

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

Code	33148
Name	Human physiology
Cycle	Grade
ECTS Credits	7.5
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	3	Second term

Subject-matter

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	11 - Integración fisiológica y fisiopatológica	Obligatory

Coordination

Name	Department
GARCERA ZAMORANO, MARIA DOLORES	23 - Functional Biology and Physical Anthropology
RAMO ROMERO, JOSE JUAN DEL	23 - Functional Biology and Physical Anthropology

SUMMARY

The subject "HUMAN PHYSIOLOGY" is part of the art "Physiological and pathophysiological integration" in the degree of Biochemistry and Biomedical Sciences of the University of Valencia and it is located in the third year. It consists of 7.5 ECTS credits (187.5 hours of student work), which include face-to-face and remote activities. This is a subject of synthesis, in which the students should understand the functional relationships between the different parts of the human being as well as coordination actions that occur between them, and which are necessary for its operation as a whole.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

In previous years, the students will have acquired the basic skills needed to meet the objectives of the course. Subjects such as "Physics", "Chemistry", "Cell Organization" and "Intracellular dynamics and signaling" as well as others that are taught in the first quarter of the course, as "Functional histology" and "Metabolism and regulation" are fundamental in the acquisition of basic background knowledge, crucial to understand the functioning of human body.

OUTCOMES

1101 - Degree in Biochemistry and Biomedical Sciences

- Conocimiento de la organización estructural y funcional de los tejidos y órganos animales.
- Comprender el funcionamiento del animal como un todo integrado reforzando el papel de los sistemas de coordinación e integración.

LEARNING OUTCOMES

- Obtain an integrated vision of human functioning, to understand the meaning of the acquired knowledge, interrelating them and implement them.
- Capacity for data analysis, choice of the appropriate method, evaluation and critical interpretation of experimental results in its various forms of expression (tables, graphs...)
- Having skill in the handling of laboratory animals.
- Ability to build a written text understandable and organized.
- Capacity for speaking to an auditorium audience, for example the class itself, through the presentation or the speech in a debate on an issue or controversial issue.
- Ability to argue from rational criteria, clearly differentiating what is opinion of what facts or accepted scientific evidence.
- Professional training. Acquisition of scientific and technical knowledge related to the physiology that will make it possible to exercise professions and civic responsibilities in a continuous increase in technological society.



DESCRIPTION OF CONTENTS

1. INTRODUCTION

ITEM 1. INTRODUCTION TO PHYSIOLOGY. Physiological systems.- Functions and processes.- Homeostasis and pathophysiology.- Functional compartments of the body.- The integrative physiology as a science.

Long-distance communication: neural signals, hormones and neurohormones.- Control pathways: response and feedback loops.- Reflex control.

2. HOMEOSTASIS AND CONTROL

ITEM 2. INTRODUCTION TO THE ENDOCRINE SYSTEM. Hormones.- Classification.- Control of hormone release: hypothalamic-pituitary system.- Hormone interactions.

ITEM 3. INTRODUCTION TO THE NERVOUS SYSTEM. Organization of the nervous system.- Electrical signals in neurons.- Intercellular communication synapse.- Integration of neural information.

ITEM 4. THE CENTRAL NERVOUS SYSTEM. White matter vs. gray matter.- Cerebrospinal fluid.- The spinal cord.- Nervous function: the brain stem, the cerebellum, the diencephalon, the cerebrum.- The cerebral cortex and its functional areas: sensory and motor integration.

ITEM 5. SENSORY PHYSIOLOGY. General properties of sensory systems.- Somatic senses.- Chemoreception: Smell and taste.- Mechanoreception: hearing and equilibrium.- Photoreception: the eye and vision.

ITEM 6. SOMATIC AND AUTONOMIC CONTROL. The autonomic nervous system.- Autonomic reflexes.- Functional Anatomy: sympathetic-parasympathetic division.- Autonomic Neurotransmitters.- The somatic motor division: functional anatomy.- The neuromuscular junction.

ITEM 7. THE CONTROL OF BODY MOVEMENT. Neural reflexes.- Autonomic reflexes.- Skeletal muscle reflexes.- The integrated control of body movement.

3. INTEGRATION OF FUNCTION

ITEM 8. CARDIOVASCULAR PHYSIOLOGY. Overview of the cardiovascular system.- Functional anatomy of the heart: the cardiac action potential.- Electrical conduction in the heart: cardiac cycle.- Cardiac Output.- Nervous and endocrine control of heart activity.

ITEM 9. BLOOD PRESSURE AND BLOOD FLOW. The blood vessels.- Blood Pressure.- Resistance in the arterioles.- Exchange at the capillaries.- Lymphatic system.- Regulation of blood pressure.- Cardiovascular disease.

ITEM 10. RESPIRATORY PHYSIOLOGY. Functional anatomy of the respiratory system.- Lung volumes.- Ventilation: inspiration and expiration.- Surfactant.- Efficiency of breathing.

ITEM 11. GAS EXCHANGE AND TRANSPORT. Gas exchange in the lungs and tissues.- Transport of blood gases: oxygen and carbon dioxide.- Regulation of ventilation.- Respiratory pathophysiology.

ITEM 12. RENAL FUNCTION. Functional anatomy of the kidney.- Overview of kidney function: filtration,



reabsorption, secretion.- Micturition.

ITEM 13. FLUID AND ELECTROLYTE BALANCE. Water balance: the role of the loop of Henle.- Control of water balance.- Control of salt balance: renin-angiotensin-aldosterone system and other hormones.- Integrated control of volume and osmolarity.

ITEM 14. ACID-BASE BALANCE. Importance of homeostasis.- Buffer systems.- Control of pH by ventilation.- Kidney control of acid-base balance.

4. METABOLISM AND GROWTH

ITEM 15. REGULATION OF BODY TEMPERATURE: heat production and loss by the body. Response to high and low temperatures. Physiological and pathological reconfiguration of the hypothalamic thermostat

ITEM 16. DIGESTIVE PHYSIOLOGY. Functional anatomy of the digestive system.- Gastrointestinal motility.- Digestive secretions.- Regulation of digestive function: role of the nervous and endocrine systems.- Cephalic, gastric and intestinal phases of digestion.- Absorption.

ITEM 17. ENDOCRINE CONTROL OF GROWTH AND METABOLISM. Homeostatic control of nutrient metabolism: insulin-glucagon relationships.- Diabetes.- Adrenal glucocorticoid: functions and control of secretion.- Response to stress.- Growth hormone: functions and control of secretion.- Thyroid hormones: functions and control of secretion.- Tissues and bone growth: Hormonal control of calcium homeostasis

ITEM 19. ENDOCRINE CONTROL OF REPRODUCTION. Basic patterns of reproduction: gametogenesis.- Male reproduction: hormonal control of spermatogenesis.- Female reproduction: hormonal control of the menstrual cycle.- Sexual response in humans.- Pregnancy, parturition and lactation.

5. LABORATORY PRACTICES

Study of sensory receptors in humans.

Electromyography I (Biopac Student System).

Electromyography II (Biopac Student System).

Electrocardiography. The ECG components (Biopac Student System).

Functional study of the absorption spectrum of hemoglobin.

Study of factors influencing blood pressure in humans.

Spirometry. Analysis of lung volumes and capacities.

Effect of temperature on the oxygen consumption of aquatic animals.

Effect of temperature on Daphnia's heart rate.Osmoregulatory activity of Artemia's gills.

6. COMPUTER SIMULATION

* Computer simulation of various physiological processes related to the endocrine system (hormones and metabolism).

* Computer simulation of various physiological processes related to the muscular system. Physiology of skeletal muscle.

* Computer simulation of various physiological processes related to the circulatory system.



Cardiovascular physiology in frogs.

- * Computer simulation of various physiological processes related to the circulatory system. Cardiovascular dynamics.

- * Computer simulation of various physiological processes related to the respiratory system. Mechanisms of the respiratory system.

- * Computer simulation of various physiological processes related to the digestive system. Physical and chemical processes of digestion.

- * Computer simulation of various physiological processes related to the excretory system. Renal physiology.

This is an OPTIONAL activity

7. TUTORIALS

Three one hour sessions will be designed in which several actions are proposal to the students including resolution of practical cases after providing information on specific symptoms or problem solving.

8. SEMINARS AND OTHER ACTIVITIES

Include:

- Critical analysis of scientific papers (cross activity with other subjects of the course).
- Questionnaires "on line" through "Aula Virtual".

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	48,00	100
Laboratory practices	24,00	100
Tutorials	3,00	100
Development of group work	5,00	0
Development of individual work	6,00	0
Study and independent work	15,00	0
Preparation of evaluation activities	40,50	0
Preparing lectures	35,00	0
Preparation of practical classes and problem	7,00	0
Resolution of online questionnaires	4,00	0
TOTAL	187,50	



TEACHING METHODOLOGY

The teaching methodology of different activities (face-to-face and remote) are described here.

- **Theory classes**, with a total of 41 hours, and that they will be taught sequentially throughout the academic year, in a way that are integrated with the rest of activities proposals.

- **Practical laboratory classes**. Total hours are divided into 8 sessions of three hours each. Practical classes will be selected from the list in paragraph 5 of the contents section based on the availability of animals and materials. At each session, proposed activities are carried out by students (in pairs of two) after reading the instructions previously supplied. At the end of each session it will respond to a questionnaire that will be delivered, along with a comprehensive table of results to the teacher. This questionnaire may be delivered only at the end of the corresponding practical session.

- **Practical classes simulation**. Computer simulations based on the software PhysioEx 9.0 for human physiology (see bibliography) will be proposed. At the beginning of semester 1 hour session reserved will be used to explain the importance of simulation in physiology and show performance PhysioEx 9. The student will perform each simulation proposal and will respond to questions raised. After conducting various simulations the student must send, through virtual platform, the document with all the answers to the activities. A questionnaire was also done through virtual platform. This activity is **OPTIONAL**. Students who wish to apply with honors must necessarily carry out this activity.

- The **tutorial** sessions. There will be three throughout the year. They have an hour and they will consider students activities involving a deepening of the pathophysiological aspects of the subject, including resolution of practical cases after providing information on specific symptoms or problem solving.

- The **seminars** and other activities will include:

* *Critical analysis of scientific papers* (cross activity with other subjects of the course). They will serve to develop activities that will allow students to expand their knowledge on the subject and to relate it with other disciplines, and to promote the acquisition of skills different than those acquired in the lectures and work sessions classroom. This activity aims to training the student in the reading of scientific papers (which necessarily involves reading technical English), bringing it closer to the original literature which new insights that enable the development and advancement of biomedical sciences. This activity mandatory, will be organized jointly with the other subjects in their third year, corresponding to each subject between 3 and 6 items, depending on number of credits. The preparation, presentation and discussion (30 minutes) of the items are held in groups of 2 students and supervised by the teacher through the tutorials.

* *Questionnaires on line* through Aula Virtual. Throughout the year various questionnaires will be proposed through Aula Virtual. The qualifications that may be obtained in each one of them will be corrected by a factor depending on their degree of difficulty.

- **Exams** of the knowledge acquired in the theoretical and practical classes (laboratory and computer models).



Aula Virtual platform of the Universitat de València will be used for all the activities.

IMPORTANT: Only accept emails from the email account of the University of Valencia (alumni.uv.es). Hotmails or other mail account will be automatically deleted.

EVALUATION

The evaluation of the contents of the **theoretical program** will take place through a final exam consisting of questions in different format (concepts, test, reasoning, etc. ...). The mark obtained will up to 50% of the final qualification.

The **assessment of laboratory practice** is carried out through a practical examination in the laboratory using a test through virtual platform. The score on the exam will represent up to 25% of the final grade. Practices will also be assessed through questionnaires that students must submit after each practice session in the laboratory. These questionnaires will represent up to 5% of the final qualification.

The **tutorials** will evaluate the student's ability to relate the knowledge acquired during the lectures and their integration into the problems and/or cases arising in them. The mark obtained will up to 5% of the final qualification.

The evaluation of the **activity consisting in the critical analysis of scientific papers** will take into consideration the degree of understanding of the information contained in the articles, the correct use of terminology and the presentation skills during the oral debate with the rest of the group. If the student does not reach the minimum required score in this activity, he/she will fail the subject. If the activity is adequately accomplished (grade of no less than 5 out of 10), the mark obtained will represent 5% of the final grade in each of the subjects of the third year that participate in this activity. Also, the participation of other students in the presentation and discussion sessions may be taken into account by the teacher to modulate their final score.

Questionnaires on line appreciate the knowledge acquired by students throughout the semester. The score on them represent up to 10% of the final qualification.

OPTIONAL simulation activity will be assessed by delivering through virtual platform of a memory containing all the answers to the questionnaires proposed in the simulations and by a test through virtual platform. The mark obtained will represent up to 10% of the final grade.

To pass the course will be essential to obtain a minimum score of 50% of grade possible in the theory and practice exams and get a final score of no less than 5 out of 10.

If on one of the two exams (theory or practice), the minimum score is not reached, the another score can be saved a full academic year. If the student fails to pass the subject in the first call (May/June), the qualifications of the following items: "practices questionnaires", "tutorials", "virtual platform questionnaires" and "practical simulation" will be saved for a full academic year. If the student wants to perform them again, he/she must repeat all. These activities can only be made in the period from September to May of each academic year.



REFERENCES

Basic

- Silverthorn, D.E. (2014) Fisiología Humana. Un enfoque integrado. 6e. Editorial Medica Panamericana. Madrid
- Fox, S.I (2013). Fisiología Humana. 13a Edición. Mc Graw Hill. Madrid.
- Sherwood, L (2016) Human Physiology: From Cells to Systems, 9th Edition. Brooks/Cole Cengage Learning.
- Koeppen, BM y Stanton, B.A. (Eds) (2009). Berne y Levy Fisiologia. 6a Edición. Elsevier España, Barcelona.
- Zao, P., Stabler, T., Smith, L., Lokuta, A., Griff, E. (2012) PhysioEx 9.0. Simulaciones de laboratorio de Fisiología. Pearson Educación. S.A. Madrid.

Additional

- Ganong, W.F. (2013). Fisiología médica. 24a Edición. Mc Graw Hill. Madrid
- Guyton, A.C. (2016). Tratado de fisiología médica. 13a Edición. Elsevier.
- Hill, R.W., Wyse, G.A. y Anderson, M. (2016) Animal Physiology. 4th Edition. Sinauer Associates, Inc, Sunderland, Massachusetts
- Stanfield, C.L. (2011). Principios de Fisiología Humana. 4th Edition. Addison Wesley (Pearson). Madrid
- Widmaier, E.P., Raff, H, Strang K.T. (2014). Vanders Human Physiology. The Mechanisms of Body Function. 13th Edition. Mc Graw Hill.

ADDENDUM COVID-19

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

1. Contenidos

Se mantienen los contenidos inicialmente programados en la guía docente para las sesiones teóricas, excepto en el Tema 17, donde los apartados referidos al crecimiento se eliminan. Se pretende garantizar y priorizar el modelo de funcionamiento endocrino del control homeostático de los nutrientes (glucemia y diabetes) que se considera indispensable en la consecución de los objetivos de aprendizaje.

Se eliminan las dos últimas sesiones de prácticas debido a que no es posible encontrar una alternativa adecuada para conseguir el objetivo de aprendizaje.



La actividad del Journal Club se mantiene.

Se mantienen las clases prácticas de simulación como actividad opcional que ya eran no presenciales.

Las 3 sesiones de tutoría se mantienen con los temas previstos en la guía docente.

2. Volumen de trabajo y planificación temporal de la docencia

La guía docente preveía un total de 41 horas presenciales teóricas y 24 de prácticas de laboratorio. En el apartado teórico restaban 11 sesiones (un 27 %) en el momento del inicio de la docencia no presencial. Las 11 horas se trasladan a un trabajo guiado asíncrono basado en lecturas, videos, ejercicios y cuestionarios. La planificación temporal coincide básicamente con el cronograma previsto para la docencia presencial. Todos los materiales están disponibles a través de Aula Virtual.

En el apartado de prácticas restaban 6 horas (un 25 %). En este apartado se añade una práctica de simulación obligatoria que ayudará a alcanzar los objetivos de aprendizaje previstos en este apartado.

El volumen de trabajo del resto de actividades se mantiene (tutorías, Journal Club, prácticas de simulación...).

3. Metodología docente

Se sustituyen las clases presenciales por materiales en Aula Virtual. Estos materiales se preparan para un uso guiado y asíncrono por parte de los estudiantes. Parte de estos materiales ya estaban previstos en la guía docente. Se suministran “lecturas” elaboradas por el profesor que complementan las “fichas de tema” con información de las fuentes (ya se incluían en la guía original). A estas lecturas, se añaden videos explicativos, elaborados por el profesor, que resaltan puntos clave de cada tema. De estas lecturas y videos se proponen ejercicios y actividades. Cada tema termina con un cuestionario “on line” en Aula Virtual (ya previsto en la guía docente original).

Se podrán emplear medios como “Blackboard” (o similar) para tutorías individuales o grupales para resolver dudas o cuestiones. El correo electrónico también será una herramienta fundamental.

En las tutorías se subirán materiales a Aula Virtual, proponiendo ejercicios. Tras el periodo de realización los estudiantes dispondrán de la resolución en Aula Virtual.

La tutorización no presencial de la actividad del Journal Club se realizará mediante correo electrónico, chat o videoconferencias, según acuerde el tutor con los alumnos.

Para la presentación y defensa del trabajo, los alumnos entregarán para su evaluación una grabación de la pantalla del ordenador mientras pasan las diapositivas de la presentación y registran en audio las explicaciones y comentarios que hubieran realizado de manera presencial. A la hora establecida en el horario se creará un chat para el control de asistencia de todos los alumnos, quienes podrán formular preguntas para su contestación por los alumnos que presentan el trabajo.

4. Evaluación

Se mantiene la ponderación de la evaluación continua que ya se estaba llevando a cabo antes de la entrada en vigor del “estado de alarma”.



Las pruebas de evaluación “on line” se llevarán a cabo a través de la herramienta de “cuestionarios” disponible a través de Aula Virtual (u otra plataforma similar). En el examen se pueden incluir preguntas cortas, de verdadero y falso, así como pruebas objetivas tipo test (semejantes a las que ya realizan los estudiantes en la evaluación continua). La evaluación del apartado de prácticas puede incluir ejercicios, problemas y preguntas tipo test.

En la guía docente se especifica que para poder aprobar la asignatura se debe sacar un 5, tanto en teoría como en prácticas. A partir de esta adenda se podrá promediar a partir de 4 tanto en teoría como en prácticas, siempre que el promedio sume 5. A partir de aquí se sumarán todas las actividades de evaluación continua y las opcionales.

Se mantiene el valor de la actividad del Journal Club en el 5% de la nota final de cada una de las asignaturas de tercer curso participantes en esta actividad. La asistencia y participación activa en el chat podrán ser tenidas en cuenta hasta en un 5% de la nota del Journal Club.

Los ejercicios, mapas conceptuales asociados a las lecturas y videos explicativos de la docencia on line podrán suponer hasta un 5% adicional de la nota final.

En la evaluación de la actividad opcional de prácticas de simulación se elimina la prueba objetiva tipo test, evaluándose únicamente el trabajo presentado.

Si por causas técnicas algún estudiante no pudiera realizar el examen online, se realizará una prueba alternativa de tipo ORAL.

Dado lo extraordinario de la situación y la generalización de los exámenes online, apelamos a la responsabilidad y a la ética de los estudiantes durante su realización. Si se detectara algún intento de copia u otro tipo de fraude, se adoptarán con rigor las medidas disciplinarias aplicables en estos casos.

5. Bibliografía

Se mantiene la bibliografía prevista en la guía docente. El libro recomendado como básico está disponible “on line” a través de la biblioteca.