1. BASIC INFORMATION

Subject	Molecular Genetics
Degree	Degree in Biotechnology
School/Faculty	Faculty of Biomedical and Health Sciences
Year	Second
ECTS	6 ECTS
Type	Compulsory
Languages	Spanish/English
Mode	On-site learning
Semester	Second semester
Academic year	25-26
Coordinating teacher	Emma Muñoz Sáez

2. PRESENTATION

The discipline of Molecular Genetics studies the structure and function of genes and genomes, as well as the cellular processes associated with them. This branch of biology has been the most notable in terms of the speed and breadth of its expansion. New data emerge every day, and a deeper understanding of previously studied processes is achieved in weeks or months, rather than years.
The objective of the course will be to provide the student with a foundation to understand the current state of the subject, integrating knowledge acquired in other subjects, without losing sight of the latest advances in the field.

3. LEARNING OUTCOMES

Knowledge

CON04. Identifying the techniques and methodological foundations of cell culture, analysis of of proteins of biotechnological interest, genetic foundations and their industrial applications.

- Recognizing the theoretical basis and techniques used in molecular genetics.
- Recognizing different types of sequences and genomic elements.
- Understanding the detailed characteristics of the central dogma of molecular biology in prokaryotes and eukaryotes.
- Recognizing potentially therapeutic targets involved in the replication, transcription, and translation processes.
- Recognizing the applications of molecular biology in the biotechnology industry.

Competencies

COMP01. Acquire an integrated view of cellular functioning and cell compartments, both at the metabolic and gene expression levels.
COMP07. Manage databases and specific software that can be used in the field of biotechnology, and learn to interpret the extracted information.

4. CONTENTS

• Organization of the eukaryotic genome. Genome structure and classification.
• Recombination. Recombination strategies and involved enzymes.
• Replication. Replication complex. Molecular mechanisms involved in replication.
• Transcription and transcription control. Biological information flow.
• Repair, restriction and modification. Conservation of genetic material structure. Repair mechanisms.
• Mutation. Spontaneous and induced mutagenesis. Genetic and evolutionary analysis of mutagenesis.
• Genetic recombination. Molecular mechanisms: proteins involved and proposed mechanisms. Transposition.
• Basic biochemical techniques for genetic analysis at the molecular level.
• Fundamentals of gene therapy

5. TEACHING-LEARNING METHODOLOGIES

The following are the types of teaching-learning methodologies that will be applied:

- Lectures.
- Case analysis.
- Cooperative learning.
- Learning based on workshop-/laboratory-based learning.

6. TRAINING ACTIVITIES

The types of training activities that will be carried out and the hours of student's dedication to each of them are as follows:

On-site learning:

Training activity	Number of hours
Lectures	35
Asynchronous lessons	15
Case analysis	10
Reports and essays	10
Tutoring	15
Autonomous work	50
Activities in workshops and/or laboratories	9
On-site objective knowledge tests	6
TOTAL	**150 h**

7. ASSESSMENT

The evaluation systems are listed below, as well as their weight in the total grade for the subject:

On-site mode:

Evaluation system	Weight
On-site knowledge tests	60%
Reports and essays	20%
Cases/problems	5%
Activities in laboratories	15%

On the Virtual Campus, when you access the subject, you will be able to consult in detail the assessment activities that must be carried out, as well as the delivery dates and the assessment procedures for each of them.

7.1. Ordinary call (ordinary exam period)

To pass the subject in the ordinary exam period, students must obtain a mark of al least 5.0 out of 10.0 points in all parts of the evaluation of the subject. Those sections that are marked under 5.00 points (not passed) in the ordinary call must be re-assessed in the extraordinary session.

The final grade will be the weighted average of the partial grades of each of the approved training activities, according to the table above.

The continuous assessment system for training activities requires attendance of at least 50% of classes.

It is mandatory to justify at least 50% attendance at classes, as a necessary part of the assessment process and to comply with the student's right to receive advice, assistance and academic monitoring from the professor. For these purposes, students must use the technological system that the University makes available to them, to prove their daily attendance at each of their classes. This system will also serve to guarantee objective information on the student's active role in the classroom. Failure to prove by the means proposed by the university, of at least 50% attendance, will authorize the professor to grade the subject as failed in the ordinary call, in accordance with the grading system provided for in these regulations. All of this, without prejudice to other requirements or higher attendance percentages that each faculty may establish in the teaching guides or in its internal regulations. Regulations for the assessment of official degree qualifications, Art. 1 point 4.

(http://www.uem.es/myfiles/pageposts/reglamento_evaluacion_titulaciones_oficiales_grado.pdf).

7.2. Extraordinary call (extraordinary exam period)

In order to pass the subject in the extraordinary session, students must obtain a mark of **at least to 5.0 out of 10.0 points** in all parts of the evaluation of the subject that they had not passed during the ordinary call.

Any activities failed in the ordinary session must be submitted, taking into account the corresponding corrections or indications by the teacher. Those activities not submitted on the ordinary call must be delivered at the extraordinary session.

The final mark will be the weighted average of the partial marks of each of the approved activities (at least 5 out of 10 points), according to the table above. For this calculation the mark of the assessable activities passed in the ordinary session will be maintained.

8. SCHEDULE

This section indicates the schedule with dates for submitting evaluable activities for the subject:

Evaluable activities	Date
Formative assessment: evaluable online questionnaire	Weeks 3, 6, 9, 12 and 14
Lab practices/practices in virtual simulated environments	Weeks 10, 11, 12
Objective test – first partial	Week 8
Evaluable activities	To be determined according to the progress of the syllabus
On-site knowledge tests	Week 13

This schedule may be subject to changes due to logistical reasons. Students will be notified of any changes in a timely manner.

9. BIBLIOGRAPHY

The reference work for following the subject is:

- Lewin's GENES XII. Krebs, J.E.; Goldstein, E.S.; Kilpatrick, S.T. 12th Edition. Jones & Bartlett Learning. 2017.
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Recommended bibliography is provided below:

- Essential Cell Biology. Alberts, B.; Heald, R.; Hopkin, K.; Johnson, A.; Morgan, D.; Roberts, K.; Walter, P. 6th Edition. WW Norton & Co. 2023.
- Lehninger Principles of Biochemistry. Nelson, D.L.; Cox, M.M. 8th Edition. W. H. Freeman. 2021.
- Voet's Principles of Biochemistry. Voet, D.; Voet, J.G.; Pratt, C.W. 5th Edition. Wiley. 2018.
- Biochemistry. Berg, J.; Gatto Jr, G.; Hines, J.; Tymoczko, J.L.; Stryer, L. 10th Edition. W. H. Freeman. 2023.
- Molecular Biology of the Cell. Alberts, B.; Johnson, A.; Lewis, J.; Morgan, D.; Raff, M.; Roberts, K.; Walter, P. 7th Edition. Norton & Company. 2022.

Other resources:

- Scientific articles.
- Bio Model : https://biomodel.uah.es/

Internet resources :

- https://www.genome.gov/es/genetics-glossary (Dictionary of genetic terminology).
- https://pubmed.ncbi.nlm.nih.gov/ (US National Library of Medicine)
- https://useast.ensembl.org/index.html (European genetic database)
- https://www.neb.com/en/tools-and-resources/interactive-tools#Restriction-Enzyme-Tools (New England Biolabs company web page).
- https://www.nature.com/scitable/ (Educational website by Nature group)
- https://dnalc.cshl.edu/DNA Learning Center, Cold Spring Harbor Laboratory. Useful website with interactive and educational videos about genetics)
- https://www.ncbi.nlm.nih.gov/datasets/docs/v2/glossary/ (Scientific dictionary of the NIH)

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

At the Educational Guidance and Diversity Unit (ODI) we offer support to our students throughout their university life to help them achieve their academic goals. The pillars of our action are the inclusion of students with specific educational support needs, universal accessibility in the different university campuses and equal opportunities.

Services offered:

1. Support and follow-up through personalized advice and plans for students who need to improve their academic performance.

2. In terms of attention to diversity, non-significant curricular adjustments are made. These adjustments are made at methodology and evaluation level, in those students with specific educational needs, thereby pursuing equal opportunities for all students.

3. We offer students different extracurricular training resources to develop various skills that will enrich their personal and professional development.

4. Vocational guidance, by providing tools and advice to students with vocational doubts or who believe they have made a mistake in choosing a degree.

Students in need of educational support can e-mail us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in our satisfaction surveys to detect strengths and areas for improvement regarding the teaching staff, the degree and the teaching-learning process.

The surveys will be available in the survey space of your virtual campus or via your e-mail.

Your feedback is necessary to improve the quality of the degree.

Thank you very much for your participation.