Teaching guide

IDENTIFICATION DETAILS

Degree:	Biotechnology
Field of Knowledge:	Science
Faculty/School:	Experimental Science
Course:	INTEGRATED LABORATORY II
Type:	Compulsory
ECTS credits:	6
Year:	2
Code:	2028
Teaching period:	Fourth semester
Area:	Work Placement
Module:	Experimental Methods in Biotechnology
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	150

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SUBJECT DESCRIPTION

The Laboratory Course II aims to solidly train the student in the laboratory work in order to consolidate the degree's theorical 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 the 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. 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(-) bacteria, by the agar diffusion assay. 4. Determination of the ability to form biofilms 5. Determination of minimum inhibitory concentration of an antibiotic. 6. Protein purification. Activity assay. 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 on 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 Aula Virtual.
I. Expository teaching Introductory class of the subjet
II. Seminars and tutorials: 2 pre-lab seminars will take held 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 held 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 obtained results 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

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
70 hours	80 hours
Expository teaching Seminars and tutorials Practical classes Evaluation	Autonomous work Virtual work

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.

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, analyse, 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

To understand the mathematical and physical foundations of the basic instrumental techniques of use in a biotechnology experimentation laboratory.

To be able to apply the most widely used instrumental techniques in a biotechnology experimentation laboratory: chromatography, electrophoresis, absorption, cytometry, purification and quantification of macromolecules, centrifugation, etc.

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.

To be able to approach a subject by means of rigorous, profound and comprehensive thought.

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.

To be able to assess the knowledge acquired.

To nurture an attitude of intellectual curiosity and a quest for truth in all areas of life.

LEARNING RESULTS

To develop safe working habits in the lab

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

To identify a microorganism’s 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

To develop a notebook that allows for the tracking of experiments

To apply the fundaments and concepts achieved during the lab sessions in order to obtain the desired results

To be able to draw conclusions from the experimental results

To apply the theoretical content to the practical work

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

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, impliying 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%) The work done during the seminars will be evaluated by a specific rubric.
2. Practical work (45%) This practical work will be assessed by a practical exercise at the end of the course. The practical exercise will take into account the work undertaken and results achieved in the laboratory (20%) and the submission of a final report on the experiment (25%). 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%): This will be carried out at the end of the course and will comprise questions and problems related the practical laboratory sessions. A minimum grade of 5 out of 10 will be necessary to consider the work for the global average.
4- Oral communication (15%). During the practical sessions, the students will have to explain the protocols to their classmates, as well as the obtained results. 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 recover, 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.

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.