

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

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|----------------------|-------------|
| Code | 34446 |
| Name | Biology |
| Cycle | Grade |
| ECTS Credits | 6.0 |
| Academic year | 2023 - 2024 |

Study (s)

| Degree | Center | Acad. year | Period |
|---------------------------|------------------------------------|-------------------|---------------|
| 1204 - Degree in Medicine | Faculty of Medicine and Odontology | 1 | First term |

Subject-matter

| Degree | Subject-matter | Character |
|---------------------------|-----------------------|------------------|
| 1204 - Degree in Medicine | 3 - Biology | Basic Training |

Coordination

| Name | Department |
|-------------------------|-------------------|
| MONLEON SALVADO, DANIEL | 285 - Pathology |

SUMMARY

The goal of this subject is that the student deepen and enlarge the study of the cell as a fundamental unity of the living beings, where they are carried out and integrate unique vital functions and where the pathologies and the response of the living being to environment aggressions are reflected.

The cytological concepts that lay the structural foundations of the cells and their processes of proliferation and differentiation are studied, to make possible the integration with the molecular levels on the one hand and the tissue and organic levels on the other.

The knowledge, stances and scientific language acquired will provide the indispensable foundations to approach later on the clinical teachings that a general doctor must master.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Equivalent to Biology's programs 2nd high school.

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

1204 - Degree in Medicine

- Understand and recognise the structure and normal function of the human body, at the following levels: molecular, tissue, organic, and of systems, in each phase of human life and in both sexes.
- Understand and recognise the effects of growth, development and aging which affect individuals and their social environment.
- Know how to use the sources of clinical and biomedical information available, and value them critically in order to obtain, organise, interpret and communicate scientific and sanitary information.
- Know how to use IT in clinical, therapeutic and preventive activities, and those of research.
- In the professional practise, take a point of view which is critical, creative, constructive and research-oriented.
- Be able to formulate hypothesis, gather information and evaluate it critically in order to solve problems by following the scientific method.
- Establish a good interpersonal communication which may allow professionals show empathy and talk to the patients efficiently, as well as to their relatives, the media and other professionals.
- Organizar y planificar adecuadamente la carga de trabajo y el tiempo en las actividades profesionales.
- Capacidad para trabajar en equipo y para relacionarse con otras personas del mismo o distinto ámbito profesional.
- Criticism and self-criticism skills.
- Capacity for communicating with professional circles from other domains.
- Acknowledge diversity and multiculturality.
- Consideration of ethics as a fundamental value in the professional practise.
- Working capacity to function in an international context.
- Knows the procedures in cell communication and the function of excitable cell membranes.
- Knows the procedures which take place in the cell cycle. Cell differentiation and proliferation.



- Knows the mechanisms of information, expression and genetic regulation. Inheritance patterns.

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

1. Conceptual comprehension of the cell as the fundamental unit of the living beings.
2. Knowledge of the cell compartments where the cell functions and their alteration during the pathological processes are carried out and integrated.
3. Knowledge of the intracellular filaments that allow the maintenance of the cell form and structure and its modifications during the motility process.
4. Understanding of the intracellular storage process of the genetic information and of the changes on its degree of condensation during the cell cycle.
5. Knowledge of the proliferation and differentiation processes, to make possible the comprehension and study of the subsequent tissue level.
6. Knowledge of the variability, modification and reparation of the genetic information, and levels of regulation of its expression.
7. Acquisition of the methodological abilities to use the optic microscope and to the diagnosis of cell structures obtained with the electronic microscope.
8. Knowledge of information and communication technologies applied to Cell biology.
9. Acquisition of basic formation for the research activity in the field of Cell biology.
10. Capacity to work in groups and abilities for the development and exposition of subjects about Cell biology.

DESCRIPTION OF CONTENTS

1. THEORY I

1. Introduction. Concept of living being. Living beings functions. Structure of the living beings: molecular and cell level.
2. Cell membrane: morphology. Molecular organization. Fluency of lipids and proteins of the membrane.
3. Cell membrane. Differentiations. Junction complex.
4. Cell membrane. Interaction with the environment. Adhesion molecules.
5. Cell membrane: Functions. Exocytosis and endocytosis. Receptor mediated endocytosis.
6. Endoplasmic reticulum. Ultra-structure. Molecular organization. Functions.
7. Golgi apparatus. Morphology. Functions. Vesicular transport. Biogenesis.
8. The lysosome: morphology. Functions. Biogenesis. Peroxisomes: functions. Biogenesis.
9. The mitochondrion. General characteristics. Ultra-structure. Functions. Biogenesis.
10. The cytoskeleton. Microtubules. Centriole. Cilium and flagellum. Molecular organization.



11. Actin filaments. Intermediate filaments.
12. Cytoskeleton functions. Regulation.

2. THEORY II

13. Cell nucleus in interphase I. Ultra-structure. Nuclear membrane. Chromatin.
14. Cell nucleus in interphase II. Nucleolus and ribosome. Biogenesis.
15. Metaphase Chromosome. General characteristics of the chromosomes. Structure. Molecular organization.
16. Interphase chromosome. Chromosome cycle.
17. Study of the human karyotype. Methodology.
18. Cell division. Mitosis-1.
19. Cell division. Mitosis-2.
20. Cell division. Meiosis-1.
21. Cell division. Meiosis-2. Genetical consequences of the meiosis.

3. THEORY III

22. The genome of the living beings. General characteristics.
23. The human genome. Sequences and transcripts. Molecular concept of gene.
24. Variability of the genetic material. Polymorphism. Mutation.
25. Record of genetic material. Reparation.
26. Genetic regulation in eukaryotes. Levels of regulation.
27. Transcriptional and post-transcriptional control.
28. Genetic engineering. Historical introduction. Basic procedures of cloning. Applications.
29. Cell cycle. Phases. Control of the cell cycle. Cell populations. Stem cells.
30. Cell aging and death. Experiences of Hayflick. Apoptosis and necrosis. Morphology. Molecular base.

4. PRACTICES

LABORATORY PRACTICES.

1. Foundation and use of optic microscope. Use of multimedia resources.
2. Adaptation techniques: coloration.
3. Cytochemistry techniques.
4. Cell types.
5. Cell culture.
6. Cell division: mitosis.
7. Electronic microscopy: Study and interpretation of images.
8. Sub-cellular structures recognition.
9. Sub-cellular structures recognition: Biopathology.
10. Review and presentation of the practices notebook.

COMPUTER PRACTICES.



1. Databases for the study of the human genome.

TUTORIALS.

1. Presentation of a work.

WORKLOAD

| ACTIVITY | Hours | % To be attended |
|--|---------------|------------------|
| Theory classes | 33,00 | 100 |
| Laboratory practices | 21,00 | 100 |
| Tutorials | 4,00 | 100 |
| Computer classroom practice | 2,00 | 100 |
| Development of group work | 10,00 | 0 |
| Development of individual work | 10,00 | 0 |
| Study and independent work | 45,00 | 0 |
| Readings supplementary material | 5,00 | 0 |
| Preparation of evaluation activities | 5,00 | 0 |
| Preparing lectures | 10,00 | 0 |
| Preparation of practical classes and problem | 5,00 | 0 |
| TOTAL | 150,00 | |

TEACHING METHODOLOGY

Theoretical Lessons: 30 master classes are taught with the participation of the student who understands the main aspects of the structure and function of the different cell compartments and of their integration in the biological behaviour of the human cell.

Laboratory Practical Lessons: students will have 10 practical sessions in the optic microscopes room, where students, individually, will learn the use of the microscope and its application to the study of the cell structure and function. Moreover, they will be taught the foundations of the electronic microscopy and the discrimination of the different organelles and cell elements observed in an ultra-structural level.

Computer Practical Lessons: 1 practical session is focused on the analysis of the human genome using the different databases and computer programs of public access available in the web.

Tutorials: students will fulfill an assigned and supervised work by the professor in charge about a topic included in the subject and will expose it through a presentation or using a poster.

The gender perspective and the sustainable development goals (SDGs) will be incorporated into teaching, whenever possible.



EVALUATION

The final score will be determined through joint assessment of the activities and written tests as regards to theoretical and practical content. In order to pass the subject, students must pass both the theoretical and the practical evaluation.

Theoretical Assessment

60% of the final score. It will be done through a written test which will consist of theoretical content, with the assessment of knowledge acquisition as an objective.

It will comprise 60 short-answer questions.

Grading criteria:

0.1 points/correct answer; 0.025 points will be deducted for each wrong answer.

The content in this test will be the same for all groups in the same subject.

Practical assessment: 40% of the final mark. It will be made by the assessment of the participation in the different activities:

Diagnoses of preparations (1 point)

Interpretation of ME images (0.5 points)

Practices notebook (0.5 points)

Tutored work (1 point)

Practical exam: 5 short questions (1 point)

Attendance to practical sessions is mandatory. Unjustified non-attendance to more than 20% of the sessions will make it impossible to pass the course.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

REFERENCES

Basic

- Alberts, Johnson, Lewis, Raff, Roberts, Walter. *Biología molecular de la célula*. Ed. Omega, 5ª edición.
- Alberts, Johnson, Lewis, Morgan, Raff, Roberts, Walter. *Molecular biology of the cell*. Garland Science NY, 6th edition.



- Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, Walter. Essential cell biology. Garland Science NY, 4th edition.
- Calvo, A. Biología Celular Biomédica. Eselvier.
- Cooper and Hausman. La célula. 6ª edición. Marbán.
- RECURSOS e-Salut: ClinicalKey Student. Elsevier (Scopus, ScienceDirect). [uv-es.libguides.com/RecursosSalut/BibliotecaSalut].