Universidad Rey Juan Carlos

GUÍA DOCENTE

HUMAN MORPHOLOGY

(Extinción examen)

GRADO EN INGENIERÍA BIOMÉDICA (INGLÉS) (Plan antiguo) (2291)

CURSO 2026-27

Q2803011B UNIVERSIDAD REY JUAN CARLOS
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I.-Identificación de la Asignatura	
Tipo	OBLIGATORIA
Período de impartición	1 curso, 1Q semestre
Nº de créditos	6
Idioma en el que se imparte	Castellano

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II.-Presentación

The student will know the basic concepts of biology, from the cellular scale, tissue, organ, to the system scale, thus
As the basic concepts of the structure and function of the human body
In order for the student to acquire the competences of this subject, it is necessary to make learning methodologies
Based on simulations; The student should: practice with other students, perform different explorations, use or apply
Techniques of assessment, assessment and treatment, which may involve discovering parts of your body or simulating "situations
Pathological ". Practices are compulsory and will be supervised at all times by teachers; Not doing them
In accordance with the above, will mean not acquiring the necessary competences and, therefore, not exceeding the subject.
Only student who took this subject in the 2022/23 academic year have the right to attend remote theoretical classes and tutorials.

III.-Resultados de Aprendizaje

CB2 . That students are able to apply their knowledge to their work or vocation in a professional manner and have the skills that are typically demonstrated through the preparation and defense of arguments and problem solving within their field of study.
CB3 . That students have the ability to gather and interpret relevant data (usually within their field of study) to express judgments that include a reflection on relevant topics related to social, scientific or ethical areas.
CB5 . That students have developed the learning skills needed to undertake further studies with a considerable degree of autonomy.
CE01 . Understand or acquire the principles of bioelectrical fundamentals, anatomy, physiology or pathophysiology needed to identify the most appropriate processing technologies for a given problem in biomedical engineering
CE29. Understand the principles of functioning of an organism from the cellular level through the tissue level to the biological system level.
CE30. Understand the of the molecular bases of genetics and proteins, the concepts of microbiology, pharmacology and proteomics and their applications in biomedicine.

- Leyenda para las titulaciones no adaptadas al RD 822/21: **CB** - competencias básicas, **CG** - competencias generales, **CE** - competencias específicas, **CT** - competencias transversales.
- Leyenda para las titulaciones adaptadas al RD 822/21: **CON** - conocimientos, **COM** - competencias, **HAB** - habilidades.

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IV.-Contenido

IV.A.-Temario de la asignatura

1. THEORETICAL CONTENT MODULE 1. HUMAN ANATOMY

I. INTRODUCTION TO THE HUMAN ANATOMY

Unit 1. Anatomy basics

-Definition of anatomy
-Anatomic terminology
-Anatomic position
-Body shafts and planes

II. NERVOUS SYSTEM

Unit 2. Introduction to the nervous system

-Introduction
-Definition
-Morphofunctional relationship

Unit 3. Brain

-Brain
-Diencephalon
-Brain stem
-Cerebellum
-Cranial nerves

Unit 4. Spinal cord

-Macroscopic anatomy
-Gray substance, dorsal and ventral horns
-White substance, dorsal, lateral and anterior cords

Unit 5. Nervous pathways

-Ascending tracts
-Descending tracks

Unit 6. Protection of the central nervous system

-Cerebrospinal fluid
-Ventricular system
-Meninges

Unit 7. Vascularization. Brain angiography

-Arterial Network
-Venous drainage

Unit 8. Autonomic and endocrine nervous system

-Sympathetic division
-Parasympathetic division

III. RESPIRATORY SYSTEM

Unit 9. Conducting portion

-Nose
-Pharynx
-Larynx
-Trachea, bronchi

Unit 10. Respiratory portion

-Lungs and pleura
-Bronchi, bronchioles and alveoli. Gaseous exchange
-Mediastinum: regions, boundaries and components

IV. CARDIO-CIRCULATORY SYSTEM

Unit 11. Heart. Cardiac angiology

-External anatomy
-Internal anatomy. Cardiac cavities and valves
-Heart impulse conduction system

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-Cardiac vascularization

Unit 12. Circulatory system

-Main arteries

-Deep and superficial venous networks

-Lymphatic system

V. DIGESTIVE SYSTEM

Unit 13. Anatomy of the gastrointestinal tract

-Mouth

-Salivary glands

-Esophagus

-Stomach

-Small intestine

-Large intestine

Unit 14. Glands attached to the digestive system

-Liver

-Gallbladder

-Pancreas

Unit 15. Vascularization of the digestive system. Peritoneum

-Mesenteric arteries and veins

-Hepatic portal circulation

-Peritoneum: parietal and visceral peritoneum

VI. GENITOURINARY SYSTEM

Unit 16. Urinary system

-Kidney

-Ureters

-Bladder

-Urethra

Unit 17. Male genital system

-Testicles and spermatozoids

-Ducts system

-Accessory glands

Unit 18. Female genital tract

-Ovaries and oocytes

-Uterus and uterine tubes

-Vagina and external genitalia

VII. LOCOMOTOR SYSTEM

Unit 19. Trunk

-Bones

-Joints

-Muscles

Unit 20. Upper limbs

-Bones

-Joints

-Muscles

Unit 21. Lower limbs

-Bones

-Joints

-Muscles

MODULE 2. CYTOLOGY AND HISTOLOGY

CELL BIOLOGY

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Unit 1. Cell biology techniques
Optical and electron microscopy. Cytological and histochemical techniques. Immunocytochemistry and histology. Cellular and organotypic cultures. Separative cellular and subcellular techniques.
Unit 2. Cell membrane
Functions and composition. Lipid rafts. Glycocalyx. Channel proteins. Passive and active transport. Receptors and signal transduction: cell signaling and cell communication. Action potentials. Proteins and adhesion complexes. Cell-cell and cell-substrate recognition and adhesion in tissue integrity. Key differences for movement and communication. Specializations of the plasma membrane.
Unit 3. Nucleus
Structure and dynamics. Nuclear envelope, nuclear pore complex and nucleocytoplasmic trafficking. Nucleoskeleton and its functions. Nucleolus. Organization of the chromatin fiber. Transcriptionally active and inactive chromatin. Histones and transcription regulation.
Unit 4. Cell cytoplasm I: from the nucleus to the cytoplasm
Translation in free and membrane-bound ribosomes. Fate of proteins. Maturation and protein degradation. Smooth endoplasmic reticulum, lipid synthesis, and cellular detoxification metabolism. Vesicular traffic. Functions and polarization of the Golgi apparatus.
Unit 5. Cell cytoplasm II: vesicular transport, cell digestion, cellular energy systems
Regulation of exocytosis, endocytosis, and transcytosis. Regulation of intracellular digestion and the role of lysosomes. Alternative routes of exocytosis (exosomes). Peroxisomes and mitochondria. Distribution within the cell. Synthesis of their components and growth.
Unit 6. Cytoskeleton
General structure and distribution of microfilaments, intermediate filaments, and microtubules. Polymerization. Concept of dynamic stability. Proteins associated with the cytoskeleton. Stabilizing drugs and destabilizing factors. Cortical cytoskeleton. Role of the cytoskeleton in cell motility and intercellular adhesiveness.
Unit 7. Cell cycle and cell life regulation
Cell cycle phases and control points. Mitosis. Cell senescence. Necrosis and apoptosis, and other forms of cell death. Mechanisms of apoptosis control. Features and consequences on tissues. Pathological consequences of deregulation. Cancer.
Unit 8. Cell differentiation and stem cells
Stem cells. Types of stem cells in embryonic and adult tissues.
II. FROM CELLS TO TISSUES
Unit 9. Basics of developmental biology
Meiosis and gametogenesis. Fertilization, pre-implantation development, and implantation stages. Post-implantation development. Derivatives of the three embryonic germ layers. Development of the body plan.
III. GENERAL HUMAN HISTOLOGY
Unit 10. Epithelial tissue I
General characteristics. Morphological and structural features of epithelial cells. Classification of epithelia. Cell renewal in epithelium.
Unit 11. **Epithelial tissue II**
Glandular epithelia. Classification of glands. Types and mechanisms of secretion. Exocrine and endocrine glands: classification, types, and structure.
Unit 12. **Connective tissue**
General concepts. Functions. Components: cells, fibers, and extracellular matrix. Classification: types and varieties. Concept of parenchyma and stroma.
Unit 13. Blood
General concepts. Blood plasma and cells. Structure and function of erythrocytes, leukocytes and platelets.
Unit 14. Adipose tissue
General characteristics. White adipose tissue. Brown adipose tissue. Impact on human pathology.
Unit 15 Cartilaginous tissue
General features. Cells. Matrix. Types of cartilaginous tissue. Growth and nutrition. Perichondrium.
Unit 16. Bone tissue
General features. Components: bone matrix and cells. Immature bone tissue. Types: compact and spongy bone tissue. Periosteum and endosteum. Osteogenesis: types of ossification (membranous and endochondral). Growth and remodeling of bone. Mechanisms of fracture repair.

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Unit 17. Muscle
Skeletal striated muscle tissue. Cardiac muscle: striated tissue. Smooth muscle tissue. Structure. Histophysiology of contraction.
Unit 18. Nervous tissue
General organization of nervous tissue. Neurons: classification and structure. Synapses. Glial cells: astrocytes, microglial cells, oligodendrocytes, ependymal cells, Schwann cells, and satellite cells. Nerve fibers: myelinated and non-myelinated.
Unit 19. Introduction to Tissue Engineering
Fundamentals and applications.
Unit 20. General concepts of body organ systems
Integumentary system. Cardiovascular system. Respiratory system. Digestive system. Urinary system. Endocrine system. Male and female reproductive systems. Central nervous system. Lymphoid organs.

2. PRACTICAL CONTENT

I. Anatomy practical sessions.
Anatomical models.
II. Cytology and Histology practical sessions.
Guided observation and classification of histological preparations in the laboratory.

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V.- Actividades formativas, metodología y método de evaluación

Las actividades formativas, las metodologías docentes y los sistemas de evaluación se adecúan al proceso de extinción de la asignatura, teniendo en cuenta que esta materia se encuentra en el segundo curso o posteriores. Por ello, la asignatura no tiene docencia, pero el alumnado tiene derecho a ser evaluado. La adecuación es la siguiente:

El personal docente facilitará los materiales de aprendizaje y/o bibliografía a través de Aula Virtual. Las actividades de evaluación se modificarán para que el estudiante pueda desarrollarlas, teniendo en cuenta que se elimina el componente presencial, salvo en la realización de exámenes durante las convocatorias oficiales. Esta adecuación es la misma para todas las convocatorias de evaluación.

Los sistemas de evaluación se adecúan al proceso de extinción de la asignatura. Las actividades de evaluación mediante las que se desarrollan los sistemas de evaluación previstos en la memoria verificada del título se aplicarán de modo que el alumnado pueda atenderlas adecuadamente. Esta adecuación es la misma para todas las convocatorias de evaluación. Por tanto, las actividades de evaluación podrán programarse durante las convocatorias oficiales (ordinaria, extraordinaria y adelantada).

El uso de herramientas basadas en inteligencia artificial está prohibido en cualquier ejercicio y prueba de evaluación de la asignatura salvo que el profesor lo indique de forma explícita en el enunciado o en el material de esta. En caso de que esté permitido, se darán indicaciones precisas de qué usos están permitidos y cuáles no.

V.A.B.- Descripción de la metodología de las actividades de evaluación y su ponderación

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Los sistemas de evaluación aplicados en esta asignatura son los siguientes:

The course comprises a theoretical part and a practical part, both of which must be passed separately to pass the course. Failure in one of the parts results in failure in the global grade of the entire course.

1. Assessment of the theoretical block

The theoretical component is divided into two modules: the Anatomy module, and the Cytology and Histology module.

• **First theoretical partial test** covers the whole Anatomy module and will be held during the term time.

• **Second theoretical partial test** covers the Cytology and Histology module and will be held during the ordinary examination period.

Both exams are multiple-choice tests covering their respective theoretical contents. To pass each multiple-choice tests, students must achieve at least **70% correct answers**, corresponding to a minimum grade of 5 on a scale of 0 to 10. Incorrect answers do not deduct points. These theoretical tests are **re-assessable** in the extraordinary call. The partial test for the Anatomy module is weighted 35%, and the partial test for the Cytology and Histology module is weighted 45% towards the final course grade. Both exams will cover the entire syllabus of their respective modules. All evaluation tests will be conducted in person.

In addition, **short continuous assessment tests** will be conducted throughout the semester to support student learning and monitor progress. These tests do **not require a minimum passing grade** and are **not re-assessable.**

2. Assessment of the practical block

The practical component of the course consists of sessions for both modules: Anatomy module, and Cytology and Histology module. Both practical parts will be held at the Alcorcón campus of Rey Juan Carlos University. Attendance at practical sessions is mandatory for all students, including both new students and students retaking the course.

• Anatomy practical sessions involve work with anatomical models. These practical sessions take place during the term time, with evaluation at their conclusion. The practical assessment weight is 5% of the total course grade.

• Cytology and Histology practical sessions involve guided observation and classification of histological preparations in the laboratory. These practical sessions will be carried out during the term time, and the evaluation will be conducted during the practical sessions. Assessment will be conducted through the completion of a laboratory notebook, in which students will record, organise and interpret their observations made during the practical sessions. The practical assessment weight is 5% of the total course grade.

Practical assessment for both parts of the course are **re-assessable activities** in the extraordinary call. Students must demonstrate having acquired the skills required in the subject during the preparation and development of the practical sessions, for which they must attend and pass the minimum grade in these evaluation activities.

3. Assessment of a short oral presentation

5% of the global grade will be allocated to a group oral presentation. In this assignment, students will explore and present a topic of scientific, technical, social, or cultural relevance that highlights the fundamental role and practical applications of concepts, tools and contents developed throughout this course within the field of Biomedical Enginering. The presentation will take place towards the end of the term time. This evaluation activity is cumulative, has **no minimum grade requirement** to pass it, and is **non re-assessable** in the extraordinary call.

Evaluation system	Evaluation activities	Modality	Weight	Minimum grade	Re-assessable in the extraordinary call	Content	Date
Written test, theoretical content (SE02)	Partial test 1, anatomy	Individual	35%	5	Yes	Anatomy syllabus	Term time
	Partial test 2,cytology and histology	Individual	45%	5	Yes	Cytology and histology syllabus	Ordinary call

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	Short tests	Individual	5%	No (cumulative)	No	Anatomy, cytology and histology syllabus	Term time
Evaluation of lab practices (SE05)	Lab practices on anatomical models	Individual	5%	5	Yes	Anatomical models	Term time
	Lab practices on histological preparations	Individual	5%	5	Yes	Lab practices on histological preparations	Term time
Short oral presentation (SE03)	Short presentation on a relevant topic related to human morphology in the field of biomedical engineering	Group assignment	5%	No (cumulative)	No	Current topics in human morphology applications in biomedical engineering	Term time

Calculation of the final or global grade

The **final** or **global grade** is calculated as the **weighted average** of the grades of all the evaluation activities. To pass the course, the global grade must be a 5 or higher, as long as the minimum grade indicated for each of the activities has been passed. If one or more evaluation activities have not been passed with the minimum grade, it will mean failure in the global grade of the whole course (the final grade of the course will be the average grade obtained among all the evaluation activities carried out, taking into account that it cannot exceed 4,9). If none of the evaluable activities have been taken, the final grade will be “No-show”.

Extraordinary call

The weighting and conditions of the assessment will remain the same in ordinary and extraordinary calls. In the extraordinary call, only the re-assessable activities which have not been passed may be taken. To calculate the final grade in the extraordinary call, both the grades of the evaluation activities obtained in the ordinary call and the grades obtained in the re-assessed activities will be used. The calculation of the final or global grade will be carried out as indicated in the previous section. The re-assessment of the evaluation activities will be carried out on the official date indicated for the extraordinary call.

Anticipated call

The anticipated call will be governed by the provisions of article 19 of the Regulation on the Assessment of Learning Outcomes at Rey Juan Carlos University, approved on June 12, 2024. Students who request an anticipated call must contact the professor responsible for the subject as soon as possible to receive the necessary information and/or materials for the evaluation. The evaluation method used for this call will be the same as that previously described.

Other observations or clarifications

The faculty may make use of automatic plagiarism detection tools. All the submitted works must be original, so productions made by other people than those reflected in the authorship of the work cannot be used without crediting the source. Teachers reserve the right to require a defense in person of all or part of the authors of the work if they deem it necessary.

It is also reminded that, according to article 8.g). of the Coexistence Regulations at Rey Juan Carlos University (https://www.urjc.es/images/Universidad/Presentacion/normativa/normativa%20convivencia%20universitaria.pdf), academic fraud in any evaluation activity is considered a very serious offense. The sanctions for such offenses, according to Article 11 of the aforementioned regulations, are temporary expulsion from the University, and the loss of enrollment rights, if applicable.

Taking photographs, recording videos or making voice recordings during classes is strictly prohibited without prior notice and the professor’s approval.

For the evaluation activities, students must come with pencils, pen and tippex.

V.C.- Revisión y reclamación de las actividades de evaluación

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Se realizará conforme al Reglamento de evaluación de los resultados de aprendizaje de la Universidad Rey Juan Carlos.

V.D.- Alumnado con discapacidad o necesidades educativas especiales

Con el fin de garantizar la igualdad de oportunidades, la no discriminación, la accesibilidad universal y la mayor garantía de éxito académico, las adaptaciones curriculares para alumnado con discapacidad o con necesidades educativas especiales serán pautadas por la Unidad de Atención a Personas con Discapacidad, de acuerdo con la normativa que regula el servicio de Atención a Estudiantes con Discapacidad, aprobada por Consejo de Gobierno de la Universidad Rey Juan Carlos.
Para que esas adaptaciones puedan realizarse, será requisito la emisión de un informe de adaptaciones curriculares por parte de dicha Unidad, por lo que el alumnado con discapacidad o necesidades educativas especiales deberán contactar con este servicio para analizar conjuntamente las distintas opciones.

V.E.- Conducta académica, integridad y honestidad académica

La Universidad Rey Juan Carlos está plenamente comprometida con los más altos estándares de integridad y honestidad académica, por lo que estudiar en la URJC supone asumir y suscribir los valores de integridad y la honestidad académica recogidos en el Código Ético de la Universidad.

Para acompañar este proceso, la Universidad dispone de la Normativa de Convivencia de la Universidad Rey Juan Carlos y de diferentes herramientas (antiplagio, supervisión) que ofrecen una garantía colectiva para el completo desarrollo de estos valores esenciales.

Las herramientas basadas en inteligencia artificial pueden mejorar la experiencia de aprendizaje, pero debe utilizarse de forma ética, legal, honesta y transparente. Por este motivo, deben seguirse las recomendaciones de uso adecuado indicadas por los docentes de la asignatura.

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VI.-Recursos y materiales didácticos

Bibliografía básica

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Bibliografía complementaria

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https://www.anatomyatlases.org/MicroscopicAnatomy/MicroscopicAnatomy.shtml (Universidad Iowa)
https://www.pathologylive.com/practicas-histologia/index.html (Universidad Complutense de Madrid)

VII.-Profesorado

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