Universidad Francisco de Vitoria UFV Madrid

# Teaching guide

## IDENTIFICATION DETAILS

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|---|---|
| Degree: | Biotechnology |
| Field of Knowledge: | Science |
| Faculty/School: | Experimental Science |
| Course: | |
| Type: | Compulsory |
| ECTS credits: | 6 |
| Year: | 1 |
| Code: | 2018 |
| Teaching period: | Second semester |
| Area: | Work Placement |
| Module: | Experimental Methods in Biotechnology |
| Teaching type: | Classroom-based |
| Language: | English |
| Total number of student study hours: | 150 |

| Teaching staff | E-mail |
|---|---|
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## SUBJECT DESCRIPTION

The subject of Integrated Laboratory I aims to give students a solid training in lab work in order to provide them with a better access to the labour market, and also to further their theoretical education as a part of the degree

course.

Laboratory 1 Course is a compulsory semester course which comprises 150 hours and it is taught during the first year of the Biotechnology Degree. The course is part of the Practicum subject, which belongs to the Experimental Methods in Biotechnology module.

The lab work will be performed within the University labs and has been designed as real-life, professional experimental situations, from the different subjects taken during the 1st year.

The course is intended to provide the students not only with the basic laboratory skills needed in a biotechnology or bioscience lab, but also to develop other personal qualities among them such as critical thinking, accuracy and teamwork, which are essential in research practice.

## GOAL

To provide the students with the basic laboratory skills needed in a biotechnology or bioscience lab.
To show the relevance of critical thinking, accuracy and teamwork in research practice, developing abilities such as observation, organization and safe working habits.

The specific aims of the subject are:

Lab organization and biosecurity rules

Preparation of solutions and Buffers

Understand and perform biochemical techniques such as purification, quantification and analysis of different biomolecules.

Integrate all these techniques in the context of a scientific project.

Critial evaluation of the results

Presentation and public defense of the results

Team work with other lab mates

## PRIOR KNOWLEDGE

Laboratory 1 Course is designed as a practical complement to different theoretical subjects. Thus, the previous theoretical knowledge will be reinforced by practical experience that will give students their first contact in the laboratory transversely. Subjects such as Biology, Chemistry and Biochemistry are necessary to meet the objectives.

## COURSE SYLLABUS

1. General information on the program
2. Security and safety
3. Lab equipment and reagent orientation
4. The Lab Notebook
5. Solutions and Buffers: calculations and preparation
4. Carbohydrates: identification
5. Pigments: identification and quantification
6. Cell fractionation, DNA and proteins: extraction, quantification and analysis
7. Enzymatic activity
8. Other biomolecules (lipids, fatty acids, amino acids): purification, quantification and analysis
9. Scientific Method Project

## EDUCATION ACTIVITIES

Practical sessions preparation:
In advance to the practical sessions, the students will be handed a Lab Manual. For each experiment, a theoretical introduction, objective, materials and experimental procedures are detailed. In addition, Laboratory 1 Course Webpage will be available. This webpage will only be accessible to students who are enrolled in this course and is found within UFV´s Aula Virtual. This webpage functions as a supportive platform to the in-class sessions, providing the student with important information as well as additional material and support needed for his/her autonomous work. Furthermore, it facilitates permanent contact between the student and the professor by means of electronic tutorials, discussion forums, and more.

Practical sessions:
The students will perform experiments in the laboratory by applying techniques and previously acquired knowledge pertaining to the theoretical courses of the first year of the Biotechnology Degree. The students will be asked to discuss and draw conclusions from the results obtained as well as to solve practical issues in the laboratory notebook, both during and after completion of the experimental activity. During and after completion of the practical sessions, the students are expected to describe and analyze the obtained results and to come to significant conclusions. This material must be written down in the Lab Notebook.

Laboratory seminars:
In order to study and discuss the results obtained during the practical laboratory session, the professor will work along with the students in small groups.

Tutorials:
Upon the student´s request and in the schedule established for this purpose, the professor will answer questions and solve issues that might arise during the course, in order to guide the student throughout the learning process.

## DISTRIBUTION OF WORK TIME

| CLASSROOM-BASED ACTIVITY | INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY |
|---|---|
| 73 hours | 77 hours |
| Introduction to practical sessions 4h<br>Laboratory practical sessions 56h<br>Tutorials 4h<br>Laboratory seminars 4h<br>Exams 5h | Elaboration of practical tasks 9h<br>Theoretical and practical contents study 39h<br>Tutorial preparation 9h<br>Group work preparation 10h<br>Exam preparation 10h |

## 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

**General Skills**

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

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

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

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**

To work suitably in a laboratory with biological material (bacteria, fungi, viruses, animal and plant cells, plants and animals) and with regard to the safety, handling and disposal of biological waste.

To be able to design and suitably execute an experimental protocol based on theoretical knowledge in a host of subjects.

To be familiar with and apply the rules and general principles of health and safety in laboratories.

To organise and suitably plan work in the laboratory.

To identify and define laboratory instruments and materials.

To be able to describe, quantify, analyse and critically assess the results of experiments performed in the laboratory.

Capacity for written and oral communication of the knowledge acquired.

To be able to apply the theoretical knowledge acquired for solving problems and practical cases linked to the various subjects.

## LEARNING RESULTS

To acquire safe working habits in the laboratory.

To correctly identify and handle laboratory materials and devices, such as a pHmeter, a vortex shaker, a heating plate, a centrifuge, a spectrophotometer among others.

To properly organise and plan work in the laboratory.

To correctly prepare the dissolutions needed for the practical seasson.

To be able to draw graphs from experimental data obtained in the laboratory.

To calculate variable and parameters using the graphical method.

To correctly process cells and tissues in order to obtain preparations enriched with subcellular organelles.

To correctly use basic macromolecular extraction and identification techniques.

To correctly use the protein and nucleic acid quantification methods in a biological sample.

To apply the fundaments and concepts obtained during the practical sessions so as to obtain results.

To be able to draw conclusions from experimental results.

To communicate experimental results by oral presentaciones and written reports.

To be able to write and conduct a case-problem project following the Scientific Method (forming a hypothesis, prediction from the hypothesis, experimentation, evaluation and analysis of results).

## LEARNING APPRAISAL SYSTEM

Attendance to all practical sessions is mandatory. Non-attendance to any of the practical sessions without the corresponding justification will incur in not passing the course. This course will be passed by getting a grade equal of higher to 5 (out of 10) which could be obtained by:

1. Final practical exam: 35% (a minimum grade of 4 out of 10 or higher will be necessary to pass the course).
2. Final written exam: 30% (a minimum grade of 4 out of 10 or higher will be necessary to pass the course).
3. Oral communication of experimental results: 20% (a minimum grade of 4 out of 10 or higher will be necessary to pass the course).
4. Presentation of activities and handed-in questions: 15% (a minimum grade of 4 out of 10 or higher will be necessary to pass the course).

## BIBLIOGRAPHY AND OTHER RESOURCES

### Basic


Boyer, R. Modern Experimental Biochemistry. 3rd ed. San Francisco: Addison Wesley Longman; 2000.

Mathews, C. K. et al. Biochemistry. 3rd ed. San Francisco: Addison Wesley Longman; 2002.

Alberts, B. et al. Molecular Biology of the Cell. 5th ed. New York and London: Garland Science; 2007.

Farrel, S. O., Ranallo, E. T. Experiments in Biochemistry. USA: Thompson Learning; 2000.


### Additional


Petrucci, R. H. Química General. 8ª ed. Madrid: Pearson Prentice Hall; 2003.

Lozano, J.A., Tudela, J. Prácticas de Bioquímica: experimentación y simulación. Madrid: Síntesis; 1988.

Teijó Rivera J.M. Bioquímica estructural: conceptos y test. 2ª ed. Madrid: Tebar; 2001.

Wilson, K. and Walker, J. Principles and techniques of biochemistry and molecular biology. 7th edn. Cambridge University. 2010