

**1. General information****Course:** GENETICS AND EVOLUTION**Type:** CORE COURSE**Degree:** 341 - UNDERGRADUATE DEGREE PROGRAMME IN BIOCHEMISTRY**Center:** 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY**Year:** 1**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 13305**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 40**Duration:** C2**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** MARTA CARMEN GUADAMILLAS MORA - Group(s): 40

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**2. Pre-Requisites**

Not established

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

The course will introduce basic genetics concepts and will show the central role of genetics in biology.

The content is related with other courses as: Gene expression (year 2), Genetic Engineering (year 3) and Molecular Pathology (year 3).

Genetic knowledge is basic to professional areas as basic research and molecular diagnosis of genetic human diseases.

**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.
E05	Acquire, develop and apply the main techniques for the preparation and observation of biological samples and identify and describe the different organs, tissues and animal and plant cells in the different types of preparations.
E07	To know the structure of genes and the mechanisms of DNA replication, recombination and repair in the context of the functioning of cells and organisms, as well as the basis of heredity and genetic and epigenetic variation between individuals.
E08	Analyze and interpret results derived from the realization of animal and/or plant karyotypes, chromosome bands and practical genetic problems.
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.
E12	Have the numerical and computational skills to apply mathematical procedures for data analysis.
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.
G03	Be able to collect and interpret relevant data, information and results, draw conclusions and issue reasoned reports on relevant social, scientific or ethical issues in connection with advances in Biochemistry and Molecular Biology.
G04	To know how to transmit information, ideas, problems and solutions in the field of Biochemistry and Molecular Biology to a specialized and non-specialized public.
T01	Proficiency in a second foreign language, preferably English, at level B1 of the Common European Framework of Reference for Languages
T02	User-level knowledge of Information and Communication Technologies (ICT).
T03	A correct oral and written communication
T05	Organizational and planning skills

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

Description

To know the structural bases of the interactions between macromolecules  
 Be able to correctly express the concepts and principles of heredity  
 Master the basic terminology of genetics.  
 To know the mechanisms of modification of the genetic material.  
 Understanding how a genetic analysis is performed  
 Understand clearly the mechanisms of heredity  
 Understand the fundamental role of genetics in the evolution of living beings.  
 To know the relationship between structure and function of nucleic acids  
 To know the applications of genetics to human biology.

## 6. Units / Contents

### Unit 1: Introduction

**Unit 1.1** Genetics as a science

### Unit 2: Inheritance

**Unit 2.1** Chromosomal basis of inheritance

**Unit 2.2** Sex determination. Sex linked inheritance

**Unit 2.3** Inheritance in humans

**Unit 2.4** Gene interaction

**Unit 2.5** Environment and genes

**Unit 2.6** Linkage and recombination in eukaryotes

### Unit 3: Molecular basis of inheritance

**Unit 3.1** Nature and structure of the hereditary material

**Unit 3.2** Organization and replication of genetic material

**Unit 3.3** Molecular biology of gene function. Transcription. Genetic code and translation

**Unit 3.4** Gene mutation. Genetic analysis

**Unit 3.5** Chromosome mutations

### Unit 4: Population genetics and evolution

**Unit 4.1** Quantitative genetics. Heritability

**Unit 4.2** Genetic structure of populations

**Unit 4.3** Changes in allelic frequencies. Mutation, migration, genetic drift and selection

**Unit 4.4** Speciation and evolution. Molecular evolution

### Unit 5: Practical contents

**Unit 5.1** Genetic mapping. Sex linkage inheritance.

**Unit 5.2** Inheritance in humans

**Unit 5.3** Electrophoresis of DNA

**Unit 5.4** Epistasis

**Unit 5.5** Karyotype

## 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	E07 E08 G01	1.28	32	N	-	
Problem solving and/or case studies [ON-SITE]	Combination of methods	E01 E08 E09 E12 G03 G04	0.32	8	Y	N	
Other off-site activity [OFF-SITE]	Project/Problem Based Learning (PBL)	E01 E08 E12 G03	0.6	15	Y	N	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E01 E02 E05 E08 E09 E12 G02 G03	0.64	16	Y	Y	Assistance is compulsory. Evaluation would be through a questionnaire. It is compulsory to obtain a minimum 4/10
Progress test [ON-SITE]	Assessment tests	E01 E07 E12 G01 G03	0.04	1	Y	N	
Final test [ON-SITE]	Assessment tests	E01 E02 E05 E07 E08 E09 E12 G01 G02 G03 G04	0.12	3	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	E01 E07 E08 E09 E12 G01	3	75	N	-	
<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
Final test	65.00%	85.00%	It is mandatory to obtain a score > 4 over 10 in the final exam to add all other evaluable parts in the percentages shown in the table.
Laboratory sessions	15.00%	15.00%	Assistance is compulsory. Evaluation would be through a questionnaire. It is compulsory to obtain a 4/10

Assessment of problem solving and/or case studies	10.00%	0.00%	Not mandatory.
Progress Tests	10.00%	0.00%	Test for evaluation of Topic 2.
<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:

It is mandatory to obtain a score > 4 over 10 in the final exam to add all other evaluable parts in the percentages shown in the table.

It is compulsory to pass the laboratory sessions and obtain a score of 4/10 in the laboratory test to pass the course.

The subject will be considered as passed if a minimum overall weighted score of 5 out of 10 is obtained.

##### Non-continuous evaluation:

Criteria will be the same.

At the beginning of the course, students should tell the professor if they wish to be evaluate non continuously

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

For the retake exam only the the laboratory evaluation test can be re-taken, applying for the other sections the marks obtained during the duration of the course.

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

To pass this examination there will be only a final exam that will represent 100% of the mark, provided that the laboratory sessions have been performed and passed.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Other off-site activity [AUTÓNOMA][Project/Problem Based Learning (PBL)]	15
Progress test [PRESENCIAL][Assessment tests]	1
Final test [PRESENCIAL][Assessment tests]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	75
Unit 1 (de 5): Introduction	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Group 40:	
Initial date: 30-01-2024	End date: 30-01-2024
Unit 2 (de 5): Inheritance	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	13
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	3
Group 40:	
Initial date: 31-01-2024	End date: 27-02-2024
Unit 3 (de 5): Molecular basis og inheritance	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	12
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	3
Group 40:	
Initial date: 01-03-2024	End date: 18-04-2024
Unit 4 (de 5): Population genetics and evolution	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	2
Group 40:	
Initial date: 23-04-2024	End date: 09-05-2024
Unit 5 (de 5): Practical contents	
Activities	Hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Group 40:	
Initial date: 26-02-2024	End date: 22-03-2024
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	8
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Progress test [PRESENCIAL][Assessment tests]	1
Class Attendance (theory) [PRESENCIAL][Lectures]	32
Final test [PRESENCIAL][Assessment tests]	3
Other off-site activity [AUTÓNOMA][Project/Problem Based Learning (PBL)]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	75
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description

Benito Jiménez, César	360 problemas de genética : resueltos paso a paso	Síntesis	84-7738-532-7	2002	Libro de problemas
Brown, T	Genomas	Editorial Médica Panamericana	9789500614481	2008	Molecular (complementario)
Fontdevila A y Moya A	Evolución	Síntesis	978-84-975612-1-1	2008	Evolución (complementario)
Freeman S y Herron J	Análisis evolutivo	Prentice Hall	84-205-3390-4	2002	Evolución (complementario)
Griffiths, Anthony J. F.	Genética. 9ª edición	McGraw-Hill	8448603680	2008	TEXTO BÁSICO
Hartl, Daniel L.	Genetics : analysis of genes and genomes	Jones and Bartlett Publishers	978-0-7637-7216-1	2012	Molecular (complementario)
Jiménez Sánchez, Alfonso	Problemas de Genética para un curso general	Universidad de Extremadura	978-84-7723-797-6	2008	Libro de problemas
Klug, Cummings, Spencer y Palladino	Conceptos de Genética (10ª edición)	Pierce Education SA	978-84-1555-249-9	2013	TEXTO BÁSICO
Klug, W., Cummings, M. y Spencer C.	Conceptos de Genética (8ª edición)	Pearson Educación SA	9788420550145	2006	TEXTO BÁSICO
Lewin, B	Genes IX	McGraw-Hill	9701066855	2009	Molecular (complementario)
Ménsua Fernández, J. L.	Genética : problemas y ejercicios resueltos	Prentice-Hall	84-205-3341-6	2004	Libro de problemas
Pierce, B.A.	Genética. Un enfoque conceptual	Editorial Médica Panamericana	9788498352160	2010	TEXTO BÁSICO
Tormo Garrido, Antonio	Problemas de Genética molecular	Síntesis	84-7738-601-8	2007	Libro de problemas