Universitat Autònoma de Barcelona

2019/2020

Methods and Techniques in Molecular Genetics

Code: 42926
ECTS Credits: 6

Degree	Type	Year	Semester
4313802 Advanced Genetics	OB	0	1

Contact

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Use of Languages

Principal working language: english (eng)

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 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)

Methodology

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.

At the end of the course, the student will elaborate a laboratory report with all the contents of the module.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Follow experimental protocols	54	2.16	
Type: Supervised			
General laboratory work	48	1.92	
Solve and discuss questions formulated during the experimental work	5	0.2	
Type: Autonomous			
Self-study	9	0.36	
Write a laboratory report	12	0.48	

Assessment

The final grade is composed of the following percentages:

-20% attendance, participation and laboratory skills.

-80% written document with an exhaustive description of all the laboratory exercicies developed in class. The document will also include the answer to some specific questions proposed by the teacher during the module.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Attendance, attitud and lab skills	20%	2	0.08	1, 5, 8, 10, 11, 12, 15, 14, 17, 9
Laboratory report	80%	20	0.8	2, 1, 3, 4, 13, 5, 6, 7, 8, 18, 10, 11, 12, 15, 14, 19, 17, 16, 9

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.