guyton, Arthur C.. Tratado de fisiología médica / Arthur G. Guyton, John E. Hall . - 11ª ed., [1ª reimp.] Madrid [etc.] :
- BB** Lang, Gerhard K.. Oftalmología : texto y atlas en color / Gerhard K. Lang ; con la colaboración de Oskar Gareis ... [e Barcelona [etc.]: Masson, 2006