

**1. General information****Course:** FUNDAMENTALS OF CELLULAR BIOLOGY**Type:** BASIC**Degree:** 341 - UNDERGRADUATE DEGREE PROGRAMME IN BIOCHEMISTRY**Center:** 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY**Year:** 1**Main language:** Spanish**Use of additional languages:** English friendly**Web site:****Code:** 13300**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 40**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** CAROLINA ESCOBAR LUCAS - Group(s): 40

Building/Office	Department	Phone number	Email	Office hours
Sabatini/029	CIENCIAS AMBIENTALES	5434	carolina.escobar@uclm.es	Thursday from 11:00 to 15:00 and Friday from 12:00 to 14:00. Except for the week of December 4, which will be Monday from 12:00 to 15:00 and Tuesday from 11:00 to 13:00 and from 14:00 to 15:00. Please write first an email to carolina.escobar@uclm.es to confirm the tutoring a few days in advance. LOCATION: BUILDING SABATINI, OFFICE 029

**2. Pre-Requisites**

Basic Knowledge on Biology from the last courses of high school

**3. Justification in the curriculum, relation to other subjects and to the profession**

Cell Biology is the first basic subject from the area of Biology in the Biochemistry degree. One of the main objectives is to gain a general knowledge of the functioning of the smallest functional unit in the organisms, the cell, from a molecular perspective. Particularly, the eukaryotic cell complexity. It is also recommended as a base for other subjects from the biochemistry degree, as those related to genetics, biochemistry, signal perception, immunology etc... Importantly, the practical approaches in biochemistry, biotechnology and biomedicine require frequently a cellular perspective.

**4. Degree competences achieved in this course****Course competences**

Code	Description
E01	Express themselves correctly in basic biological, physical, chemical, mathematical and computer terms.
E02	Work properly and quality driven in a chemical, biological and biochemical laboratory, including safety, handling and disposal of waste and keeping a record of activities.
E03	Understand and know how to explain the physical and chemical bases of biochemical processes and the techniques used to investigate them
E09	Be familiar with the different cell types (prokaryotes and eukaryotes) at the level of structure, physiology and biochemistry and be able to critically explain how their properties are adapted to their biological function.
E11	To have an integrated vision of the cellular functioning of both the metabolism and the gene expression, being able to relate the activity of the different cellular compartments.
E20	To know the biochemical and molecular bases of the control of gene expression and the activity, location and replacement of cellular proteins.
G01	To possess and understand the knowledge in the area of Biochemistry and Molecular Biology at a level that, based on advanced textbooks, also includes cutting-edge aspects of relevance in the discipline
G02	To know how to apply the knowledge of Biochemistry and Molecular Biology to professional practice and to possess the necessary intellectual skills and abilities for this practice, including the capacity for: information management, analysis and synthesis, problem solving, organization and planning and generation of new ideas.
G05	Develop those strategies and learning skills necessary to undertake further studies in the area of Biochemistry and Molecular Biology and other related areas with a high degree of autonomy.
T01	Proficiency in a second foreign language, preferably English, at level B1 of the Common European Framework of Reference for Languages
T03	A correct oral and written communication
T04	Ethical commitment and professional deontology
T05	Organizational and planning skills
T06	Capacity for design, analysis and synthesis
T10	Ability to self-learn and to obtain and manage bibliographic information, including Internet resources

**5. Objectives or Learning Outcomes****Course learning outcomes****Description**

Exercise critical thinking based on the analysis and synthesis of knowledge in cell biology.

Initial learning in the use of laboratory instruments for the study of cellular processes.

To train the student in the understanding and application of the scientific method to the study of biological systems at the cellular level.

To introduce into the knowledge of some cellular types and levels of organization of living beings.

Obtain a comparative overview of prokaryotic and eukaryotic cells, both animal and plant.

To know the ultrastructure and function of the main intracellular eukaryotic structures.

To know the concepts and principles underlying complex cellular processes, particularly those associated with the transduction of intracellular signals and the transport of macromolecules, as well as cell cycle control.

#### Additional outcomes

To apply basic techniques on preparation and observation of biological samples, especially from plants

### 6. Units / Contents

#### Unit 1: The origin of the cell

**Unit 1.1** Pre-cellular evolution. The formation of the first genetic material and enzymes. The origin of membranes. Prokaryotes to eukaryote cell evolution. The endosymbiotic theory and the origin of the subcellular compartments. Basic differences between prokaryotes and eukaryotes

#### Unit 2: The function and structure of cell envelopes.

**Unit 2.1** Function and structure of the plasmatic membrane. Principles of Membrane Transport. Passive or Active Transport to drive solutes across the membrane. Carriers and Channels: Sodium-potassium pumps and proton pumps. Classification of ion channels. Function and structure of the cell wall as an example.

#### Unit 3: Cytoskeleton

**Unit 3.1** The Molecular components and dynamic structure of the cytoskeleton. The assembly of microtubules and filaments. Dynamics of the cellular skeleton. Motor proteins. Function of cytoskeleton in cellular processes: contractile structures

#### Unit 4: Intracellular compartments

**Unit 4.1** Chloroplasts, nucleus, endoplasmic reticulum, Golgi apparatus, vacuoles, glyoxisomes, peroxisomes, lysosomes. General characteristics of each compartment and relevant functions. Sub-compartmentalization of each organelle. Mitochondria and Chloroplasts as examples of the connection between structure and function

#### Unit 5: General Principles of Cell Signaling and perception

**Unit 5.1** Membrane receptors. Signaling cascades inter/intracellular associated to different receptors. Amplification, modulation and interconnection of signals. Multiple responses.

#### Unit 6: Intracellular Compartments and Transport.

**Unit 6.1** Basic mechanisms of macromolecules intracellular transport. The transport mechanisms to the nucleus. The transport to chloroplasts and mitochondria. The transport to the endoplasmic reticulum.

**Unit 6.2** Vesicle transport (endocytosis and exocytosis)

#### Unit 7: The cell division cycle

**Unit 7.1** Cell division: mitosis and cytokinesis. Control mechanisms of the different Cell cycle stages.. Cell cycle regulation. Cell differentiation

#### Unit 8: Practicum: Laboratory practical experimentation

### 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E01 E03 E09 E11 E20 G01 G02 G05 T06	1.2	30	N	-	
Workshops or seminars [ON-SITE]	project-based learning	E01 E03 E09 E11 E20 G01 G02 G05 T01 T03 T05 T06 T10	0.16	4	N	-	
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	E01 E02 E03 E09 E11 G01 G02 G05 T03 T04 T05 T06	0.64	16	N	-	
On-line Activities [OFF-SITE]	Online Forums	E01 E03 E09 E11 E20 G01 G02 G05 T01 T03 T04 T05 T06 T10	0.04	1	Y	N	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E01 E03 E09 E11 E20 G01 G02 G05 T01 T03 T04 T05 T06 T10	0.08	2	N	-	
Final test [ON-SITE]	Assessment tests	E01 E03 E09 E11 E20 G01 G02 G05 T01 T03 T04 T05 T06 T10	0.16	4	Y	Y	
Other off-site activity [OFF-SITE]	Self-study	E03 E09 E11 E20 G01 G02 G05 T01 T05 T10	3.56	89	N	-	
Class Attendance (practical) [ON-SITE]	Combination of methods	E01 E03 E09 E11 E20 G01 G02 G05 T03 T05 T06	0.08	2	Y	Y	
Final test [ON-SITE]	Assessment tests	E01 E03 E09 E11 E20 G01 G02 G05 T03 T04 T05 T06	0.08	2	Y	Y	
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

### 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
			Evaluation of the laboratory practicals. A 4 out of 10 will be

Final test	20.00%	20.00%	necessary to average the rest of the grades. Attendance at practices is considered a compulsory and non-recoverable activity in order to pass the subject. The evaluation will be recoverable, either in the extraordinary or special call for completion.
Final test	62.00%	65.00%	Final exam of the theoretical part. This grade plus the theoretical exam of the questions on cooperative group work, learning by problems and projects and their resolution must add up to at least a 4 out of 10 to average with the rest of the grades. The final exam is compulsory and can be recovered in the extraordinary or special final exam.
Progress Tests	1.00%	1.00%	delivery of summaries or presentations of the practices by groups and co-evaluation between groups. For those who do not pass the course, they may submit an individual summary that will be graded by the professor both in the extraordinary and special final exams.
Self Evaluation and Co-evaluation	3.00%	0.00%	Not mandatory, not recoverable in continuous evaluation. Multi-answer test questions, for individual assessment of cooperative group work, problem learning and projects.
Theoretical exam	14.00%	14.00%	Theoretical exam on cooperative group work, learning by problems and projects and their resolution that together with the final theoretical test must add a 4 out of 10 to average with the rest of the grades. This test is compulsory and recoverable in the extraordinary or special final exam.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

In the ordinary exam will be evaluated: Theoretical parts 76% (62%+14%) + laboratory practices 20%. The theoretical parts will also include questions for the evaluation of guided autonomous work, cooperative group work and resolution of exercises and problems. The modality assigned by default to the student will be the continuous evaluation. Any student may request a change to the non-continuous evaluation mode (before the end of the class period) by sending an e-mail to the professor, as long as he/she has not completed 50% of the evaluable activities. It is advisable to notify the professor as soon as possible carolina.escobar@uclm.es.

The overall grade of the course is calculated with the percentages shown in the table. In any case, the course will only be considered passed if all the evaluable activities together result in a grade of 5 or higher (out of 10).

In order to obtain an average between the different parts of the course, it is an indispensable requirement to obtain a minimum grade of 4 points in the exams, separately the theoretical and laboratory practicals parts

IN ORDER TO PASS THE COURSE, ATTENDANCE TO THE PRACTICALS IS COMPULSORY. The evaluation of the practices will be recoverable, either in the extraordinary or special call for completion.

##### Non-continuous evaluation:

THOSE STUDENTS WHO DECIDE TO DO NON-CONTINUOUS EVALUATION, IT IS RECOMMENDED THAT THEY NOTIFY THE TEACHER AS SOON AS POSSIBLE, PREFERABLY AT THE BEGINNING OF THE COURSE AT CAROLINA.ESCOBAR@UCLM.ES.

The overall grade of the course is calculated using the percentages reflected in the table above. In any case, the course will only be considered passed if the set of all evaluable activities results in a grade of 5 or higher (out of 10).

In order to obtain an average between the different parts of the course (theory and practicals), it is essential to obtain a minimum grade of 4 points in the exams, separately the theoretical and laboratory practicals parts

IN ORDER TO PASS THE COURSE, ATTENDANCE TO THE PRACTICALS IS COMPULSORY. The evaluation of the practices will be recoverable, either in the extraordinary or special call for completion.

#### Specifications for the resit/retake exam:

The overall grade of the course is calculated using the percentages shown in the table above. In any case, the course will only be considered passed if all the evaluable activities together result in a grade of 5 or higher (out of 10).

In order to obtain an average between the different parts of the course (theory and practicals), it is essential to obtain a minimum grade of 4 points in the exams, separately the theoretical and laboratory practicals parts

IN ORDER TO PASS THE COURSE, ATTENDANCE TO THE PRACTICALS IS COMPULSORY. The evaluation of the practices will be recoverable, either in the extraordinary or special call for completion.

#### Specifications for the second resit / retake exam:

In the special call, 100% of the grade may be recovered: theory exam (80%) + laboratory practical part (20%) provided that the student has attended the laboratory practices

## 9. Assignments, course calendar and important dates

### Not related to the syllabus/contents

Hours	hours
-------	-------

## 10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K. & Walter, P Bruce Alberts / Dennis Bray / Karel	Essential cell biology	Garland Science		978-0-8153-4130-7	2010	

Hopkin / Alexander Johnson / Julian Lewis / Martin Raff / Keith Roberts / Peter Walter	introducción a la biología celular	panamericana	9786077743187	2011
Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter	molecular biology of the cell	gardland sciences	9780815344322	2014
Bruce Alberts, Dennis Bray, Karel Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter	introduccion a la biología celular		9786077743187	2011
¿ Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. & Walter, P	Molecular biology of the cell : reference edition	Garland Science	978-0-8153-4111-6	2008
¿ Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H. & Matsudaira, P	Molecular cell biology	W.H. Freeman and Company	978-0-7167-7601-7	2008
Alberts, B., Bray, D., Johnson, A., Lewis, J., Raff, M., Roberts, K. & Walter, P	Introducción a la biología celular	Médica Panamericana	84-7903-523-4	2008