

# Teaching guide

## IDENTIFICATION DETAILS

Degree:	Biotechnology		
Scope	Biology and Genetics		
Faculty/School:	Experimental Sciences		
Course:	INTEGRATED LABORATORY II		
Type:	Compulsory	ECTS credits:	6
Year:	2	Code:	2028
Teaching period:	Fourth semester		
Subject:	Practicum		
Module:	Experimental Methods in Biotechnology		
Teaching type:	Classroom-based		
Language:	English		
Total number of student study hours:	150		

## SUBJECT DESCRIPTION

The Laboratory Course II aims to solidly train the student in the laboratory work in order to consolidate the degree's theoretical contents, as well as to facilitate the student's access to the job market.

The Laboratory Course II is a compulsory semester course that is taught during the second year of the Biotechnology Degree. This course is part of the Practicum subject, which belongs to the Experimental Methods in Biotechnology module.

Laboratory Course II will be performed in the University laboratories and has been designed as real-life, professional experimental situations, from the different subjects coursed during the 2nd year. The course is intended to provide students not only with the basic laboratory skills needed in a biotechnology or bioscience lab

but also to develop other personal aptitudes such as critical thinking, accuracy or teamwork, which are essential in research practice.

## GOAL

To develop competence in the management and development of basic laboratory techniques, acquiring the necessary skills in results assessment, organization and the practical application of theoretical concepts which cover various subjects.

The specific aims of the subject are:

Integrate all the techniques in the context of a scientific project

CRITICAL analysis of the results

Lab performance, organization and fulfilment of biosecurity rules

Presentation and public defense of experiments and results

## PRIOR KNOWLEDGE

The knowledge acquired during the previous degree courses is required for the Laboratory Course II

## COURSE SYLLABUS

1. Characterization of protein isoforms by Native conditions gel electrophoresis.
2. Identification of an unknown microorganism by phenotypic and genotypic analysis.
3. Detection of N-acyl-homoserin lactones (AHL) from Gram-negative bacteria by the agar diffusion assay.
4. Determination of the ability to form biofilms by bacteria
5. Determination of minimum inhibitory concentration of an antibiotic.
6. Protein purification, activity assay and SDS-gel electrophoresis.
7. Bacterial transformation by chemical method.
8. Isolation and purification of human genomic DNA.
9. Amplification of polymorphic loci by PCR technique

## EDUCATION ACTIVITIES

The Laboratory Course II will consist mainly of the performance of different laboratory experiments conducted by an instructor. These practical classes will be complemented by seminars and tutorials with the teacher. In addition,

all activities will be supported by the UFV's Virtual Classroom.

I. Expository teaching Introductory class of the subject

II. Seminars and tutorials: 2 pre-lab seminars will take place before starting the practical sessions. The objective of those seminars is to work out the protocols of each practical and to organize the time of these sessions. During these seminars, students will work cooperatively. A final seminar will take place after the practical sessions in order to solve questions related with the experiments and results. Moreover, upon the student's request and in the schedule established for this purpose, the teacher will answer questions and solve issues that might arise during the course, in order to guide the student throughout the learning process.

III. Practical classes. The students will perform experimental work in the laboratory using techniques and theoretical knowledge related to the contents of the second course of the degree in Biotechnology. For each experiment, a theoretical introduction, objective, materials and experimental procedures are explained by the students, according to the work done in the pre-lab seminars. During and after the completion of the practical sessions, the students are encouraged to describe and analyze the results obtained and to figure out some conclusions. This information must be written down in the Lab Notebook.

IV. Evaluation. The students will do a practical exam and a theoretical exam.

## DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
70 Horas	80 Horas

## SKILLS

### Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study.

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

To acquire firm theoretical, practical, technological and humanistic training needed to develop professional activity.

Capacity for teamwork and group management.

To have acquired the ability for analytical, synthetic, reflective, critical, theoretical and practical thought.

Capacity for problem-solving and decision-making.

To be able to plan time effectively.

To foster a concern for knowledge as a key tool in the personal and professional growth process of a student.

To develop capacity for and a commitment to learning and personal development.

To develop an ability to search for, take in, analyze, sum up and relate information.

To develop oral and written communication skills.

To understand the fundamental laws and principles of physics, mathematics, chemistry and biology as the foundation for the mental structure of a biotechnician.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

## **General Skills**

To acquire firm theoretical, practical, technological and humanistic training needed to develop professional activity.

Capacity for teamwork and group management.

To have acquired the ability for analytical, synthetic, reflective, critical, theoretical and practical thought.

Capacity for problem-solving and decision-making.

To be able to plan time effectively.

To foster a concern for knowledge as a key tool in the personal and professional growth process of a student.

To develop capacity for and a commitment to learning and personal development.

To develop an ability to search for, take in, analyze, sum up and relate information.

To develop oral and written communication skills.

To understand the fundamental laws and principles of physics, mathematics, chemistry and biology as the foundation for the mental structure of a biotechnician.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

### **Specific skills**

Understand the physical and mathematical basis of the basic instrumental techniques used in a biotechnological experimentation laboratory.

Know how to apply the most used instrumental techniques in a biotechnological experimentation laboratory: chromatography, electrophoresis, absorption, cytometry, purification and quantification of macromolecules, centrifugation, etc.

Work properly in a laboratory with biological material (bacteria, fungi, viruses, animal and plant cells, plants and animals) including safety, handling and disposal of biological waste.

Know how to properly design and execute an experimental protocol based on the theoretical knowledge of the various subjects.

Know and apply the general rules and principles of Safety and Health in laboratories.

Organize and plan the work in the laboratory correctly.

Identify and define laboratory instruments and materials.

Know how to describe, quantify, analyze and critically evaluate the results obtained from experimental work carried out in the laboratory.

Develop habits of rigorous thinking.

Ability to communicate the knowledge acquired orally and in writing.

Know how to apply the theoretical knowledge acquired to solving problems and practical cases related to different subjects.

Be able to self-evaluate the knowledge acquired.

Cultivate an attitude of intellectual concern and search for truth in all areas of life.

### **LEARNING RESULTS**

To develop safe working habits in the lab

To develop a notebook that allows for the tracking of experiments

To perform an enzymatic assay correctly and determine the kinetic parameters featuring an enzymatic reaction

To identify a microorganism by biochemical, metabolic and genetic characteristics for its subsequent identification and classification.

To perform nucleic acid isolation, purification and separation techniques correctly

To use techniques correctly in order to establish a bacteria's competence state

To carry out the horizontal gene transfer mechanism correctly

To carry out the PCR technique and identify different parameters that may affect the reaction||To apply the fundamentals and concepts achieved during the lab sessions in order to obtain the desired results

To apply the theoretical content to the practical work

To explain the results of theoretical and practical analysis, both orally and in writing

To be able to draw conclusions from the experimental results

## LEARNING APPRAISAL SYSTEM

The behaviors of plagiarism, as well as the use of illegitimate means in the evaluation tests, will be sanctioned in accordance with those established in the University's Evaluation Regulations and Coexistence Regulations.

**ORDINARY EVALUATION SYSTEM** Attendance to all practical sessions and seminars are both mandatory and indispensable so as to be eligible for the practical and theoretical examinations. Non-attendance to any of these sessions without corresponding valid justification will result in failing the course. Arriving two days more than 15 minutes or one day more than 30 minutes late to class, will count as a non-justified absence, implying not passing the course. This course will be passed by getting a grade equal or higher to 5 (out of 10) which could be obtained by:

1. Seminars work (10%).
2. Practical work (45%) This practical work will be assessed by a practical exercise at the end of the course. A minimum mark of 4.5 out of 10 must be obtained in each of these parts and, a minimum grade of 5 out of 10 will be necessary to consider the work for the global average.
3. Theoretical final exam (30%): A minimum grade of 5 out of 10 will be necessary to consider the work for the global average.
- 4- Oral communication (15%). A minimum grade of 5 out of 10 will be necessary to consider the work for the global average.

In the evaluation activities in which the opposite has not been specified, it will not be necessary to take a minimum grade. But, if after applying all the percentages the subject fails, the continuous assessment items may be recovered, optionally, asking some extra questions that assess those skills in the extraordinary call. The activities passed in the ordinary call will be saved for the extraordinary call during the same academic year but not for the following.

**ALTERNATIVE EVALUATION SYSTEM** The same percentages and contributions are maintained as in the ordinary evaluation. Students in 2nd or subsequent enrollments must do all the activities layed out in the ordinary evaluation system.

## 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/](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

Joseph Sambrook, Michael R. Green. Molecular cloning: a laboratory manual/4th ed. New York: Cold Spring Harbor Laboratory Press,2014.

D. Freifelder. Molecular biology and biochemistry: problems and applications/W.H. Freeman.