COURSE DATA

DATA SUBJECT

Code: 34325
Name: Physiology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1208 - Degree in Podiatry	Facultat d'Infermeria i Podologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1208 - Degree in Podiatry	Physiology	BASIC

COORDINATION

VALLES MARTI LILIAN SORAYA

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

Health Sciences track in high school, in which the student takes courses in Biology, Physics, and Chemistry. General Physiology, Biochemistry, and Medical Physiology I are first-year subjects.

COMPETENCES / LEARNING OUTCOMES

1208 - Degree in Podiatry

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.

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.

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.

DESCRIPTION OF CONTENTS

1. Introduction to Physiology (Topic 1)

TOPIC 1. Introduction to the study of Physiology. Internal Environment. What is Physiology? Physiology in the Podiatry Degree curriculum. Internal Environment. Homeostasis and its general mechanisms.

2. Blood Physiology (Topics 2¿3¿4¿5¿6)

TOPIC 2. Properties of blood. Introduction: General functions of blood. Blood components and their quantification: cellular elements and plasma chemistry. Hematopoiesis.

TOPIC 3. Erythrocyte physiology. Red blood cells: morphology and composition. Functions of erythrocytes. Erythropoiesis. Regulation and importance of vitamin B12. Hemocateresis. Iron metabolism. Blood groups.

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

TOPIC 5. Adaptive immunity. Concepts of antigen and hapten. Adaptive immunity: Humoral (B lymphocytes and antibody production) and Cellular (T lymphocytes and cytokines). Primary and secondary immune response.

TOPIC 6. Hemostasis, coagulation, and fibrinolysis. Concept and mechanisms of hemostasis. Platelets: functions and thrombocytopoiesis. Phases of hemostasis. Mechanism of coagulation and fibrinolysis.

3. Physiology of the Circulatory System (A) (Topics 7¿13)

TOPIC 7. Functions of the cardiovascular system. General organization. Systemic and pulmonary circulation. Venous system. General functions.

TOPIC 8. Electrical activity of the heart. Electrocardiogram. Heart's conduction system. Transmission of cardiac impulses. Recording cardiac electrical activity: the normal ECG.

TOPIC 9. Cardiac mechanics. The heart as a pump. Cardiac cycle and its phases. Function of heart valves. Heart sounds. Temporal relationship of pressure, volume, and ECG recordings. Auscultation and phonocardiogram.

TOPIC 10. Cardiac output and regulation. Concepts of stroke volume and cardiac output. Preload and afterload. Cardiac work. Regulation of cardiac function. Frank-Starling law. Nervous and humoral control.

TOPIC 11. Hemodynamics. Arterial and venous circulation. Relationship between blood flow, pressure, and vascular resistance. General scheme of circulation and its functions. Structure-function relationship in blood vessels. Arterial and venous circulation. Blood pressure.

TOPIC 12. Microcirculation. Capillary exchange. Arteriolar and capillary circulation. Substance exchange across capillaries. Capillary transport mechanisms. Lymphatic circulation. Structure and function of lymphatic capillaries. Lymph formation and composition. Lymph flow. Edema.

TOPIC 13. Blood flow regulation. Local regulation: autoregulation, metabolic regulation, active and reactive hyperemia. Nervous regulation: vasomotor center. Reflexes. Humoral regulation: vasoconstrictor and vasodilator agents.

4. Physiology of the Circulatory System (B) (Topics 14¿15)

TOPIC 14. Blood pressure regulation. Short-term: nervous mechanisms (baroreceptor, chemoreceptor, and low-pressure reflexes). Medium-term: hormonal mechanisms (vasoconstrictor and vasodilator systems). Long-term: renal mechanisms (renin-angiotensin system, antidiuretic hormone).

TOPIC 15. Circulation in special areas. Pulmonary circulation: hemodynamic characteristics and regulation. Coronary circulation: blood flow and regulation. Cerebral circulation. Cutaneous circulation. Skeletal muscle circulation: flow and regulation.

5. Physiology of the Respiratory System (Topics 16¿19)

TOPIC 16. Respiratory system. Ventilatory mechanics. General functions. Inspiration and expiration. Pressure changes along the respiratory tract. Ventilatory work. Gravity's effect on pulmonary ventilation.

Lung volumes and capacities. Ventilation/perfusion ratio. Gas exchange in tissues.

TOPIC 17. Gas exchange. Introduction. Pulmonary gas exchange. Respiratory membrane. Partial pressures and pressure gradients. Factors affecting alveolar PO¿ and PCO¿. Gas diffusion coefficients.

TOPIC 18. Gas transport. Oxygen transport in blood. Hemoglobin saturation curve. Bohr effect. Carbon dioxide transport. CO¿ dissociation curve. Haldane effect.

TOPIC 19. Ventilation regulation. Importance of ventilation control. Nervous regulation: respiratory centers and reflexes. Humoral regulation: medullary chemosensitive area. Chemoreceptors sensitive to PO¿.

6. Renal Physiology (Topics 20¿24)

TOPIC 20. Introduction to the renal system. Glomerular filtration and renal hemodynamics. Filtration dynamics. Structure and permeability of the glomerular membrane. Glomerular filtrate composition. Factors affecting filtration rate. Autoregulation.

TOPIC 21. Tubular functions. Basic mechanisms of reabsorption, secretion, and excretion. Active and passive transport. Tubular transport maximum. Reabsorption mechanisms in different tubule segments.

TOPIC 22. Regulation of fluid volume and osmolarity. Urine. Sodium, potassium, and water excretion regulation. Medullary interstitial hyperosmolarity. Roles of aldosterone and ADH. Urine concentration and dilution mechanisms. Diuresis.

TOPIC 23. Physiology of urinary pathways. Overview of kidney function. Morphofunctional organization. The nephron. Kidney as a regulator of the internal environment. Non-excretory kidney functions. Renal blood flow organization.

TOPIC 24. Acid-base balance. Importance of maintaining hydrogen ion concentration. Extracellular pH values. Acidosis and alkalosis. Buffer systems. Respiratory and renal adjustments to maintain acid-base balance.

7. Digestive System Physiology (Topics 25¿28)

TOPIC 25. General digestive functions. Structure and function of the GI tract. GI wall features. Enteric nervous system. Neural control. GI reflexes. Nutritional needs: energy and structural. Hunger, appetite, satiety. Ingestion regulation.

TOPIC 26. Motor processes of the GI tract. Chewing: functions and control. Swallowing. Gastric motility. Small intestine motility: segmentation and peristalsis. Colon motility: mass movements and defecation reflex.

TOPIC 27. Secretory processes. Salivary and esophageal secretion. Gastric secretion: HCl. Pancreatic secretions: enzymes, bicarbonate, trypsin inhibitor. Bile secretion. Intestinal secretions.

TOPIC 28. Digestion and nutrient absorption. Small intestine digestion of carbohydrates, fats, and proteins. Absorption of water, electrolytes, carbs, proteins, fats, vitamins.

8. Endocrine System Physiology I (Topics 29¿34)

TOPIC 29. Endocrine system physiology. Autocrine, paracrine, and endocrine systems. Hormone types. Endocrine glands. Hormone synthesis, storage, secretion, regulation. Receptors and mechanisms of action.

TOPIC 30. Hypothalamic-pituitary axis. Anterior pituitary: structure and functions (GH, TSH, ACTH, gonadotropins, prolactin). Regulation of hormone secretion.

TOPIC 31. Posterior pituitary and pineal gland. Hormones (ADH and oxytocin): synthesis, transport, secretion, regulation. Pineal hormones: melatonin and its functions.

TOPIC 32. Thyroid gland. Structure. Iodine metabolism. Thyroid secretions: thyroxine, triiodothyronine, calcitonin. Regulation, mechanisms, and functions.

TOPIC 33. Phosphocalcic homeostasis. Calcium and phosphate metabolism. Bone physiology. Mineralization and remodeling. Parathyroid hormone, vitamin D, and calcitonin: functions and regulation.

TOPIC 34. Endocrine pancreas. Islet of Langerhans secretions. Insulin and glucagon: synthesis, storage, secretion, mechanisms, functions. Regulation by blood glucose. Somatostatin.

9. Endocrine System Physiology II (Topics 35¿37)

TOPIC 35. Adrenal glands. Adrenal cortex: mineralocorticoids, glucocorticoids, androgens (aldosterone, cortisol). Adrenal medulla: catecholamines (synthesis, storage, secretion, action, physiological effects).

TOPIC 36. Male reproductive system. Organs. Steroidogenesis and spermatogenesis. Testosterone: synthesis, secretion, mechanisms, regulation, and functions.

TOPIC 37. Female reproductive system. Organs. Ovarian hormones: estrogens and progestogens. Secretion, mechanisms, regulation. Ovarian and endometrial cycles.

10. Nervous System Physiology I (Topics 38¿44)

TOPIC 38. Nervous system physiology and organization. CNS structure. Blood-brain barrier. Autonomic and

peripheral nervous systems. Cranial and spinal nerves.

TOPIC 39. Sensory physiology. Sensory receptors. Types of sensation. Sensory modalities. Sensory information coding. Transmission. Receptor study and classification.

TOPIC 40. Somatic and nociceptive sensation. Mechanical skin sensitivity, proprioception, thermoreception, nociception. Pain types and functions. Endogenous analgesic system. CNS processing of sensory input.

TOPIC 41. Auditory physiology. Vestibular system. Ear functions. Cochlear dynamics. Auditory pathways. Balance sense. Semicircular canals, utricle, and saccule. Vestibular pathways.

TOPIC 42. Smell, taste, and vision physiology. Taste: modalities, pathways, centers. Smell: olfactory mucosa structure, neurons, pathways, centers.

TOPIC 43. Visual system. Image formation. Eye optics. Accommodation and presbyopia. Retinal physiology. Cones and rods. Phototransduction. Visual pathways.

TOPIC 44. Motor system. Spinal cord. Muscle tone. Motor units. Alpha motor neuron. Neuromuscular junction. Motor control mechanisms.

11. Nervous System Physiology II (Topics 45¿49)

TOPIC 45. Motor system. Cerebellum and basal ganglia. Posture and balance control. Cerebellar functions and pathways. Basal ganglia role in movement and tone regulation. Cortical motor areas.

TOPIC 46. Autonomic nervous system. Autonomic neurotransmitters and receptors. Effector organ responses. Adrenal medulla. Autonomic reflexes. Higher CNS centers in autonomic regulation.

TOPIC 47. Sleep and wakefulness. Brain activation processes. Reticular activating system. Sleep and EEG. Role in learning and memory.

TOPIC 48. Limbic system. Instinctive behavior, emotions, motivation. Structure and connections. Control of food, thirst, sexual behavior. Motivation and emotion centers. Fear, anxiety, anger.

TOPIC 49. Cognitive functions. Learning and memory: definitions, structures, biochemistry. Language and communication structures.

12. Practicals and Seminars

1. **Group projects** will be conducted on topics related to physiology and of practical interest in podiatry. Topics are selected from a professor-suggested list or proposed by students (if aligned with course goals). Work will be presented to the class.

2. **Seminars** may serve as reinforcement sessions and include active student participation and group quizzes.

3. **Practical sessions** will be held in class and lab as needed.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	50,00
Laboratory	2,00
Classroom practices	6,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	90,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

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 exam covering both theoretical and practical content (including theory questions and questions based on completed practicals) will account for up to 90% of the final grade (for every four incorrect answers, one correct answer will be deducted).

The remaining 10% will correspond to seminar participation and engagement in tutored group work. There will also be continuous assessment after each thematic group.

Students who fail the first exam session will not be required to redo the practical work.

The second exam session will also be multiple-choice, including theory and practical questions (maximum grade: 9).

The score from the multiple-choice test will be combined with the seminar and tutored group participation grade (maximum of 1 point).

The minimum passing grade recorded will be a 5.

REFERENCES

- 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: Elsewier Saunders. 4. Stuart Ira Fox. (2004). Fisiología. Madrid: Mc Graw-Hill Interamericana.