Teaching guide

IDENTIFICATION DETAILS

Degree:	Biomedicine
Scope	Biology and Genetics
Faculty/School:	Experimental Sciences
Course:	EXPERIMENTATION METHODOLOGY III
Type:	Compulsory
ECTS credits:	6
Year:	3
Code:	2159
Teaching period:	Fifth-Sixth semester
Subject:	Biomedical Experimentation Methodology
Module:	Experimental Methodology in Biomedicine
Teaching type:	Classroom-based
Language:	Spanish/English
Total number of student study hours:	150

SUBJECT DESCRIPTION

A fundamental objective of the training program of the Degree in Biomedicine is the training of students to enter the world of work in the biomedical sector and, for this reason, we consider excellent practical training to be essential. The student's immersion in practical work in the laboratory will continue in third place through the subject of Methodology of Experimentation III. This course will establish and consolidate the theoretical-practical knowledge acquired throughout the course and will continue to lay foundations and principles that should govern biomedical research.

The subject of Methodology of Experimentation III belongs to the subject of Methodology of Biomedical Experimentation, which is taught throughout the 1st, 2nd, 3rd, 4th, 5th and 6th semesters. This is a compulsory, annual course of 7 ECTS that includes 2.5 ECTS of theoretical training in Basic Instrumental Techniques commonly used in a research laboratory in the field of Biomedicine and 4.5 ECTS practical in research

laboratories.
This course consists of three interrelated blocks: on the one hand, the theoretical part of the course will study the basis of in vivo imaging techniques, organotypic eukaryotic cultures, eukaryotic subcellular fractionation, programmed cell death analysis techniques, basic concepts of flow cytometry and key processes in the survival of eukaryotic cells, such as autophagy.
The second block corresponds to the practical part of the subject. In it, the student will learn techniques for embryonic chicken retinal dissection, organotypic culture, isolation of eukaryotic nuclei, TUNEL technique, analysis of apoptosis by flow cytometry and analysis of apoptosis by fluorescence microscopy. In addition to consolidating the concepts learned in the theoretical part, you will learn to design experimental approaches, review the bibliography and analyze results and infer conclusions derived from them. Both blocks will provide the student with solid theoretical-practical training in the basic techniques mentioned, as well as rigorous, critical and ethical scientific thinking.
The third block aims to develop and learn active techniques for communicating data and results at various levels: preparation of scientific posters as well as the acquisition of scientific communication skills at the informative level. Both tools are considered essential for the training of any researcher in the biomedical field, as well as for their professional competencies.

GOAL

OBJECTIVES

The purpose of the subject of Methodology of Experimentation III is to train students solidly in biomedical laboratory work both inside and outside the laboratory.
In addition, the aim is for students to understand the importance of critical thinking, ethics and scientific rigor and to develop skills such as observation, organization, work habits and rigorous communication.
The student will develop the interpretation and communication of the experimental results obtained at an informative and professional level.

The specific purposes of the course are:

- Develop safe work habits in the biomedical laboratory, learning the use of experimental animals in a safe, rigorous and ethical way and managing the biological waste generated.

- Develop a capacity for critical analysis of the results obtained in the laboratory, as well as learning to interpret these results based on the results obtained, discussion with colleagues and bibliography.

- Know how to apply the stages of the scientific method to experimental design, understanding the meaning of the different variables and controls.

- Understand and know how to perform the different dissection and culture techniques, subcellular fractionation techniques, analysis of cell viability and cell death and flow cytometry.

- Develop communication techniques essential for a research career both inside and outside the academic world.

PRIOR KNOWLEDGE

PREVIOUS KNOWLEDGE

Students who study Methodology of Experimentation III will obtain optimal use of the subject if they have the level of knowledge of the 1st and 2nd degree of Biomedicine for the subjects of Molecular and Developmental Genetics, Histology, Cell Biology, Embryology, Experimentation Methodology I and II and Biochemistry.

COURSE SYLLABUS

Block 1: CELL AND TISSUE ANALYSIS TECHNIQUES II: Organotypic culture, cell death analysis techniques: TUNEL technique, analysis of apoptosis by flow cytometry and by fluorescence microscopy.
Block 2: GENE EXPRESSION ANALYSIS TECHNIQUES: Laboratory techniques for carrying out classical, molecular and human genetic studies. Gene expression analysis: microarrays, RNASeq. Management of biomedical and pharmacological databases.
Block 3: GENOMIC DIAGNOSTIC TECHNIQUES
Block 5: IN VIVO IMAGING TECHNIQUES FOR PRECLINICAL STUDIES

EDUCATION ACTIVITIES

The various methodologies used are the following:
- Participatory master class that will be given by teachers in which the theoretical bases of the different techniques described in the contents will be explained.
- Practical classes in which the student will carry out experimental work in the laboratory. Two activities are included in this training activity:
1) Targeted practice on the detection of apoptosis in vertebrate retinas.
2) Targeted development of a scientific poster based on knowledge and the results of practice.
-Seminar on scientific communication at an academic and educational level given by communication experts at both levels.
-Seminar on autophagy given by an expert in the field.
- Tutorial action system: on a schedule previously established by the teachers, students will be able to answer any questions that the study of the subject may pose to them.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
67 Horas	83 Horas

LEARNING RESULTS

Understand and know how to apply molecular tools to the development of research projects and to the design of processes in biomedicine.

Understand the physico-chemical basis of instrumental techniques used in a biomedical experimentation laboratory.

Know the different laboratory instruments and materials (biological and non-biological) and their obtaining and handling for different purposes, observing the necessary safety principles.

SPECIFIC LEARNING RESULTS

Acquire safe work habits in the biomedical laboratory

Correctly identify and handle laboratory materials and equipment such as culture plates, incubators, magnifying glasses, ultracentrifuges and cytometers, among others, correctly and safely ||Organize a work plan in the laboratory appropriately.

Express the results in the form of graphs and use the statistics appropriately

Know and apply the methods of subcellular fragmentation, cytometry and fluorescence microscopy.

Communicate correctly and with scientific rigor oral experimental results in different fields.

Understand the physicochemical basis of in vivo imaging techniques

Understand sequencing techniques and methods of experimentation and analysis applied to structural and functional genomics.

LEARNING APPRAISAL SYSTEM

Attendance to practical laboratory classes will be a 'conditio sine qua non' for passing the subject.
- Evaluation of the theoretical content of the subject through oral or written tests with development, short answer or test-type questions: 35%.
- Implementation and evaluation of practical work: 55%. The examination of the practical content, in turn, consists of two parts:
1) Theoretical practical exam (20% of the block), through oral or written tests with development, short answer or test-type questions. It is mandatory to pass this exam to pass the internship.
2) Preparation of the scientific poster and its defense (80%). It is mandatory to approve this item to approve internships.
- Evaluation of scientific social communication works (10%).
Students who have passed the practical part and not the theoretical part are exempt from doing them in the second call.
Students in second or subsequent enrollment must contact the teacher to request to take advantage of this system.

The official exams will be carried out in person.
In the extraordinary call, the theory exam may vary in format with the ordinary call exam.
Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:
a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Bruce Alberts... [et al.]; with problems by John Wilson, Tim Hunt. Molecular biology of the cell/6th ed. New York: W.W. Norton & Company, 2015.
(Bruce Alberts... [et al.]; with problems by John Wilson, Tim Hunt. Molecular biology of the cell/6th ed. New York: W.W. Norton & Company, 2015. , ||Kalodimou, Vasiliki E. Basic principles in flow cytometry/Betheda (Maryland) :AABB, 2013.)