

**1. General information****Course:** MOLECULAR BIOLOGY**Type:** CORE COURSE**Degree:** 402 - UNDERGRADUATE DEGREE PROGRAMME IN BIOTECHNOLOGY**Center:** 601 - E.T.S. AGRICULTURAL ENGINEERS AND MOUNTS AB**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 60613**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 10**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** OUSSAMA AHRAZEM EL KADIRI - Group(s): 10

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**2. Pre-Requisites**

Not established

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

Molecular Biology is a discipline that is in continuous development, in which our knowledge has advanced enormously, although there are still many processes that are not fully resolved. The study of cellular structures from the point of view of their molecular constituents, in particular protein and nucleic acid molecules, has allowed us to understand the processes of regulation of genetic expression, the cellular response to DNA damage, etc. The skills and knowledge provided by this subject are essential to establish the basic principles of molecular components and communication processes and the flow of information in both prokaryotes and eukaryotes. The contents of the subject have direct or indirect applications in professional areas such as basic research, molecular diagnosis, the pharmaceutical and agri-food industries, and any biotechnological activity. Molecular Biology is essential to understand the experimental basis of the concepts that will be taught in other subjects, particularly Genetic Engineering (third year), but also in all other subjects related to molecular biology and Biotechnology.

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

Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CE09	Apply and develop methodologies derived from molecular biology and genetic engineering.
CG01	Organizational and planning skills.
CG02	Capacity for analysis and synthesis.
CG03	Ability to work in multidisciplinary teams collaboratively and with shared responsibility.
CG05	Ability to apply knowledge in practice.
CT01	Know a second foreign language.
CT02	Know and apply the Information and Communication Technologies.
CT03	Use correct oral and written communication.
CT04	Know the ethical commitment and professional deontology.

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

Know the fundamentals of the responses of microorganisms to stress conditions and some of the adaptations of organisms to extreme environments, along with examples of biotechnological applications

Know the different gene regulation strategies of eukaryotic organisms.

Know the proteins involved in gene expression and its regulation.

Know the plant metabolism and main metabolic pathways.

Understand the need for expression regulation in eukaryotic cells.

## 6. Units / Contents

Unit 1: Tools and techniques in Molecular Biology

Unit 2: Genomes and the flow of biological information

Unit 3: Structure and function of chromosomes

Unit 4: Transcription

Unit 5: Transcription regulation

Unit 6: RNA processing

Unit 7: Translation

Unit 8: Regulatory RNAs

Unit 9: Protein modification

Unit 10: Plant secondary metabolites

Unit 11: Plant metabolic pathways

Unit 12: Responses of microorganisms to stress conditions

Unit 13: Adaptations of organisms to extreme environments

## 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	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	1	25	N	-	In the master classes, the teaching staff will explain the fundamental contents of each subject of the program and will point out the activities associated with it.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	0.8	20	Y	Y	All students will carry out the laboratory practices corresponding to the subject. The realization of the practices are NOT repeatable, however they are recoverable. In the ordinary call, a procedural test of the practices will be carried out. In this test, the students will have to respond individually to questions related to the practices. To make an average with the different evaluable training activities, the student must obtain a grade equal to or greater than 4. The student who obtains a grade lower than 4, may recover this part in the Extraordinary call
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02	0.2	5	N	-	Group work and transversal activities
Mid-term test [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	0.2	5	Y	Y	The student will have the opportunity to take two partial tests to remove theoretical content in in the ordinary call
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	2.6	65	N	-	Autonomous work by the student to be able to acquire the knowledge that enables them to acquire the skills of the subject
Writing of reports or projects [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	1	25	N	-	Autonomous work at home to develop and prepare activities such as workshops or seminars and group tutorials
Workshops or seminars [ON-SITE]	Workshops and Seminars	CB01 CB02 CB03 CB04 CB05 CE09 CG01 CG02 CG03 CG05 CT01 CT02 CT03 CT04	0.2	5	Y	N	Exhibition and information search work
<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
Theoretical papers assessment	10.00%	10.00%	The different works presented by the students will be evaluated through direct observation and/or forms and/or delivery of works. There is no minimum grade in this evaluation system to be able to make a weighted average with the rest
			A procedural test will be carried out on the contents dealt with

Laboratory sessions	20.00%	20.00%	in each of the practical sessions carried out in the ordinary call. To make an average with the rest of the evaluation systems, it is also a requirement to obtain a grade equal to or greater than 4. The student will have another opportunity in the extraordinary call. The realization of the laboratory practices in the continuous evaluation is recoverable but NOT repeatable. In the non-continuous evaluation, the student who has not done the practices will have the opportunity to take a laboratory test and/or a procedural test on the contents covered in the practical sessions on the day of the ordinary call. To make an average with the rest of the evaluation systems, it is also a requirement to obtain a grade equal to or greater than 4. The student will have another opportunity in the extraordinary call with the same requirements as in the ordinary one. The note of this section will be kept for two academic years in case of not passing the subject when making the weighted average of the evaluation systems and not reaching 5.00
Test	70.00%	70.00%	The student in the continuous call, may ask the teacher to be able to eliminate matter through two partial tests that will constitute 45% of the theory section, thus leaving 25% for the ordinary call (70% theory). A request will be carried out through a form posted on the Virtual Campus Forum, published in a timely manner. The weighted average of the three tests in the "Theory" section will be carried out. In turn, the weighted average can be made with the rest of the evaluation systems, if the weighted average of the theory is equal to or greater than 4. In the case of obtaining less than 4, the student will have the opportunity to go to the extraordinary call with 70% corresponding to the theoretical content. To make an average with the rest of the evaluation systems, it is also a requirement to obtain a grade equal to or greater than 4 in the extraordinary call. The student who chooses the non-continuous evaluation will have the opportunity to go to the ordinary and the extraordinary call to be able to be evaluated of the 70% that corresponds to the section of evaluation of theoretical contents. To make an average with the rest of the evaluation systems, it is also a requirement to obtain a grade equal to or greater than 4.
<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:

The final grade for the course will be calculated taking into account the percentages in the table above. It is necessary to obtain a grade equal to or greater than 4.00 in the practical evaluation system and test (theory) to be able to make a weighted average with the 3 evaluation systems. The subject will be passed when the weighted average of the grade obtained with the 3 evaluation systems is equal to or greater than 5.00.

The contents and/or specific sections of this guide may be modified if the social and health situation due to the pandemic requires it. In any case, students will be notified of said changes through the virtual campus.

##### Non-continuous evaluation:

Students may opt for non-continuous evaluation as long as they have not participated in 50% of the evaluation or have finished the school period. If this change is not communicated, it is understood that the student remains on the continua. To communicate the change to non-continuous evaluation, the student will fill out a form that will be posted after the second partial test and before the ordinary call on the virtual campus. In the case of not completing this form on time, the mark of the partial tests will be taken into account with the mark obtained or with a zero in case of no show.

The final grade for the course will be calculated taking into account the percentages in the table above. It is necessary to obtain a grade equal to or greater than 4.00 in the practice and test (theory) section in order to make a weighted average with the 3 evaluation systems. The subject will be passed when the weighted average of the grade obtained with the different evaluation systems is equal to or greater than 5.00.

The contents and/or specific sections of this guide may be modified if the social and health situation due to the pandemic requires it. In any case, students will be notified of these changes through the virtual campus.

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

The same criteria as for the ordinary call will be followed.

The grades obtained in the different theoretical tests, carried out throughout the course and in the ordinary call will not be kept for the extraordinary call.

The qualifications of the practical activities (resolution of problems or cases and laboratory practices) and theoretical works will be maintained for two successive courses.

The contents and/or specific sections of this guide may be modified if the social and health situation due to the pandemic requires it. In any case, students will be notified of these changes through the virtual campus.

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

Only students who meet the requirements set out in the Student Assessment Regulations of the University of Castilla-La Mancha may access this call. This evaluation will consist of a compulsory test that will account for 100% of the final grade for the subject, the test will consist of a theoretical part that will account for 80% of the grade and another practical part in the laboratory that will account for 20% of the final grade. The student will have to get a grade greater than or equal to 4 to make the weighted average between theory and practices. The subject is passed if the weighted average grade between both parts is greater than or equal to 5.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 13): Tools and techniques in Molecular Biology	
Activities	Hours

Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 12-09-2022	<b>End date:</b> 15-09-2022
<b>Unit 2 (de 13): Genomes and the flow of biological information</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.18
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	1
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 19-07-2022	<b>End date:</b> 19-07-2022
<b>Unit 3 (de 13): Structure and function of chromosomes</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 20-07-2022	<b>End date:</b> 20-07-2022
<b>Unit 4 (de 13): Transcription</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 22-09-2022	<b>End date:</b> 22-09-2022
<b>Unit 5 (de 13): Transcription regulation</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 29-09-2022	<b>End date:</b> 29-09-2022
<b>Unit 6 (de 13): RNA processing</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 03-10-2022	<b>End date:</b> 03-10-2022
<b>Unit 7 (de 13): Translation</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 04-10-2022	<b>End date:</b> 06-10-2022
<b>Unit 8 (de 13): Regulatory RNAs</b>	
<b>Activities</b>	<b>Hours</b>

Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 10-10-2022	<b>End date:</b> 10-10-2022
<b>Unit 9 (de 13): Protein modification</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 03-11-2022	<b>End date:</b> 03-11-2022
<b>Unit 10 (de 13): Plant secondary metabolites</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.5
Mid-term test [PRESENCIAL][Assessment tests]	.42
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.44
Group 10:	
<b>Initial date:</b> 19-09-2022	<b>End date:</b> 10-11-2022
<b>Unit 11 (de 13): Plant metabolic pathways</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.52
Mid-term test [PRESENCIAL][Assessment tests]	.4
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 21-11-2022	<b>End date:</b> 22-11-2022
<b>Unit 12 (de 13): Responses of microorganisms to stress conditions</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 12-12-2022	<b>End date:</b> 12-12-2022
<b>Unit 13 (de 13): Adaptations of organisms to extreme environments</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	.38
Mid-term test [PRESENCIAL][Assessment tests]	.38
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	.38
Group 10:	
<b>Initial date:</b> 13-12-2022	<b>End date:</b> 13-12-2022
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Mid-term test [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	65
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20
Writing of reports or projects [AUTÓNOMA][Self-study]	25
<b>Total horas: 150</b>	

## 10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Craig, N., Cohen-Fix, O., Green, R., Greider, C., Storz, G., Wolberger, C.	Molecular Biology: Principles of Genome Function	Oxford		978-0199658572	2014	
Hans-Walter Heldet	Plant Biochemistry	Elsevier Academic Press		0-12-0888391	2005	
ALBERTS, B., JOHNSON A., LEWIS J., RAFF M., ROBERTS K. Y WALTER P,	Molecular biology of the cell	Taylor and Francis Group		978-84-282-1507-7	2015	
BRUNETON, J.	Farmacognosia. Fitoquímica. Plantas medicinales	Acribia		978-84-200-0956-8	2001	
James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine , Richard Losick	Molecular Biology of the Gene	Pearson International Education		978-0321762436	2013	
Hofmann, A and Clokie, S.	Principles and techniques of biochemistry and molecular biology	Cambridge		978-1-316-61476-1	2018	
KREBS, J.E., KILPATRICK, S.T., GOLDSTEIN, E.S.	Lewins Genes XI	Jones and Bartlett Learning		978-1449659851	2014	