



COURSE GUIDE 2024/25

Faculty 310 - Faculty of Science and Technology

Cycle .

Degree BMYBM204 - Master in Molecular Biology and Biomedicine

Year .

COURSE

501109 - Molecular Basis of Cell Proliferation, Differentiation and Death

Credits, ECTS: 5

COURSE DESCRIPTION

Homeostasis depends crucially on a proper balance between cell proliferation, differentiation and death. In fact, defects of these key processes underlie many human diseases, such as cancer. Thus, dissecting the exceedingly complex molecular mechanisms that control how cells proliferate, differentiate and die is a major goal of current biomedical research. In this context, the subject "Molecular bases of cell proliferation, differentiation and death" aims to extend and deepen the understanding of these mechanisms that students have acquired during their undergraduate training. Students are provided with updated information on several aspects of molecular and cellular biology, and are prompted to critically analyze the reports of research findings. Importantly, the faculty of the subject is a group of selected researchers that are actively working on different aspects of the molecular bases of cell proliferation, differentiation and death. Therefore, students are exposed to first-hand experiences of how current research on this areas is being carried out.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCIAS DE LA ASIGNATURA

RESULTADOS DE APRENDIZAJE DE LA ASIGNATURA

- Appreciate how on-going advances in biomedicine stem from an increasingly detailed knowledge of basic cellular processes.
- Integrate different fundamental aspects of molecular and cellular biology as elements to open novel avenues of research in the biomedical field.
- Critically assess scientific results presented in primary research reports on molecular and cellular biology.

Theoretical and Practical Contents

- Topic 1: SIGNALING PATHWAYS INVOLVED IN GROWTH AND DIFFERENTIATION. CELL RECEPTORS. CELL ADHESION. RAS, TGF, WNT, PI3K, MAPK PATHWAYS.
- Topic 2: PHYSIOPATHOLOGY OF NUCLEOCYTOPLASMIC TRANSPORT.
- Topic 3: SIGNALING PATHWAYS INVOLVED IN CELL SURVIVAL. OXIDATIVE METABOLISM.
- Topic 4: GENE REGULATION AND HUMAN DISEASE.
- Topic 5: POST-TRANSCRIPTIONAL MECHANISMS REGULATING CELL PROLIFERATION. PROTEIN UBIQUITINATION.
- Topic 6: MOLECULAR BASES OF CELL CYCLE. CELL DIVISION AND CANCER.
- Topic 7: EDITING THE GENOME USING CRISPR.
- Topic 8: MOLECULAR MECHANISMS OF CELL DEATH. APOPTOSIS AND CANCER.
- Topic 9: MOLECULAR MECHANISMS OF STEM CELL RENEWAL AND DIFFERENTIATION.
- Topic 10 MOLECULAR MECHANISMS IN TISSUE REGENERATION.

METODOLOGIA (ACTIVIDADES FORMATIVAS)

Actividad Formativa	Hours	Porcentaje presencialidad
Expositive classes	35	57 %
Drawing up reports and presentations	40	25 %
Analysing and discussing papers	50	40 %



TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	25	25							
Horas de Actividad No Presencial del Alumno/a	38	37							

Legend: M: Lecture-based S: Seminar GA: Applied classroom-based groups
 GL: Applied laboratory-based groups GO: Applied computer-based groups GCL: Applied clinical-based groups
 TA: Workshop TI: Industrial workshop GCA: Applied fieldwork groups

Evaluation tools and percentages of final mark

Denominación	Ponderación mínima	Ponderación máxima
Attendance and participation	0 %	6,5 %
Questions to discuss	0 %	3,5 %

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final grade will be based on the following aspects:

1. Attendance and participation in class: 65% of the final grade.
2. Written assignment: 35% of the final grade.

Attendance is compulsory. Excused absences may be made up for with the activity indicated by the person in charge of the session.

The intervention of the student in the classes will be valued, the questions and comments made in each session will be valued. A high participation and attendance to 100% of the sessions allows passing the course.

An unexcused attendance of less than 80% of the sessions will result in the failure of the course.

In the case of absence with a justified cause (more than 30%), an exam/test of the subject adjusted to the specific situation will be carried out.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary call will involve the realization of an exam/test of the subject that will consist of the development of a topic of the subject to choose between two chosen at random.

MANDATORY MATERIALS

For each individual subject included in the program the student will be provided by the instructors with additional teaching aids (i.e Power Point presentations and other specialized references as reviews or research articles).

BIBLIOGRAPHY

Basic bibliography

EWING, B. GENES VIII. PEARSON PRENTICE HALL, NJ INTERNATIONAL EDITION. 2004.

STEIN, GS AND PARDEE, AB. CELL CYCLE AND GROWTH CONTROL. 2ND EDITION. JOHN WILEY AND SONS, INC, NJ. 2004.

LATCHMAN, D. GENE REGULATION. A EUKARYOTIC PERSPECTIVE. 4TH EDITION. CHELTENHAM: NELSON THORNES LTD. 2002.

EI-DEIRY, WAKIF. TUMOR SUPPRESSOR GENES: REGULATION, FUNCTION AND MEDICINAL APPLICATIONS. HUMANA PRESS. 2002.

ALBERTS, B. ET AL. MOLECULAR BIOLOGY OF THE CELL. 6TH EDITION. GARLAND PUBLISHING, NY, 2014.

Selected papers from scientific journals: NATURE, SCIENCE, CELL, MOLECULAR CELL, EMBO J, NATURE GENETICS. These papers will be discussed in the seminars.

Detailed bibliography

Journals



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Web sites of interest