UAB
Universitat Autònoma de Barcelona

Cellular Signalling

2026/2027

Code: 107994
Credits: 3

Degree programme	Type	Course
Biochemistry	OB	3

Contact lecturer

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Group languages

You can consult this information at the end of the document.

Prerequisites

Basic knowledge and competences of Biochemistry, Cell Biology, Physiology and Histology, Chemistry, Mathematics, Physics.

Objectives

Cell Signalling is part of the Functional Biochemistry module. One of the courses within this module is taken during the second year, while the remaining courses are completed during the third year.

Cellular behaviour depends on the physiological state of the cell. This requires cells to sense external stimuli and respond appropriately. The process by which cells perceive stimuli and generate a response is known as cell signalling or signal transduction.

In this course, students will study the nature of signalling molecules and the mechanisms by which cells recognize these molecules and respond to them appropriately.

Objectives:

Describe the molecules involved in intracellular and intercellular communication systems.

Develop an integrated understanding of the roles of signalling molecules in the regulation of gene expression.

Explain the signal transduction pathways involved in the regulation of the cell cycle and apoptosis.

Understand the experimental approaches used to study signal transduction mechanisms.

Search for, retrieve, and interpret information from the scientific literature and biological signalling databases; analyze experimental results and identify consistent and inconsistent findings.

Read and understand specialized scientific texts written in English.

Prepare and deliver an oral presentation supported by appropriate visual materials on a topic related to the course.

Learning outcomes

- CM25 (Understand metabolic pathways, catalytic and regulatory mechanisms, and energy-gathering processes involved in meeting physiological demands.) Understand metabolic pathways, catalytic and regulatory mechanisms, and energy-gathering processes involved in meeting physiological demands.
- CM26 (Deliver a public presentation of an advanced biochemistry topic.) Deliver a public presentation of an advanced biochemistry topic.
- KM29 (Describe intercellular and intracellular communication systems, as well as metabolic pathways, their interconnections, and physiological significance.) Describe intercellular and intracellular communication systems, as well as metabolic pathways, their interconnections, and physiological significance.
- SM28 (Apply bioinformatics resources when searching databases on enzymes, metabolic pathways and pathological alterations, and to calculate enzyme kinetic parameters.) Apply bioinformatics resources when searching databases on enzymes, metabolic pathways and pathological alterations, and to calculate enzyme kinetic parameters.
- SM30 (Critically analyse measurable experimental parameters in tissues in normal or pathological physiological conditions and in the quantification of metabolic control.) Critically analyse measurable experimental parameters in tissues in normal or pathological physiological conditions and in the quantification of metabolic control.

Contents

THEORY

Topic 1. Characteristics of cell signaling.

Topic 2. Basic biochemistry of signal transduction.

Topic 3. Basic equipment: G proteins, according to messengers and protein kinases

Topic 4.Signal Transduction by Receptors with Seven Transmembrane Domains

Topic 5. Signal Transduction by Serine/Threonine Kinases-Coupled Receptors

Topic 6. Signal transduction by receptor couplings to tyrosine kinases and protein phosphatases

Topic 7. The Ultimate Goal of Signal Transduction: Transcription and translation

Topic 8. Regulation of cell division

Topic 9. Signal Transduction by Proteolysis and Programmed Cell Death

Topic 10.Ion signal transduction

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Seminar preparation	4	0.16	CM25, CM26, KM29, SM28, SM30
Seminars/ case study	2	0.08	CM25, CM26, KM29, SM28, SM30
Theory classes	21	0.84	CM25, CM26, KM29, SM28, SM30
Study	36	1.44	CM25, CM26, KM29, SM28, SM30

The learning activities of this course consist of lectures, practical case-study/seminar sessions, and the submission of assignments through the Virtual Campus.

Lectures

The course content will be delivered through lectures, supported by audiovisual materials that will be made available to students via the course Virtual Campus.

Materials published on the Virtual Campus are intended exclusively for teaching purposes and to support face-to-face instruction. Students are granted permission to use these materials solely for personal study. The images and materials provided may not be reproduced, distributed, or publicly shared through websites, social media platforms, or digital repositories for teaching materials.

Students are encouraged to consult the materials available on the Virtual Campus, as well as the textbooks and websites recommended in the Bibliography section.

Seminars

Four seminar sessions related to the lecture content are scheduled throughout the course.

During the first weeks of the semester, the instructor will propose a set of topics to be developed by groups of 3 to 5 students. The outcome of this work will consist of a PDF document to be uploaded to the Virtual Campus and an oral presentation delivered during a scheduled seminar session. Oral presentations must not exceed 15 minutes. Seminar presentations will take place on the dates established by the course coordinator.

Assignment Submission

Exercises and practical case studies will be assigned through the Virtual Campus. Students will work on these activities in groups of 3 to 5 and submit their solutions before the specified deadline.

For this academic year, a single assignment is planned throughout the semester. It must be submitted in PDF

format using the file-submission tool available on the Virtual Campus within the established deadline.

This activity is designed to complement both the lecture and seminar components of the course.

Students are responsible for mastering all the content described in this course guide. To support their learning, they are encouraged to make use of office hours and consult the instructor regarding any aspect of the course, its content, or assigned work during the designated consultation periods.

To facilitate communication between students and the instructor outside class hours, students are required to activate and regularly use the institutional email account provided by the UAB. Communication may also take place through the appropriate tools available on the UAB Virtual Campus.

Use of Artificial Intelligence Tools

For this course, the use of Artificial Intelligence (AI) technologies is permitted exclusively for support tasks, such as literature and information searches, text proofreading, or translation. Students must clearly identify any parts of their work that have been generated using such technologies, specify the tools employed, and include a critical reflection on how these tools influenced both the process and the final outcome of the activity. Failure to disclose the use of AI in an assessed activity will be considered a breach of academic integrity and may result in partial or full penalties in the activity grade, or more serious disciplinary measures in cases of significant misconduct.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Delivery of work using moodle	5	6	0.24	CM25, CM26, KM29, SM28, SM30
theory exam	80	2	0.08	CM25, KM29, SM28, SM30
Seminars	15	4	0.16	CM25, CM26, KM29, SM28, SM30

Evaluation of this course is individual and continuous and is divided into the following components: a theory and practical cases examination, assignment submissions through the Virtual Campus, and seminars.

Theory Exam

The exam will take place on the date indicated on the Faculty website. It will consist of both multiple-choice questions and short-answer questions/problems, thereby providing an integrated assessment of all concepts covered during the lectures.

Students who obtain a score below 3.5/10 in the theory examination must assist to the resit exam on the scheduled date. The grade obtained in this exam will replace the original examination grade for the calculation of the final mark.

This component accounts for 80% of the final grade.

Assignment Submission through the Virtual Campus

A practical exercise or case study will be assigned for students to complete in groups of 3 to 5 members and submit through the appropriate Virtual Campus submission tool before a specified deadline. Sufficient time will be provided between the announcement of the assignment and the submission deadline; however, this deadline must be strictly respected, as the Virtual Campus automatically rejects late submissions.

The assignment grade will be awarded at the group level and adjusted for each student as follows:

- The grade obtained by the group will be weighted to calculate the individual grade of each member.
- The weighting factor will be determined by the average participation score assigned to the student by the other members of the group.

This component accounts for 5% of the final grade.

Seminars

The assessment of seminars prepared in groups of 3 to 5 students accounts for 15% of the final grade.

Students will be evaluated on their analytical and synthesis skills, as well as their teamwork and oral presentation abilities. The assessment will consider the seminar content, written summary, oral presentation and defence, and responses to questions.

The instructor will assign 80% of the seminar grade, while the remaining 20% will be based on peer evaluation by classmates.

Attendance at seminar presentations is mandatory. Unjustified absence will result in a 50% reduction of the grade for this component.

The individual seminar grade will be calculated by multiplying the group grade by a weighting factor derived from the average scores assigned by all members of the group.

Overall Assessment

Students must participate in and be assessed in all components of the course in order to pass. Apart from the minimum score of 3.5/10 required in the theory examination, no additional minimum grades are required for the remaining components.

To be eligible for the resit examination, students must previously have been assessed through activities whose combined weight represents at least two-thirds of the total course grade. Consequently, students whose completed assessment activities account for less than 67% of the final grade will receive a final mark of "Not Assessed" (No Avaluable).

The course will be considered passed when the weighted sum of all assessment components reaches a minimum final grade of 5.0/10.

Unique evaluation

Students opting for the unique-evaluation modality must prepare the seminar individually and deliver the oral presentation on the same day as the final examination.

Under this modality:

- The seminar will account for 20% of the final grade.
- The examination will account for the remaining 80% of the final grade.

The same re-evaluation system applied to the continuous assessment pathway will also apply to the single-evaluation modality.

Note: Any irregularity committed during an evaluation activity (including academic fraud, plagiarism, or the improper use of artificial intelligence tools, unless such use is expressly authorized in the course guide) that may lead to a significant alteration of the assessment outcome will result in a grade of 0 for that activity. If the course guide establishes that obtaining a minimum grade in that activity is a mandatory requirement to pass the course, or if multiple irregularities occur in assessment activities within the same course, the final course grade will be 0. In addition, disciplinary proceedings may be initiated against students who engage in any such irregularities.

Bibliography

Molecular Biology of the Cell, 7th edition

Bruce Alberts , Rebecca Heald , Alexander Johnson , David Morgan , Martin Raff , Keith Roberts , Peter Walter

Norton 2022.

ISBN: 9780815344322978039384852

Lehninger Principles of Biochemistry, 8th edition

David L. Nelson, Michael M. Cox

New York: Macmillan Higher Education; 2021.

ISBN: 9781319228002

Molecular Cell Biology, 9th edition

Harvey Lodish; Arnold Berk; Chris A. Kaiser; Monty Krieger; Anthony Bretscher; Hidde Ploegh; Kelsey C. Martin; Michael Yaffe; Angelika Amon

New York: Macmillan Higher Education; 2021.

ISBN-10: 1-4292-3413-X

Cellular signal processing (second edition)

Friedrich Marks, Ursula Klingmüller, Karin Müller-Decker

Garland Science;2017

ISBN: 978-0-8153-4534-3

Signal Transduction (Third edition)

Ijsbrand M. Kramer

Elsevier Inc. ; 2015

ISBN: 978-0-12-394803-8

Cell signalling, 3rd edition

John Hancock

Oxford University Press; 2010

ISBN-10: 0-1992-3210-5

Biochemistry of Signal Transduction and Regulation, 5th Edition

Gerhard Krauss

Ed. John Wiley and Sons, 2013,

ISBN-10: 3-5273-3366-5

Handbook of Cell Signaling. 2th edition

Ralph A. Bradshaw and Edward A. Dennis

Elsevier. Academic Press, 2009,

ISBN-10: 0123741459

Software

No specific software is required

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	33	Catalan	first semester	morning-mixed
(SEM) Seminars	331	Catalan	first semester	morning-mixed
(SEM) Seminars	332	Catalan	first semester	morning-mixed