Methods and Techniques in Molecular Genetics

Code: 42926
ECTS Credits: 6

2025/2026

Degree	Type	Year
Advanced Genetics	OB	0

Contact

Name: Alba Garcia Rodriguez

Email: alba.garcia.rodriguez@uab.cat

Teachers

Laura Rubio Lorente

Alba Garcia Rodriguez

Irene Barguilla Moreno

Cristian Valiente Gil

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The prerequisites for this module are those required to be admitted in the Advanced Genetics Master Program:

-B1 level of english

-Degree in Biosciences, Medicine, Pharmacy or Veterinary medicine

Basic knowledge in Molecular Genetics and laboratory skills are recomended.

Objectives and Contextualisation

This course is designed to provide the student the necessary skills to perform accurately and autonomously inside the bioscience lab, with emphasis on molecular aspects. It provides a broad grounding on several techniques commonly used in the genetic field (DNA and RNA extraction, PCR, rtPCR, cloning, cell and bacterial cultures, southern blot, etc)and an introduction to experimental design and data analysis.

Competences

- Analyse the research results to obtain new products or processes valuing their industrial and commercial viability for transfer to society.
- Conceive, design, carry out and synthesise scientific projects in the area of genetics, both theoretical and applied.
- Demonstrate a mastery of genetic analysis as a transversal tool applicable to any field of genetics.
- Demonstrate responsibility in management of information and knowledge.
- Demonstrate responsibility in the direction of groups and/or projects in multidisciplinary teams.
- Design and apply scientific methodology in resolving problems.
- Develop critical reasoning in the area of study and in relation to the scientific and business environments.
- Integrate genetic analysis at different levels of complexity (molecular, cell, individual, population) to coherently resolve different problems in the area of genetics.
- Integrate knowledge of the possible alterations in DNA with their consequences for living beings.
- Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.
- Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent.
- Students should know how to apply the knowledge they acquire and be capable of solving problems in new or little-known areas within broader contexts (or multidisciplinary contexts) related to their area of study.
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously.
- Understand the genetic techniques necessary for improving biological processes and their acceptability in economic and health terms.
- Use and manage bibliographical information and other resources related to genetics and related fields.
- Use scientific terminology to argue the results of the research and show how to communicate in spoken and written English in an international setting.
- Work individually and in a team in a multidisciplinary context.

Learning Outcomes

1. Analyse and compare current methodologies in the context of applicability to genetics.
2. Analyse the research results to obtain new products or processes valuing their industrial and commercial viability for transfer to society.
3. Analyse the variability observable in nucleotide sequences according to the possible changes experienced by the DNA.
4. Apply strategies and techniques to isolate genomic regions for specific purposes.
5. Characterise mutations present in genetic pathologies that are of special relevance.
6. Demonstrate responsibility in management of information and knowledge.
7. Demonstrate responsibility in the direction of groups and/or projects in multidisciplinary teams.
8. Develop critical reasoning in the area of study and in relation to the scientific and business environments.
9. Evaluate the importance of a good experimental protocol to answer specific questions.
10. Have experience of techniques of isolation, cloning and expression of sequences/genes of interest.
11. Have experience of the techniques of fluorescent in situ hybridation to detect genes/regions of interest.
12. Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of in a research context.
13. Search for and make explicit the bibliography necessary for understanding the design of protocols explained in the module.
14. Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent.
15. Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously.
16. Use scientific terminology to argue the results of the research and show how to communicate in spoken and written English in an international setting.
17. Work individually and in a team in a multidisciplinary context.
18. Write a report that considers the use of the methodology used in the module to resolve a specific problem.

19. Writing of a critical work experience report.

Content

- DNA and RNA extraction

- DNA extraction and purification from agarose gels

- Polymerase chain reaction (PCR)

- Qualitative reverse transcription (RT)-PCR

- Cloning of PCR products

- Transformation

- Bacterial culture

- Restriction enzyme digestion

- Miniprep

- DNA Labeling

- Transfer of PCR products into nylon membranes

- Probe-DNA hybridization

- Probe detection

- Cell culture

- In vitro toxicity assay

- Use of softwares of design and analysis (Primer, Nice, Image J, Chromas)

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Follow methodologies and laboratory guidelines	54	2.16	
Type: Supervised			
General laboratory work	50	2	
Solve and discuss questions formulated during the experimental work	20	0.8	
Type: Autonomous			

Independent study of protocols	2	0.08
Self-study	20	0.8

The present module is entirely practical. The student will work mostly individually, learning how to take care of its own biological samples while collaborating with other classmates. The student will go over different experimental protocols in order to solve theoretical exercises previously proposed by the teacher.

During the course, the student will also need to autonomously solve different specific questions related to the experimental design and/or the analysis of the obtained results.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Attendance, attitud and lab skills	10%	2	0.08	1, 5, 8, 10, 11, 12, 15, 14, 17, 9
Multiple-choice exam and applied problems	50% + 40%	2	0.08	2, 1, 3, 4, 13, 5, 7, 6, 8, 18, 10, 11, 12, 15, 14, 19, 17, 16, 9

CONTINUOUS EVALUATION

The final grade is composed of the following percentages:

- 10% attendance, participation, and laboratory skills.
- 50% multiple-choice exam and 40% applied problem-solving.

Unjustified absence will result in a "not evaluable" grade. Furthermore, in each of the graded components, the student must complete at least 50% of the corresponding tasks to be eligible for a positive evaluation. If this minimum is not met, the final grade will be recorded as "not evaluable."

SINGLE EVALUATION

This course/module does not offer a single evaluation system.

CONSIDERATIONS REGARDING THE USE OF ARTIFICIAL INTELIGENCE:

PROHIBITED USE: In this course, the use of Artificial Intelligence (AI) technologies is not permitted in any phase of gradable assignemnts. Any assignment that includes AI-generated content will be considered a breach of academic integrity and may result in a partial or total penalty in the activity grade, or more severe sanctions in serious cases.

OTHER CONSIDERATIONS

Attendance at practical sessions is mandatory.

Bibliography

Students will receive a complete list of specific bibliography and internet resources during the classes or via the Campus Virtual.

A laboratory manual with the experimental protocols to be developed during the module will also be available from the Campus Virtual.

Software

Not required

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLABm) Practical laboratories (master)	1	English	first semester	morning-mixed
(TEm) Theory (master)	1	English	first semester	morning-mixed