UNIVERSIDADE DA CORUÑA USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA Universidade de Vigo

Master in Chemical Research and Industrial Chemistry

MOLECULAR BIOLOGY

Course Guide

Course Guide

1. Subject description.

Character: Optional
Call: Quarterly
Credits: 3 ECTS

Teachers:

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Language: Spanish and/or english

2. Status and importance of the subject in the master.

2.1. Module to which the subject belongs. Related subjects.

Module 2.3: Chemical Biology. Is mainly related to the subjects of that module.

2.2. Role of the subject in this module and in the master.

This material contains basic and fundamental concepts of research methods on biological processes that are performed on living cells.

2.3. Prior knowledge (recommended / required) that students must possess to study the subject.

It is necessary to know the different kinds of biomolecules and the processes of information transfer and expression in cells.

3. Learning objectives and skills to be acquired by the student with the subject.

3.1. Learning Objectives.

- Understand the fundamentals for the isolation, cloning, expression and purification of proteins.
- Learn the basic techniques used for visualizing biological processes in cells.

3.2. General skills.

- Acquire knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context.
- The students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
- The students should communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialists people, clear and unambiguously.
- Students must possess the learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
- Identify information from scientific literature using appropriate channels and integrate such information to raise and contextualize a research topic.
- Use scientific terminology in English to discuss experimental results in the context of the chemical profession.
- Ensure proper implementation of new technologies to capture and organize information to solve problems in professional activity.

3.2. Specific skills.

- Define concepts, principles, theories and facts of the various specialized areas of chemistry.
- Suggest alternatives for solving complex of complex chemical problems from different chemical disciplines.
- Apply materials and biomolecules in innovative fields of industry and chemical engineering.
- Innovate in the methods of synthesis and chemical analysis related to different areas of chemistry.
- Promote innovation and entrepreneurship in the chemical industry and research.

3.3. Transversal skills.

Ability to work in groups on both the resolution and the discussion of problems.

4. Course content

TOPIC 1. DNA manipulation and sequencing.

1. Introduction

This topic will address the description of the main tools and methods to manipulate genetic information and to verify that the operations have been successful and have been performed as they were designed.

2. Content.

Restriction enzymes and cloning vectors, hybridization for detection of specific sequences, PCR, DNA sequencing.

3. Bibliography.

- Molecular Biology of the Cell fifth edition (2008). Alberts et al. Garland Science. Chapter 8.

- Molecular Biology fourth edition (2008). Robert F. Weaver. McGraw-Hill International Edition. Chapters 4 y 5.

4. Activities.

The students must solve case studies using the acquired knowledge. They will also read scientific articles related to the topic for their public exhibition.

TOPIC 2. Protein production and analysis tecniques

1. Introduction

In this topic, we will study how can we produce and purify proteins in the laboratory for study or to use their activity, their structure, etc., by using the techniques seen in topic 1.

2. Content.

Recombinant proteins, labeling of proteins, protein expression and purification, protein sequencing.

3. Bibliography.

- Molecular Biology of the Cell fifth edition (2008). Alberts et al. Garland Science. Chapter 8.

- Molecular Biology fourth edition (2008). Robert F. Weaver. McGraw-Hill International Edition. Chapters 4 y 5.

4. Activities.

The students must solve case studies using the acquired knowledge. They will also read scientific articles related to the topic for their public exhibition.

TOPIC 3. Visualization of biological processes.

1. Introduction

This topic describes the main methods for visualizing the biological structures and processes, both in vivo and in vitro.

2. Content.

Chemical markers, GFP and fluorescent fusion proteins, optical microscopy (confocal, super-resolution, real-time), electron microscopy.

3. Bibliography.

- Molecular Biology of the Cell fifth edition (2008). Alberts et al. Garland Science. Chapter 9.

4. Activities.

The students must solve case studies using the acquired knowledge. They will also read scientific articles related to the topic for their public exhibition.

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5.1. ECTS credits.

CLASSROOM WORK	HOURS	PERSONAL STUDENT WORK	HOURS
Lectures	12	Autonomous, individual or group study	20
Interactive classes in small group (seminars)	7	Solving exercises, or other work	24
Tutorials	2	Preparation of oral, written submissions, preparation of the exercises. Library work, etc.	10
Total classroom working hours	**21**	**Total hours of personal work**	**54**

5.2. Activities in the classroom with the teacher's presence.

A) *Lectures in large group ("L" in the timetables): Lecture that may have different formats (theory, problems and/or general examples...).*

B) *Interactive classes in small groups (seminars, "S" in the timetables): theoretical/ practical class in which problems and exercises are proposed and solved. It may also be proposed the public presentation of a topic related to the subject by the students.*

C) *Tutorials* ("T" in calendar): They are scheduled by the teacher and coordinated by the Centre. In general, each student will account for 2 hours per semester and subject. Monitoring activities, clarifying doubts about the theory, problems, exercises, readings or other proposed tasks are proposed. Attendance at these classes is mandatory.

5.3. Recommendations for the study

- It is very important to attend the lectures.

- **5.4. Calendar of Events.**

December 2014	Monday	Tuesday	Wednesday	Thursday	Friday
16-18 h	1	2	3	4	5
16-18 h	8	9	10	11	12
16-18 h	15	16	17	18	19

	Lectures
	Seminars
	Tutorials
	Bank holidays

6. Evaluation.

6.1. Evaluation procedure.

The evaluation will be done through continuous assessment and completion of a final exam. Access to the exam will be conditioned to participate in at least 80% of compulsory attendance activities (seminars and tutorials).

Continuous assessment (N1) will have a 40% weight and will consist of two components: seminars and tutorials. Seminars and tutorials will include the following: problem solving and case studies (15%), written reports (5%), oral exposure of proposed topics (10%), and oral questions throughout the classes (10%).

The final exam (N2) will cover all the contents of the subject.

The student's score, will never be less than the final exam score, or the score obtained by combining the final exam and the continuous evaluation, that will be done by applying the following formula:

Final Note = maximum (0.4xN1+ 0.6xN2, N2)

Being N1 the numerical score corresponding to the continuous assessment (0-10 scale) and N2 that of the final exam (0-10 scale).