Information about the subject

Degree: Bachelor of Science Degree in Biotechnology

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 1100202 **Name:** Molecular Biology of Microorganisms

Credits: 6,00 **ECTS Year:** 2 **Semester:** 2

Module: Biochemistry and Molecular Biology

Subject Matter: Molecular Biology of Microorganisms **Type:** Compulsory

Department: Biotechnology

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

1102	Miguel Martí Jiménez **(Responsible Lecturer)**	miguel.marti@ucv.es
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Module organization

Biochemistry and Molecular Biology

Subject Matter	ECTS	Subject	ECTS	Year/semester
Biochemistry	12,00	Biochemistry I	6,00	1/2
		Biochemistry II	6,00	2/1
Molecular Genetics	6,00	Molecular Genetics	6,00	2/1
Molecular Biology of Microorganisms	6,00	Molecular Biology of Microorganisms	6,00	2/2
Enzimology	6,00	Enzymology	6,00	3/1

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1 The student has understood and assimilated the contents of the subject.

R2 The student is able to solve problems or case studies related to the subject contents, by using different resources (bibliographic, IT, etc.)

R3 The student is able to work in a laboratory, carrying out basic operations correctly and taking into account the corresponding safety standards. He/she understands the planning, development and purpose of the experience, and is able to contrast and validate the obtained results.

R4 The student is able to write an intelligible and organized text on different aspects of the subject.

R5 The student is able to present and defend his/her work adequately.

R6 The student seeks bibliographic information from different sources and can analyze it with a critical and constructive spirit.

R7 The student collaborates with the teacher and his/her peers throughout the learning process; he/she works in a team; treats everyone with respects, is proactive and fulfills the organization rules of the course.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students acquire and understand knowledge in their field of study based on general secondary education but usually reaching a level that, although supported on advanced text books, also includes aspects involving state-of-the-art knowledge specific to their area.			x	
CB2	Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.			x	
CB3	Students are able to collect and interpret relevant data (generally in their field of study) and give opinions that involve reflection on relevant social, scientific or ethical issues.	x			
CB4	Students can communicate information, ideas, problems and solutions to a specialized or non-specialized audience.			x	
CB5	Students develop the necessary learning skills to undertake further studies with a high level of autonomy.				x

GENERAL		Weighting			
		1	2	3	4
CG01	Capacity to analyze and synthesize.			x	

SPECIFIC		Weighting			
		1	2	3	4
CE23	Knowing how to use laboratory equipment and to carry out basic operations for each discipline including: safety measures, handling, waste disposal and activity register.			x	

CE24	Knowing basic and instrument laboratory techniques in the different areas of biotechnology.				x
CE25	Knowing how to analyze and understand scientific data related to biotechnology.		x		
CE29	Contrasting and checking results of biotechnological experimentation.	x			
CE32	Knowing how to use different specific operating systems and software packages designed for Biotechnology.		x		

TRANSVERSAL		Weighting			
		1	2	3	4
CT02	Capacity to organize and plan.			x	
CT03	Mastering Spanish oral and written communication.			x	
CT05	Knowing and applying Basic ITC skills related to Biotechnology.		x		
CT06	Capacity to manage information (capacity to look for and analyze information coming from different types of sources).		x		
CT07	Problem solving.		x		
CT08	Decision making		x		
CT09	Capacity to work in interdisciplinary and multidisciplinary team.			x	
CT10	Interpersonal skills.		x		
CT11	Understanding multicultural and diverse environment	x			
CT12	Critical and self-critical capacity.		x		
CT13	Ethics.	x			
CT14	Capacity to learn			x	
CT15	Capacity to adapt to new situations	x			

CT16	Capacity to produce new ideas (creativity)	x		
CT17	Leadership abilities	x		
CT18	Taking initiatives and enterprising spirit	x		
CT19	Capacity to apply theoretical knowledge		x	
CT20	Research skills		x	
CT21	Sensitivity to environmental issues	x		

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R5	40,00%	Written test
R1, R4, R5, R6, R7	20,00%	Submission of papers
R1, R2, R3, R5, R7	35,00%	Laboratory test
R1, R2, R7	5,00%	Solving problems with the computer

Observations

This course is not eligible for single evaluation. According to the general evaluation and qualification regulations, the preferred evaluation system will be continuous evaluation. Specifically, the delivery of the work will be assessed according to a system of continuous assessment through deliveries where the development of the work will be reviewed.
The three parts of the evaluation should be passed independently (written test, laboratory test and delivery of works). They will be considered approved with a score of five. Once approved, each part will be adjusted by the corresponding percentage correction.
Attendance to the laboratory practices is mandatory.
*The use of artificial intelligence (AI)-based tools is subject to the discretion of the teacher, who may establish specific limits or conditions depending on the training or assessment activity.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1	Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
M2	Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
M3	Activities carried out in spaces with specialized equipment.
M4	Supervised monographic sessions with shared participation..
M5	Application of multidisciplinary knowledge.
M6	Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.
M7	Set of oral and/or written tests used in initial, formative or additive assessment of the student
M8	Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning.

M9 Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2, R5, R7	37,00	1,48
PRACTICAL CLASSES M2	R1, R2, R3, R5, R7	5,00	0,20
LABORATORY M3	R1, R3, R5, R7	8,00	0,32
SEMINAR M4	R1, R5, R7	3,00	0,12
GROUP PRESENTATION OF ASSIGNMENTS M5	R1, R4, R5, R6, R7	3,00	0,12
TUTORIAL M6	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
ASSESSMENT M7	R1, R2, R3, R4, R5, R6, R7	2,00	0,08
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
AUTONOMOUS GROUP WORK M8	R1, R4, R5, R6, R7	18,00	0,72
AUTONOMOUS INDIVIDUAL WORK M9	R1, R2, R3, R4, R5, R6, R7	72,00	2,88
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
DIDACTIC UNIT 1: PRINCIPLES OF MOLECULAR BIOLOGY OF MICROORGANISMS AND GENETICS	Chapter 1.1. Essentials of bacterial molecular biology.
	Chapter 1.2. Archaeal and eukaryotic molecular biology
	Chapter 1.3. Regulation of gene expression
	Chapter 1.4. Molecular biology of viruses and bacteriophages
	Chapter 1.5. Bacterial genetics
	Chapter 1.6. Basic techniques of molecular biology and genetic engineering
DIDACTIC UNIT 2: MICROBIAL METABOLISM REGULATION	Chapter 2.1. Autotroph metabolic systems
	Chapter 2.2. Chemolithotrophy and nitrogen fixation
	Chapter 2.3. Oxidative metabolic systems
	Chapter 2.4. Anaerobic respiration
	Chapter 2.5. Fermentations

DIDACTIC UNIT 3: PRACTICES	Bacterial plasmid extraction. Digestion of plasmid DNA with restriction enzymes and PCR technique. Preparation of competent cells and bacterial transformation. Induction of bacteriophages. Bacteriophages (titration and transduction). Practice with specific software.

Organization of the practical activities:

	Content	Place	Hours
PR1.	Bacterial plasmid extraction.	Laboratory	2,00
PR2.	Digestion of plasmid DNA with restriction enzymes and PCR technique.	Laboratory	3,00
PR3.	Preparation of competent cells and bacterial transformation.	Laboratory	3,00
PR4.	Induction of bacteriophages.	Laboratory	2,00
PR5.	Bacteriophages (titration and transduction).	Laboratory	2,00
PR6.	Practice with specific software.	Computer	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
DIDACTIC UNIT 1: PRINCIPLES OF MOLECULAR BIOLOGY OF MICROORGANISMS AND GENETICS	21,50	43,00
DIDACTIC UNIT 2: MICROBIAL METABOLISM REGULATION	1,50	3,00
DIDACTIC UNIT 3: PRACTICES	7,00	14,00

References

Basic references:

Dale, J.W., Park S.F. (2010). Molecular genetics of bacteria. Oxford: Wiley-Blackwell.

Dale, J.W., Park S.F. (2004). Molecular genetics of bacteria. England: John Wiley & Sons, Ltd.

Klug, W. S. (2013). Conceptos de genética. Madrid: Pearson Educación.

Krebs, J.E., Goldstein, E. S., Kilpatrick, S.T .(2017).Lewin's GENES XII. U.S.A: Jones & Bartlett Learning.

Krebs, J.E., Goldstein, E. S., Kilpatrick, S.T .(2013).Lewin's essential genes. U.S.A: Jones & Bartlett Learning.

Kumar, R. & Gautam, H.K. (2013). Molecular biology of bacteria. New York: Nova.

Lewin, B. (2008). Genes IX. México: Mc Graw-Hill.

Madigan, M.T., Martinko, J.M., Bender, K.S., Buckley, D.H. & Stahl, D.A. (2015) Brock Biología de los microorganismos. (14ª Edición). Madrid: Pearson.

Madigan, M.T., Martinko, J.M., Dunlap, P.V. & Clark, D.P. (2009). Brock Biología de los microorganismos. (12º Edición). Madrid: Pearson.

Ream, Geller, Trempy, Field. Molecular microbiology laboratory. (2003). Academic Press.

Willey, J.M., Sandman, K.M. & Wood, D.H. (2022). Prescott's Microbiology. McGraw-Hill.

Willey, J.M., Sandman, k. & Wood, D. (2020). Prescott's Microbiology. McGraw-Hill.

Willey, J.M.; Sherwood, L.M. & Woolverton, C.J. (2009). Microbiología de Prescott, Harley y Klein. Madrid: Mc. Graw-Hill.

Additional references:

Alberts, B . (2010). Biología molecular de la célula. Barcelona: Omega.

Renneberg, R . (2009). Biotecnología para principiantes.Barcelona: Ed. Reverté.

Sambrook, J. (2001). Molecular Cloning a laboratory manual. USA: Cold Srping Harbor Laboratory Press.

Singleton, P. & Sainsbury, D. (2001). Dictionary of microbiology and molecular biology. Reino Unido: John Wiley & Sons.

Websites:

PubMed, base de datos de bibliografía científica en biología: http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed

http://www2.edc.org/weblabs/WebLabDirectory1.html