

**COURSE DATA****Data Subject**

<b>Code</b>	34325
<b>Name</b>	Physiology
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1208 - Degree in Podiatry	Faculty of Nursing and Chiropody	1	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1208 - Degree in Podiatry	3 - Physiology	Basic Training

**Coordination**

<b>Name</b>	<b>Department</b>
VALLES MARTI, LILIAN SORAYA	190 - Physiology

**SUMMARY**

Human Physiology is a basic discipline in Healthy Sciences Academic Degree. Contents of this discipline include the study of mechanism to maintain the normal body function. It is important to understand pathology and podiatry treatment.

**PREVIOUS KNOWLEDGE****Relationship to other subjects of the same degree**

There are no specified enrollment restrictions with other subjects of the curriculum.



### Other requirements

Modalidad de bachillerato de Ciencias de la Salud, en las cuales el alumno cursa contenidos de Biología, Física y Química.

## COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

### 1208 - Degree in Podiatry

- Know the embryological development in the different stages of formation. Human anatomy and physiology. Study of the different organs, apparatuses and systems. Vascular and nerve elements of the viscera. Body planes and axes. Specific anatomy of the lower limb.
- Know the bases of biophysics, physiology and biochemistry related to the human body. Immediate principles. Biochemistry and biophysics of membranes, muscles and nerves. Acquire knowledge of the functions and regulation of the different organs and systems of the human body.
- Acquire skills to work in a team as a unit in which experts and other professionals in the field of podiatric prevention, diagnosis and treatment are structured in a single- or multi-disciplinary and inter-disciplinary manner.

## LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

**English version is not available**

## DESCRIPTION OF CONTENTS

### 1. Introducción a la Fisiología

T 1. Introduction to the study of physiology. Internal environment. What is physiology? Physiology in the Degree of Podiatry. Internal environment. Homeostasis and general mechanisms

### 2. Fisiología de la Sangre ( TEMA 2-3-4-5-6 )..

T 2. Properties of blood. Introduction: General functions of blood. Blood components and quantification thereof: cellular and plasma chemical elements. Hematopoiesis.

T 3. Physiology of the erythrocyte. Red blood cells, morphology and composition. Erythrocyte functions. Erythropoiesis. Regulation and importance of vitamin B12. Hemocateresis. Iron metabolism. Blood groups.

T 4. Leukocytes. Innate Immunity Leukocytes: types and functions. General properties of leukocytes. Concept of innate immunity. Humoral innate immunity: complement system. Cellular innate immunity: inflammation and phagocytosis.

T 5. Adaptive immunity. Concept and apteno antigen. Concept of adaptive immunity. Adaptive humoral



immunity: B lymphocytes and antibody production. Adaptive cellular immunity: T lymphocytes and cytokines. Primary and secondary immune response.

T 6. Haemostasis, coagulation and fibrinolysis. Concept and mechanisms of hemostasis. Platelets. Functions and thrombocytopoiesis. Phases of hemostasis. Mechanism of coagulation and

### 3.

UNIT 14. Regulation of arterial pressure. In the short term: nervous mechanisms: reflexes \* baroreceptor, \* chemoreceptor and low pressure receptors. In the medium term: hormonal mechanisms: vasoconstrictor and vasodilator systems. Long-term: renal mechanisms: function of the wrist-angiotensin system. Antidiuretic hormone function.

UNIT 15. Circulation in special areas. Pulmonary circulation. Hemodynamic characteristics of pulmonary flow. Regulation. Coronary circulation. Coronary blood flow and regulation. Brain circulation. Cerebral blood flow and regulation. Cutaneous circulation. Cutaneous blood flow and regulation. Circulation in skeletal muscle. Blood flow and regulation.

### 4. Fisiología del Aparato Respiratorio ( Tema 16-17 -18-19 ..

T 16. Respiratory. Ventilatory mechanics. General functions of the respiratory system. Inspiration and expiration. Pressures in different areas of the respiratory tree during ventilatory movements. Ventilatory work. Gravity on pulmonary ventilation. Volume and lung capacity. Relationship: ventilation / perfusion. Gas exchange in tissues.

T 17. Exchange of gases. Introduction. Gas exchange in the lungs. Respiratory membrane. Partial pressure and pressure gradient. Factors affecting PO<sub>2</sub> and PCO<sub>2</sub> in the alveoli. Diffusion coefficient of gases.

T 18 .Transport gas. Oxygen transport by the blood. Saturation curve of hemoglobin. Bohr effect. Transport of CO<sub>2</sub> in the blood. CO<sub>2</sub> dissociation curve of blood. Haldane effect.

T 19. Regulation of ventilation. Importance of regulation of ventilation. Nervous regulation. Respiratory center. Respiratory reflexes. Humoral regulation. Chemosensitive bulbar area. Chemoreceptors sensitive to oxygen partial pressure

### 5. Fisiología renal( TEMA 20-21-22-23-24)..

T 20. Introduction to the renal system. Glomerular filtration and renal hemodynamics. Glomerular filtration. Structure and permeability of the glomerular membrane. Composition of the glomerular filtration rate. Dynamics of glomerular filtration. Factors affecting the intensity of glomerular filtration. Self-regulation of filtration.

T 21. Tubular functions. Basic mechanisms of absorption, secretion and excretion. Active transport processes: Maximum tubular transport. Passive diffusion processes. Mechanisms of reabsorption in the



proximal convoluted tubule, loop of Henle, distal convoluted tubule and collecting duct.

T 22. Adjusting the volume and osmolarity of body fluids. Urine. Regulation of sodium excretion. Regulation of potassium excretion. Regulation of water excretion. Hyperosmolarity the medullary interstitial fluid. Role of aldosterone and antidiuretic hormone. Mechanisms of concentration and dilution of urine. Diuresis.

T 23. Physiology of the urinary tract. General on renal function. Morphofunctional organization of the kidney. The nephron as functional unit of the kidney. The kidney as a key organ in the regulation of the constancy of the internal environment. No sewage kidney functions. Mechanisms and importance. Organization renal blood flow.

T 24. Acid-base balance. Introduction: hydrogen ion concentration as a parameter to maintain constant internal environment. PHs in the extracellular fluid. Acidosis and alkalosis. Role of buffer systems. Adjustments respiratory acid-base balance. Renal adjustments to maintain acid-base balance. Renal correction of acidosis and alkalosis.

## **6. Fisiología del Aparato Digestivo( TEMA 25-26-27-28)**

T 25. General Functions of the digestive system. Division and functions of the digestive aparato. Features of the gastrointestinal wall. Gastrointestinal nervous system. Nervous control. Gastrointestinal reflexes. Energy and structural: food requirements. Hunger, appetite and satiety. Regulation of food intake.

T 26. engines digestive processes. General functions of the digestive system. Food energy and structural requirements. Chewing: Functions and control. Swallowing: Functions and control. Gastric motility: Functions and regulation. Small bowel motility: segmentation and peristalsis. Functions and regulation. Motility of the colon: Mass movements. Regulation. Defecation reflex.

T 27. secreting digestive processes. Salivary secretion and esophageal. Regulation. Gastric secretions: hydrochloric acid. Regulation of gastric secretion. Secretions of the pancreas enzymes, bicarbonate ion and trypsin inhibitor. Regulation of pancreatic secretion. Biliary secretion and regulation. Secretions of the small and large intestine.

T 28. Digestion and absorption of nutrients. Food digestion in the small intestine. Digestion of carbohydrates. Digestion of fats. Protein digestion. Absorption in the small intestine. Absorption of electrolytes and water. Absorption of carbohydrates and proteins. Lipid absorption. Vitamin

## **7. Fisiología del Sistema Endocrino 1( TEMA 29-30-31-32-33-34 )**

T 29. Physiology of the endocrine system. Autocrine, paracrine and endocrine system. Concept and types of hormones. Endocrine glands. Synthesis, storage and hormone secretion: regulation. Hormone receptors and mechanism of action.

T 30. hypothalamic-pituitary axis. Adenohypophysis. Hypothalamic pituitary structure. Functions of growth hormone. Effects on metabolism. Regulation of growth hormone secretion. Role of thyroid stimulating hormone, adrenocorticotrophic and gonadotropic hormones. Prolactin functions.

TOPIC 31. neurohypophysis and pineal gland. Neurohypophyseal hormones. Nature, synthesis,





transport, storage and discharge. Antidiuretic hormone functions. Regulation of secretion. Oxytocin functions. Regulation of secretion. Pineal hormone: Melatonin and functions.

T32. Thyroid. Gland structure. Iodine metabolism. Thyroid secretions: thyroxine, triiodothyronine and calcitonin. Regulation of secretion. Mechanism of action of thyroid hormones. Physiological functions of thyroid hormones.

T 33. phosphocalcic Homeostasis. Calcium and phosphorus metabolism. Absorption of calcium and phosphate. Bone physiology. Mechanism of bone mineralization. Bone remodeling. Parathyroid hormone. Functions and regulation. Vitamin D. Functions and regulation. Calcitonin. Functions and regulation.

T34. endocrine pancreas. Secretions of Langerhans islets. Insulin: synthesis, storage, secretion and mechanism of action. Functions of insulin. Glucagon: synthesis, storage, secretion and mechanism of action. Glucagon functions. Regulation of insulin secretion and glucagon blood sugar. Somatostatin.

## **8. Fisiología del Sistema Endocrino 2 (TEMA -35-36-37)..**

T 35. adrenal glands. Adrenal cortex. Synthesis, secretion and action mechanism mineralocorticoid, glucocorticoid, and androgen. Aldosterone. Cortisol. Adrenal medulla. Sympathetic regulation of the secretion of catecholamines. Synthesis, storage, secretion and mechanism of action of catecholamines. Physiological effects.

T 36. Male reproductive system. Male sex organs. Steroidogenesis and espermatogénesis. Androgens: testosterone synthesis, secretion, mechanism of action and functions. Regulation of secretion.

T 37. Female reproductive system. Female sexual organs. Secretion of ovarian hormones: estrogen and progestin, synthesis secretion, mechanism of action and functions. Regulation of secretion. Ovarian cycle. Endometrial cycle.

## **9. Fisiología del Sistema Nervioso ( TEMA 38-39-40-41-42-43-44)..**

T 38. Physiology of the Nervous System and its organization. Structure and organization of the central nervous system. The blood brain barrier. The autonomous and peripheral nervous system. Cranial and spinal nerves.

TOPIC 39. Sensory physiology. Sensory receptors. The sensitivity as a starting point for the activities of the nervous system. Types of sensitivity. Sensory modalities. Coding of sensory information. Transmission of signals sensitive nerve fibers. Study of sensory receptor. Receptor types. Classification criteria.

T 40. Somatic and nociceptive sensitivity. Concept. Classification. Mechanical sensitivity of the skin. Mechanoreception. Proprioception. Termocepción. Nociception. Pain and its usefulness. Types of pain. Features of painful sensations. Nociceptors. Endogenous analgesic system. Transmission of somatic sensory information. Processing somatic sensory information by the central nervous system.



T 41. Physiology hearing. Vestibular system. Sense of hearing. Functions of the middle and inner outer ear. Cochlear dynamic. Mechano-electrical transduction. Auditory pathways. Sense of balance. Vestibular apparatus: semicircular canals, utricle and saccule. Mechano-electrical transduction. Vestibular pathways.

T 42. Physiology of smell, taste and sight. Introduction to the chemical senses. Physiology of Taste. Main terms of taste. Roads and gustatory nerve centers. Physiology of smell. Structure of the olfactory mucosa and olfactory sensory neurons. Olfactory pathways and nerve centers.

T 43. visual system. Imaging. The dioptric apparatus of the eye. Dimensioning and presbyopia. Physiology of the retina. Rods and cones. Phototransduction. Visual pathways.

#### TOPIC

T 44. Motor system. Spinal cord. Muscle tone. Muscle tone concept. Motor unit. Alpha motor neuron. Neuromuscular use. Mechanism of muscle tone. Spinal reflexes and types.

### **10. Fisiología del Sistema Nervioso ( 2)( TEMA 45-46-47-48-49)**

T45. Motor system. Cerebellar and basal ganglia. Control of posture and balance. Cerebellar function. Afferent and efferent pathways. Function of basal ganglia in the control of movement. Motor control tone. Cortical motor areas.

T46. autonomic nervous system. Introduction. Vegetative neurotransmitters. Receptors. Effector organs response to activation of the autonomic nervous system. Adrenal medulla. Autonomic reflexes. Control of the autonomic nervous system for higher nerve centers. Central regulation of visceral functions.

T 47. Sleep and wakefulness. Introduction: The brain activation and processes related to it. Reticular activating system. The dream. Electroencephalogram. Importance of the grid system in learning and memory.

T 48. Limbic System. Instinctive behavior, emotions and motivation. Limbic system structure and connections. Control eating behavior, thirst and sexual behavior. Control of motivation and emotions. Centers punishment reaction of fear, anxiety and anger.

T 49. Cognitive functions. Learning. Concept. Neural structures related to learning. Memory. Concept. Neural structures involved in memory. Biochemical processes related to memory. Language. Morphological and functional aspects of the structures in relation to communication.

### **11. Practices and seminars**

Tutored groups will be formed (U) to do group work on topics related to physiology and of practical interest in podiatry. These will be done online. The topics have to be chosen from a list proposed by the teacher, or suggested by the students, if they meet the objectives of the course.

The seminars can also be organized as reinforcement sessions of the lesson plan.

There will also be sessions with a more participative component of the students and with test type tests for each group of parts of the subject.



## WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	50,00	100
Classroom practices	6,00	100
Laboratory practices	2,00	100
Tutorials	2,00	100
Study and independent work	90,00	0
<b>TOTAL</b>	<b>150,00</b>	

## TEACHING METHODOLOGY

- The contents of the theoretical classes will be worked on through a master class, participatory classes with questions and answers and review sessions at the end of a thematic block.
- The students will carry out group work that will be supervised by the teacher and that they will present in class.
- In the tutorial classes, the knowledge learned in the theory will be reinforced.

## EVALUATION

A multiple-choice test of the content of the theoretical and practical lessons will be taken, which will account for 90% of the mark. The remaining 10% will correspond to the seminars and the use of the tutored groups. There will also be a continuous evolution after each thematic group.

## REFERENCES

### Basic

- 1. Gunnong, WF. Fisiología Médica. McGraw Hill
- 2. Guyton, AC y Hall, JE. (2008). Tratado de Fisiología. Madrid: Elsevier Saunders.
- 3. Costanzo, LS. Fisiología. Texto y Atlas de Fisiología. Madrid: Elsevier Saunders.
- 4. Stuart Ira Fox. (2004). Fisiología. Madrid: Mc Graw-Hill Interamericana.

## ADDENDUM COVID-19



**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

## **6. CONTENTS**

All contents are given without changes.

## **7. WORKING VOLUME and PLANNING OF THE TEACHING**

The load and volume of work is maintained as well as the time distribution of the classes. Classes continue to be held according to the organization of the corresponding OCA: Mondays, Wednesdays and Fridays from 11 a.m. to 1 p.m.

## **8. TEACHING METHODOLOGY AND LEARNING**

Classes are conducted live through the virtual classroom's Blackboard application. The students access from the link indicated in the virtual classroom of the subject. To deliver and defend the practices made before the class these will be previously sent by e-mail to the teacher and will be enabled in the virtual classroom. During the time of class the students will access to this content via virtual classroom in order to see and listen to the corresponding file. Once this has been done, the correction will be made live just as the class is done.

As for the tutorials for the Physiology work, these are maintained on demand by the students and will be carried out with the relevant working groups live via the virtual classroom and the Blackboard application, following the same mechanism as the classes.

## **9. EVALUATION**

A multiple-choice test of the content of the theoretical and practical lessons will be taken, which will account for 90% of the mark. The remaining 10% will correspond to the seminar and the use of the tutored groups.

You will be uploaded to the virtual classroom on the day of the exam and will have a limited time available. The duration of the exam will be 55 minutes. Access to the test will be opened at a specific time for all students equally. The result of the test will be added to the seminar score in no case higher than one.

If a person does not have the means to establish this connection and access the virtual classroom, he/she will have to contact the teacher responsible for his/her group by e-mail at the time of publication of this attachment in the teaching guide to establish the best way of evaluating each particular case.

## **10. REFERENCES (Bibliographic and documentary resources).**

The recommended bibliography will be:





- Gannong, WF. Medical Physiology. Mc Graw Hill.
- Guyton, AC., Hall, JE. Treatise on Medical Physiology
- Constanzo LS. Physiology. Text and Atlas of Physiology. Elsevier Saunders.
- Stuart Ira Fox. Human Physiology. MC Graw Hil