

Molecular Bases of Signal Transduction and Cancer

Code: 42893
ECTS Credits: 9

2025/2026

Degree	Type	Year
Bioquímica, Biología Molecular y Biomedicina	OP	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

This is an advanced course for graduate students in in Biology, Biotechnology, Biochemistry, Biomedicine, Genetics, Microbiology, as well as graduates in Medicine and Veterinary.

A comprehensive understanding of Molecular Cell Biology is highly recommended

Specific interest in the subject. Commitment active and dynamic students

High level of English is mandatory (Understanding, spoken writing).

Objectives and Contextualisation

Providing advanced training on the molecular mechanisms involved in signal transduction pathways and in the control of cell proliferation, and how these mechanisms are altered in the cancer cell.

Reviewing and updating key concepts of the field

Defining our current knowledge on the field, as well as identifying critical issues to be investigated.

Learning Outcomes

1. CA13 (Competence) Devise biomedical projects for transfer to society related to the mechanisms of signal transduction, their alteration in cancer and the action of anti-tumour drugs.
2. CA14 (Competence) Use knowledge acquired on the mechanisms of signal transduction and their alteration in cancer to formulate new foundations, while considering sex/gender-based inequalities.
3. KA19 (Knowledge) Describe molecular mechanisms involved in signal transduction and its alteration in cancer.
4. KA20 (Knowledge) Identify in molecular terms the mechanisms that control the cell cycle, genome integrity, and responses triggered by growth factor and antiproliferative receptors.
5. KA21 (Knowledge) Define the importance of stem cells in tumour progression and their relationship with cell differentiation and death.
6. SA19 (Skill) Use the scientific method to analyse morphology and normal physiological processes and their pathological alterations at the molecular level.
7. SA20 (Skill) Examine how dysregulation of normal tissue processes (angiogenesis, metabolism) affects tumour progression and malignancy.
8. SA21 (Skill) Apply the mechanisms of antitumour drugs to the field of biomedicine.

Content

Introduction (Victor J. Yuste)

Apoptosis and its role in cancer tumorigenesis and resistance (Victor J. Yuste). *Signal transduction in apoptosis. Necroapoptosis or programmed necrotic cell death. Senescence and its alteration in cell death. Apoptosis and cancer: importance of genome degradation in chemotherapy.*

Protein kinases (Nestor Gomez). *Structure, classification, regulation and its role in cancer.*

MAP kinases and Protein phosphatases in cancer (Nestor Gomez). *MAP kinases function. Regulation of MAP kinases activity and subcellular localization. Phosphatases: Classification, structure and regulationInhibitors. Kinases and Phosphatases in cancer*

The PI3-kinase pathway (Jose Miguel Lizcano). *The discovery of the PI3-kinase pathway. Role of the PI3-K signalling pathway on the activation of the AGC protein kinases Akt (PKB), and p70S6K.*

PDK1 signaling to the AGC kinases (Jose Ramon Bayascas). *The PDK1 signalling network.*

mTOR signaling (Asier González) *Regulation of mTORC1 by nutrients. Insights into the regulation of mTORC2.*

The stromal component of tumors (Anna Bassols). *Molecular mechanisms mediating cell-cell and cell-substrate interactions. Components of the tumor stroma. How the stroma influences tumor biology and behaviour.*

The LKB1-AMPK pathway (Jose Miguel Lizcano). *The signaling pathway regulated by the tumour suppressor protein kinase LKB1.*

Tumor supresor genes (Jose Ramon Bayascas). *Generalities. Tumor suppressor genes in cell cycle, signalling, DNA repair, DNA methylation and as microRNAs.*

Cancer epigenetics (Nestor Gomez) *DNA Methylation. Chromatin/Histone modifications. Epigenetics in cancer and cell signalling.*

Therapeutic strategies (Anna Bassols) *Radiotherapy. Chemotherapy. Hormone therapy. Immunotherapy. Some examples of targeted therapy.*

Transcriptional and translational control and cancer (Jose Manuel López)

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	45	1.8	
Type: Supervised			
Supervised work	52.9	2.12	
Type: Autonomous			
Study and bibliographic research. Search and selection of an original scientific article for its oral presentation within a limited time.	125	5	

Oral lectures and student homework and preparation of different topics that will be discussed at the classroom

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Oral criticism of a journal paper.	40%	0.9	0.04	CA14, KA20, KA21, SA20, SA21
Oral presentation of a journal paper.	30%	0.6	0.02	CA13, KA19, KA21, SA19
Quality of the presentation format of a scientific article	30%	0.6	0.02	CA13, CA14, KA19

Evaluation will be the result of:

1. Class attendance (minimum required: 80% class attendance and 100% attendance at external seminars)

2. Active participation/intearction during classes and seminars, by addressing questions and comments.

3. Oral presentation/defense of an original research paper, published in an international scientific journal, and related to the module.

The student will not be evaluated ("Non-evaluable" mark) if misses more than 20% of the lectures, or she/he does not defend a journal scientific paper.

Important: If plagiarism is detected in any of the works submitted, the student will fail the whole module!

Retake process: To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Available" if the weight of all conducted evaluation activities is less than 67% of the final score.

This module does NOT include the unique evaluation system.

IMPORTANT NOTICE: RESTRICTED USE OF AI

For this module, the use of Artificial Intelligence (AI) technologies is permitted only for support tasks, such as bibliographic or informational research, text correction, or translation. Students must clearly identify which parts of their work were assisted by AI, specify the tools used, and include a critical reflection on how these tools influenced both the process and the final outcome of the activity.

THE USE OF AI FOR GENERATING CONTENT IS STRICTLY PROHIBITED.

Lack of transparency regarding AI use in this assessed activity will be considered a breach of academic integrity and may result in a partial or total loss of marks for the assignment, or more severe academic sanctions in serious cases.

Bibliography

Molecular Biology of the Cell. Alberts et al. Garland Science. (2022). 7th ed.

The Biology of Cancer. Weinberg. Garland Science. (2014). 2nd ed.

Cell Signalling. Wendell, Mayer and Pawson. Garland Science (2015) 1st ed.

Cancer Biology. King and Robins. Pearson Education. (2006) 3rd ed.

Signal Transduction in Cancer and Immunity. Edited by Lorenzo Galluzzi and Thomas S. Postler. Elsevier ScienceDirect, Cambridge, Massachusetts Academic Press, 2021. (Access from the browser www.bib.uab.cat).

Molecular Biology of Human Cancers. Edited by Wolfgang Schultz. Kluwer Academic. (2023). (Access from the browser www.bib.uab.cat).

Journals devoted to cancer research:

Cancer Cell

Nature Reviews Cancer

BBA Reviews on Cancer

Cancer Treatment Reviews

Nature Reviews in Drug Discovery

Cancer Discovery

Software

Slide show from different platforms such as PowerPoint or Adobe, and videos from players like VLC.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(SEMM) Seminars (master)	1	Catalan/Spanish	annual	morning-mixed
(TEm) Theory (master)	1	Catalan/Spanish	annual	morning-mixed