

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
MEDICINE AND PHARMACOLOGY	PHYSIOLOGY	2st	1st	6 ECTS	Obligatory
LECTURER(S)			Tutoring Contact Information (Postal address, telephone no, e-mail address)		
<ul style="list-style-type: none"> • José Luis Quiles Morales • Alfonso Varela López • María Dolores Yago Torregrosa 			Dpto. Fisiología 1ª planta, Facultad de Farmacia. Campus de Cartuja. (Tfno. 958243879) jlquiles@ugr.es , alvarela@ugr.es , mdyago@ugr.es		
			TUTORING AND MEETINGS HOURS <ul style="list-style-type: none"> • José Luis Quiles Morales: First semester: Mon 08.30-14.30. Second semester: Mon 9.30-10.30 and 12.30-14.30. Fri 9.30-10.30 and 12.30-14.30 • Alfonso Varela López: Tue 13.00-14.00 • María Dolores Yago Torregrosa: Tue 9.30-11.30, Wed 10.30-12.30 and Thu 9.30-11.30 		
PREREQUISITES and/or RECOMMENDATIONS (if necessary)					
Prerequisites: those necessary to access to the degree, related with the level of formation that the student must acquire to accede to the University. Recommendations: to have previous basic knowledge (background knowledge of Chemistry, Anatomy and Histology, Biochemistry, Metabolism. A good standard of English and informatics skills are also required.					
BRIEF ACCOUNT OF THE SUBJECT PROGRAMME					
The programme has a high degree of coherence and integration and covers a diverse range of topics, while reflecting particular strengths within the biological and life sciences and there is a clear coherence between the different modules. Physiology is the study of the normal functions of cells, organs and systems of the human organism, the mechanisms by which they are achieved and the regulation of functional activities to maintain the homeostasis, therefore the programme has been divided into thematic units just for didactic purposes, but during the course we will integrate all the body systems emphasizing on their associations to maintain homeostasis. Particular issues to be considered include: body liquid compartments, the cardiovascular system, the respiratory system, the renal system, acid-base regulation, physiology and function of the reproductive system, physiology of the muscle fibres, motor control physiology, temperature regulation, integumentary system, and the general adaptation syndrome.					



GENERAL AND PARTICULAR ABILITIES

KEY GENERAL SKILLS

CG1 Recognizing the essential elements of the profession of a Dietitian-Nutritionist, including ethical principles, legal responsibilities and exercise of the profession, applying the principle of social justice to professional practice and developing it with respect for people, their habits, beliefs and cultures

CG2 develop the profession with respect for other health professionals, acquiring skills for teamwork

CG3 recognize the need to maintain and update professional skills, paying particular attention to learning autonomously and continuously, new knowledge, products and techniques in nutrition and food, as well as the motivation for quality

CG4 Knowing the limits of the profession and its competences, identifying when interdisciplinary treatment or referral to another professionals as required

CG5 Reach to communicate effectively, both orally and in writing with people, health professionals or industry and the media, knowing how to use the information and communications technology especially those related to nutrition and habits of life

KEY SPECIFIC SKILLS

EC1 Knowing the chemical, biochemical and biological basis of application in human nutrition and dietetics.

CE2 knowing the structure and function of the human body from the molecular level to the whole organism, at the different stages of life.

CE7 Acquiring teamwork skills, when the teamwork is structured form uni or multidisciplinary and interdisciplinary professionals and other staff related to the dietetic or nutritional diagnostic evaluation and treatment

CE32 Understanding the pathophysiology of diseases related to nutrition.

CE33 Identifying patients dietary and nutritional problems as well as risk factors and inadequate practices.

CE34 Developing and interpreting a dietary history in healthy and diseased subjects. Interpreting a medical history. Understanding and using the terminology used in health sciences.

CE35 Interpreting and integrating clinical, biochemical and pharmacological data on the nutritional assessment of the patient and their dietary and nutritional treatment.

CE37 Planning, implementing and evaluating therapeutic diets for individuals and / or groups.

CE41 planning and carrying out programs of dietary and nutritional education in healthy subjects and patients.

CE43 handling basic ICT tools used in the field of Food, Nutrition and Dietetics.

CE45 prescribing the specific treatment, corresponding to the purview of the dietitian.

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

The objectives are directed so that the student, future professional of nutrition, acquires knowledge about the functioning of the human organism. The objectives are:

-To understand the physiological processes, analyzing their biological meaning, its description, regulation and integration to the different levels of organization: cellular, organs, systems and organism, in state of health.

-To establish the bases to understand the modifications of the physiological processes as form of adjustment to a changeable environment.



DETAILED SUBJECT TOPICS

Subject 1. Body Fluids. The blood (1,5 hrs)

- ▶ Describe the compartments that distributes water from the body
- ▶ Give an overview of the components of blood
- ▶ Give an estimate of volume percentages and formed elements
- ▶ Describe the formed elements of the blood and their functions
- ▶ Describe the functions of the blood
- ▶ Understand what the hematocrit value and its clinical utility
- ▶ Describe the main plasma components and their functions
- ▶ Describe the different types of plasma proteins and their functions

Subject 2. Physiology of the erythrocyte and leukocyte (1,5hrs)

- ▶ Describe erythropoiesis and its regulation
- ▶ Explain the production and degradation of hemoglobin
- ▶ Describe the role of iron and its main metabolic aspects
- ▶ Know the current theories of the stem cells
- ▶ Explain how to determine the ABO blood groups and Rh factor
- ▶ Describe leukopoiesis
- ▶ List the functions of neutrophils, eosinophils and basophils

Subject 3. Platelet physiology and hemostasis (1,5hrs)

- ▶ Explain the formation of the platelet clot
- ▶ Describe the mechanisms that contribute to hemostasis
- ▶ Identify the stages of blood coagulation and explain the various factors that stimulate and inhibit it.
- ▶ List the hemostatic regulatory mechanisms

Subject 4. Functional Anatomy of the Heart. Myocardial properties. Electrocardiogram. (2hrs LM + 0.5S)

- ▶ Describe the function of the heart chambers and valves
- ▶ Explain the functional characteristics of the myocardium.
- ▶ List the properties of the myocardium.
- ▶ Explain the functional characteristics of the cardiac conduction system.
- ▶ Explain the significance of the electrocardiogram (ECG) and its diagnostic significance.

Subject 5. Cardiac cycle. Cardiac output and factors affecting it. (2hrs LM)

- ▶ Explain the temporal sequence of contraction-relaxation in the cardiac cycle.
- ▶ Explain and relate the pressure changes that occur in the cardiac chambers with valves dynamics and blood movements during the cardiac cycle.
- ▶ Explain the origin and components that produce heart sounds.
- ▶ Define cardiac output and describe the factors that affect it: stroke volume and heart rate.
- ▶ List the factors controlling stroke volume and heart rate.

Subject 6. Arterial and venous circulation. (1hr LM + 0.5S)

- ▶ Describe and differentiate the function of arteries and veins.
- ▶ Schematize the general circulation.
- ▶ Explain the factors that regulate the rate and blood flow.
- ▶ Define the concepts of systolic, diastolic, and mean differential blood pressure.
- ▶ Describe the mechanisms that are implemented in the short, medium and long-term blood pressure control.
- ▶ Explain the main determinants of the venous circulation.

Subject 7. Capillary circulation and lymphatic circulation. (1hr LM)



- ▶ Differentiate the function of arterioles, capillaries and venules.
- ▶ Describe the organization of the microcirculatory unit.
- ▶ Analyze the pressures associated with the movement of fluids and substances between capillaries and interstitial spaces.
- ▶ Describe the circulation of the lymphatic vessels.
- ▶ Describe the formation and flow of lymph.
- ▶ Understand the functions of lymph.

Subject 8. Cardiovascular regulation. (2hrs LM)

- ▶ Explain the heart self regulation.
- ▶ Explain the role of baro and chemoreceptors in the control of the cardiovascular activity.
- ▶ Know the functioning of the nerve centers in the cardiocirculatory activity control.

Subject 9. - Morphofunctional structure of the respiratory system. Mechanical ventilation. (1hr LM + 1S)

- ▶ Describe the function of the respiratory tract.
- ▶ Describe the processes causing inspiration and expiration.
- ▶ Explain what is meant by surface tension and the role of the alveolar surfactant.
- ▶ Describe and differentiate anatomic dead space and physiologic dead space.
- ▶ Define and quantify lung volumes and capacities.
- ▶ Describe the unique characteristics of the pulmonary circulation.

Subject 10. - Exchange and transport of respiratory gases. (1.5hrs LM + 0.5S)

- ▶ Know the partial pressures of oxygen and carbon dioxide in the atmosphere, alveoli, blood and tissues, and based on that describe the diffusion of gases.
- ▶ Describe the different ways in which oxygen and carbon dioxide are transported in the blood.
- ▶ Explain the role of hemoglobin in the transport of CO₂.

Subject 11. - Regulation of respiration. (1.5hrs LM)

- ▶ Describe the areas of the central nervous system and the mechanisms involved in the nervous control of respiration.
- ▶ Explain peripheral mechanisms that contribute to the maintenance of normal breathing patterns.
- ▶ Describe the role of central and peripheral chemoreceptors on breathing control.

Subject 12. - Morphological-functional structure of the excretory system. The nephron. (1hr LM + 0.5S)

- ▶ Make a list of kidney functions.
- ▶ Describe the functional anatomy of the nephron.
- ▶ Know the structure and function of the juxtaglomerular apparatus.

Subject 13. - Mechanisms of urine formation. (2hrs LM)

- ▶ Define glomerular filtration explaining the mechanisms that produce it.
- ▶ Explain the basic mechanisms of tubular reabsorption and secretion.
- ▶ Explain the countercurrent mechanism.
- ▶ Explain the mechanisms and factors involved in the concentration and dilution of urine.
- ▶ Explain the concept of urine clearance and usefulness.
- ▶ Explain the mechanisms and stages that occur in urination.

Subject 14. Regulation of renal function. (1hr LM)

- ▶ Know the self and endocrine regulation of the glomerular filtration.
- ▶ Describe the role of the renin-aldosterone-angiotensine system in the reabsorption and secretion of electrolytes.
- ▶ Understand the role of antidiuretic hormone on water reabsorption in the renal tubules.

Subject 15. Regulation of the acid-base balance. (1hr LM + 0.5S)

- ▶ Relate hydrogen ion secretion by the kidney in the maintenance of the acid-base balance.
- ▶ Explain the importance of buffer systems for the acid-base balance.
- ▶ Define the concepts of acidosis and alkalosis.
- ▶ Describe the importance of the respiratory system in the regulation of the acid-base balance.



Subject 16. Functions and hormonal regulation of the male reproductive system

- ▶ Know the physiology of male sexual organs
- ▶ Describe the stages of spermatogenesis and functions of Sertoli's cells in this process
- ▶ Function of seminal vesicles and prostate gland
- ▶ Describe the hypothalamic-hypophysary-testicular control of testosterone secretion
- ▶ Puberty and regulation of its beginning

Subject 17. Female physiology before pregnancy and female hormones

- ▶ Know the physiology of the female sexual organs
- ▶ Describe the different stages of ovarian and menstrual cycles
- ▶ Explain hormonal interactions involved in the control of ovulation
- ▶ Describe the biological actions of testosterone, estrogen and progesterone
- ▶ Describe the hypothalamic-hypophysary-ovarian control the secretion of estrogen and progesterone
- ▶ Compare the various types of methods of birth control and its effectiveness

Subject 18. Physiology of fecundation, pregnancy, childbirth and lactation

- ▶ Describe the structure and functions of the placenta
- ▶ Know what hormones the placenta secretes and describe their actions
- ▶ Describe the evolution of the plasma levels of estrogen, progesterone and chorionic gonadotropin throughout gestation
- ▶ List the functional changes in the endocrine glands of women during pregnancy
- ▶ Explain the hormonal mechanisms triggering birth
- ▶ Describe the interactions of various hormones in the initiation and maintenance of breastfeeding

Subject 19. Control of motor activity I. Motor function in the spinal cord and brainstem

- ▶ Describe the function of the neural structures responsible for movement
- ▶ Explain the spinal circuits and motor control
- ▶ Describe topographic relations: neural-skeletal muscle
- ▶ Explain the importance and function of alpha and gamma motor neuron
- ▶ Describe the following spinal reflexes: the stretch reflex and the flexor reflex
- ▶ Describe the function of the brainstem motor: vestibular nucleus and reticular formation in the maintenance of balance and posture

Subject 20. - Control of motor activity II. Motor function in the cerebellum, basal ganglia and cortex

- ▶ List the motor areas of the cerebral cortex and its relative contribution to the organization of the motor act
- ▶ Report the differences between the pyramidal and extrapyramidal motor systems
- ▶ Explain the role of the cerebellum in voluntary movements
- ▶ Describe the afferent and efferent projections of the cerebellum
- ▶ Explain the role of the basal ganglia
- ▶ Describe the afferent and efferent projections of the basal ganglia
- ▶ Make a diagram integrating the functions of the various structures involved in the regulation and control of the motor act

Subject 21. - Higher functions of the nervous system

- ▶ Explain the cellular basis of sleep-wake rhythms and their possible functions
- ▶ Explain the cellular basis of learning and memory

Subject 22. Thermoregulation

- ▶ Remember homeothermy concepts and poikilothermia
- ▶ Study the importance of maintaining body temperature
- ▶ Studying the role of the hypothalamus in regulation system of the body temperature
- ▶ Consider what happens in situations of abnormal body temperature regulation

Subject 23. Integumentary system. Physiology of the skin and related structures

- ▶ Functionally describe the various layers of the epidermis and dermis and their component cells



- ▶ Describe the various functions of the skin
- ▶ Compare the structure and functions of the skin adnexal structures
- ▶ know the role in regulating skin perspiration

Subject 24. - General adaptation syndrome

- ▶ Explain aferences that mediate the endocrine response to stress
- ▶ To study the activation of the autonomic nervous system and the adrenal medulla
- ▶ Understand the response of the various systems of the body in relation to adaptation to stress

LABORATORY PRACTICE PROGRAM

Practice 1. - Microscopic study of cell components of the blood (functional description)

Practice 2. - Cardiovascular Physiology (simulated). Electrocardiogram

Practice 3. - Measurement of arterial blood pressure in humans and its computer simulation.

Practice 4. - Mechanisms of the respiratory system (simulated). Measurement of lung volumes and capacities: spirometry.

Practice 5. – The acid-base balance

Theoretical-practical exam

Each academic year four practices will be selected for its inclusion in the educational organization.

SYSTEM FOR ASSESSING THE ACQUISITION OF THE COMPETENCES AND KNOWLEDGE/EVALUATION CRITERIA

I. Continuous Assessment

This is the default system. Continuous Assessment includes several theory exams which will take place on dates scheduled by the Faculty in coordination with the other subjects offered in the term. Prior to the exam, the lecturer will describe the structure and type of exam questions. Coursework performed by the students (essays, presentations, seminars...) as well as regular attendance and class participation will be also assessed.

The final mark will be calculated according to the following:

Theory: 70%

Laboratory practice: 10%

Coursework (presentations, seminars, etc.): 10%

Attendance to theoretical classes: 10%

A minimum mark of 5 (out of 10) in both the theory and laboratory practice sections must be obtained in order to pass the subject.

II. Single Final Assessment

According to the Students Assessment and Qualification Policy of the University of Granada (adopted by the Governing Council on May 20, 2013), those students who cannot follow the continuous assessment system due to working, health or disability issues (or any other reason appropriately justified) can apply for a Single Final Assessment. For this purpose, the student will submit a formal request to the Director (Head) of the Department, arguing and proving (with documented evidence) the reason for not being able to follow the continuous system. The submission deadline will be 2 weeks after the beginning of the lectures. In extraordinary circumstances, the starting date for counting the 2-week period will be the enrolment date (policy NCG78/9) and,



in this case, the student will have to include the proof of enrolment date when making the request. After ten days without the student receiving a written reply from the Director of the Department, it will be understood that the request has been dismissed. In case of denial, the student may file, within one month, an appeal to the Rector, who may delegate this task to the Dean or Director of the Centre, exhausting the administrative proceedings.

For students in the Single Final Assessment system, the final mark will be calculated according to the following:

Theory: 90%

Laboratory practice: 10%

A minimum mark of 5 (out of 10) in both the theory and laboratory practice sections must be obtained in order to pass the subject.

BIBLIOGRAPHY

GENERAL

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RHOADES, R. and TANNER, G.A. Fisiología Médica. Barcelona: Ed. Masson, 2003.

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TRESGUERRES, J.A.F. y otros, Fisiología Humana. 4ª edición. Madrid: Ed. Interamericana-McGraw-Hill, 2010.

Diccionarios y atlas médicos:

Diccionario médico. Editorial Marban, 2005.

Diccionario médico de bolsillo. Editorial Marban, 2005.

NETTER, F. H. Atlas de Anatomía Humana, 5ª edición. Ed. Elsevier , 2011

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SPECIFIC REFERENCES:

CURSOS "CRASH" de MOSBY. Distintos autores. "Lo esencial en": Aparato digestivo (2004)/ Sistema cardiovascular (2004)/ Aparato respiratorio 2ªed.(2004)/ Sistema nervioso y sentidos especiales 2ªed.(2004)/ Sistema endocrino y aparato reproductor 2ªed(2004)/ Sistema músculo esquelético (1999)/ Metabolismo y nutrición (1998). Harcourt Brace. Madrid

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JOURNALS

News in Physiological Sciences

Physiological Review

Current Advances in Physiology

Annual Review of Physiology

PRACTICAL HANDBOOKS

Backer, J. The laboratory rat. Academic Press. Nueva York, 1980.

Donelli, A. Laboratory manual for anatomy and physiology. Harper Collins Academic. Londres, 1990.

Fernández, G.N. Manual de laboratorio de Fisiología. 2ª ed. McGraw-Hill Interamericana. Madrid, 1998.

The International Union of Physiological Sciences. Commission on teaching Physiology. A source book of practical experiments in physiology requiring minimal equipment. World Scientific, 1991.

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Stabler T, Peterson G, Smith L, Gibson MC y Zanetti N. PhysioEx 6.0 para fisiología humana. Simulaciones de laboratorio de fisiología. Pearson. Addison Wesley, 2006.

RECCOMENDED INTERNET LINKS

<http://medicapanamericana.com/fisiologia>

http://neurofisiio.hn.org/wikihtml/Sistema_Nervioso.html

<http://pb010.anes.ucla.edu/> Fisiología de la célula nerviosa

<http://muscle.ucsd.edu/musintro/Jump.shtml> Fisiología del Músculo esquelético

<http://arbl.cymbbs.colostate.edu/hbooks/pathphys> Conceptos de Endocrinología

<http://www.tiroides.net>

Sociedades científicas con webs educativas y webs generalistas

<http://www.the-aps.org/> The American Physiological Society

<http://physoc.org/> The Physiological Society

<http://www.seccff.org/> Sociedad Española de Ciencias Fisiológicas

<http://www.feps.org/> Federación Europea de Sociedades de Fisiología



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