VNIVERSITAT DE VALÈNCIA

Course Guide
33181 Integrated internship methods in cellular and molecular biology

COURSE DATA

Data Subject	
Code	33181
Name	Integrated internship methods in cellular and molecular biology
Cycle	Grade
ECTS Credits	4.5
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	3	Second term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	86 - Cellular and molecular methodology	Obligatory

Coordination

Name	Department
HERRERO SENDRA, SALVADOR	194 - Genetics

SUMMARY

This course aims to provide students with an integration of previously acquired knowledge in subjects such as Molecular Biology, Molecular Genetics, Methods in Biochemistry and Molecular Biology, Methods in Molecular Biology and Genetic Engineering and generation of transgenic organism.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

There are no previous requirements but is highly recommended to study or have studied the subjects of Molecular Biology (33174) and Methods in Molecular Biology and Genetic Engineering (33178). It is also advisable to take or have taken the subjects of Cellular Technology (33180) and OTransgenic Organism Acquisition (33182).

OUTCOMES

1102 - Degree in Biotechnology

- Design protocols for the separation, purification and characterisation of biological molecules.
- Properly handle the equipment and material of a biochemistry and molecular biology laboratory.
- Be able to use recombinant DNA techniques and design protocols.
- Know how to use immunological techniques in qualitative and quantitative tests.
- Saber utilizar las técnicas microscópicas en sus distintas aplicaciones.
- Know how to grow and maintain cells in vitro.
- Saber diseñar y construir un organismo transgénico.

LEARNING OUTCOMES

It is intended that students integrate the knowledge acquired on Molecular and Cellular methodologies across all subjects studied during the first 3-year of the degree in Biotechnology. A key objective is that students have to be able to solve a problem as well as design experimental strategy (including the use of reagents and protocols) using the information available in books, catalogs and other experimental resources.

DESCRIPTION OF CONTENTS

1. Introduction and monitoring

Sessions prior to start the work in the laboratory:
Students approach the problem to be solved experimentally and the method of work followed during the development of the subject.
Students present in groups the experimental strategy to tackle the problem that is proposed. After a period of discussion students have to create the final protocol
Subsequent sessions to work in the laboratory:
Presentation and discussion of final results. Carrying out a questionnaire regarding fundamental aspects that must have been assimilated.

2. Laboratory of genetics

-Separation of digestion fragments from agarose gel and subsequent purification.
-Ligation reaction and transformation of E. coli.
-Colony-PCR to identify positive clones.
-Extraction of plasmid DNA from the positive colonies.
-Confirmation of positive clones by digestion with restriction enzymes.
-Quantification of DNA and preparation for transfection.

3. laboratory of Cell Biology

- Cell culture of mammalian cells, spreading of the cells to be transfect
- Transfection of mammalian cells with the plasmids obtained in the thematic unit 2.
- Double immunofluorescence to detect expression and subcellular distribution of luciferase and GFP
- Analysis of results from the fluorescence microscopy experiments.

4. Laboratory of Biochemistry

- Collection cell extracts.
- Preparation of polyacrylamide gel.
- Measurement of luciferase activity.
- Electrophoresis, transfer, blocking and antigen detection.
- Representation of the luciferase activity results

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	36,00	100
Theory classes	9,00	100
Development of group work	25,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**110,00**	

TEACHING METHODOLOGY

Most of the contents are transmitted by practical lectures that seek a high degree of autonomy in the design and development of the experiments.

EVALUATION

In this course assessment of the learning is based on the following sections:

1. Preparation and presentation of an initial proposal of an experimental procedure to follow. This activity will score a maximum of 1 point
2. The development of a laboratory notebook in which students will explain their work along the practice sessions as well as any incident and outcome to be found. This activity will score a maximum of 2 points
3. The resolution of an exam in which students should demonstrate their knowledge about the experiments carried out in the laboratory and their analysis. Besides, they should be able to compare their studies with other similar published in a research paper that will be previously provided for their consideration. This activity will score a maximum of 7 points.

The final grade for the course will be the weighted sum of the four sections listed above. It is mandatory that the student has attended all classroom and laboratory sessions, the score of 5 or higher (out of 10) for the section 3 and none of the other two notes has to be lower than 4 (out of 10).

REFERENCES

Basic

- PRIMROSE S.B. y TWYMAN R.M. (2006). "Principles of gene manipulation and Genomics." 7ª ed. Blackwell Publishing.
- GREEN, M.R. y SAMBROOK,J. (2012). Molecular Cloning. A laboratory manual. 4ª ed. Cold Spring Harbor Laboratory Press (3 volúmenes).

Additional

- BROWN, T.A. (2011). Gene cloning and DNA analysis. An introduction. 6ª ediction. Ed Blackwell Science
- GLICK, B.R. y PASTERNAK, J.J. (2010). Molecular Biotechnology. Principles and applications of recombinant DNA. 4ª Ed. ASM Press.
- GLOVER D. M. y HAMES B.D. (1995). DNA cloning (vol 1, 2, 3, 4). A practical approach. IRL Perss
- IZQUIERDO, M. (1999). Ingeniería genética y transferencia génica. Ed. Pirámide
- LUQUE, J. y HERRAEZ, A. (2001) Biología Molecular e Ingeniería Genética. Harcourt.
- WATSON, J.D.; GILMAN, M.; WITKOWSKI, J. y ZOLLER, M. (1992). "Recombinant DNA". 2a ed. Scientific American Books.
- WINNACKER E.L. (ed.) (1987). "From genes to clones". VCH.
- AUSUBEL, F.M. et al. (1987-97). Current protocols in Molecular Biology. John Wiley & sons.

- BIRREN ET AL. (1999). Genome analysis. 4 Volúmenes. Cold Spring Harb. Lab.Press
- KREUZER, H. y MASSEY, A. (1996). Recombinant DNA and Biotechnology. A guide for teachers. ASM Press.
- PERERA, J., TORMO, A. y GARCIA J.L. (2002). Ingeniería genética. Vol.I. y Vol II. Ed. Síntesis.
- DIEFFENBACH, C.W. y DVEKSLER, G.S. (1995). PCR primer. A laboratory manual. Cold Spring Harbor.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The need for non-face-to-face teaching forces not to be able to carry out the experiments planned in the Genetics (9 hours), Cell Biology (9 hours) and Biochemistry (9 hours) Laboratories, although the contents set within each of them. The aim of the teaching staff, if the University and the Center make it possible, would be to carry out these experiments when possible in a reduced version.

Volume of work and temporary planning of teaching

The workload has not been modified, but the activities planned in the laboratory have been transformed by other types of tasks, as will be pointed out in the Methodology block. Temporary planning has been modified, extending these activities in a longer time than the laboratory sessions in order to facilitate the planning of their work for the students.

Teaching methodology

The teaching guide establishes that "Most of the content is represented by practical classes, in which a high degree of autonomy is sought in the design and development of experiments." In order to largely maintain student learning, laboratory classes must be replaced by autonomous work at home. This work consists of the study of material prepared by the teaching staff. This includes presentations that describe, in detail, the experimental procedures that would have been carried out in the laboratory, their basis and possible alternatives to them, along with links to videos that show these methodologies in the most complex cases. In addition, various questions are asked so that, from results similar to those that would have been obtained in laboratories, the students can carry out relevant calculations and interpret data. During the development of this activity, teachers will be available for tutoring through a virtual classroom.

In a subject of this nature, with 36 hours (of the 45 defined) of laboratory these tasks and activities cannot substitute the learning that the students can achieve by carrying out the experiments. We understand that it is not feasible, for organizational reasons, to transfer the subject to the next academic year. However, we consider that it is essential that this promotion of students can carry out the practical classes initially planned, even if it is intensive and without reflection on the grade, when they can recover face-to-face teaching (either at the end of this academic year or at the beginning of the next one). We ask for this the support in terms of availability of resources and spaces from the University of Valencia, the Faculty of Biological Sciences, the departments involved in this teaching and the CAT of Biotechnology.

Evaluation

The evaluation of the subject is based, according to the current teaching guide, on three components:

1. Preparation and presentation of an initial experimental proposal. This activity has a value of 1 point in the final grade of the subject

2. The preparation of a laboratory notebook, where the students explain their work throughout each one of the practical sessions, as well as any incidence and result that they find. This activity has a value of 2 points.

3. The resolution of an exam, in which the students must demonstrate their knowledge of the experiments carried out in the laboratory classes and their interpretation, as well as their comparison with similar studies published in a research article that is provided for analysis previously. This activity has a value of 7 points.

The first component is maintained as an evaluation criterion, since all the students were able to elaborate and present the experimental proposal in due time and form. However, considering the effort of the students in this activity, we consider it appropriate to increase its value in the final grade.

Regarding the second aspect, the laboratory notebook, cannot be taken into account in the evaluation since any group of students has been able to complete the laboratory sessions. This evaluable activity is replaced by questions that the students have to develop from the material on experimental procedures that are available to them in the virtual classroom. Also the value of this activity is increased in the final grade at the expense of the exam.

The third component, the exam, remains as a final test of the knowledge acquired by the student body, although it will have a lower value in the grade and will be carried out, under the circumstances, with all the considerations and precautions necessary to guarantee that the students obtain a fair grade. Therefore, the evaluation is as follows:

1. Preparation and presentation of an initial experimental proposal: 2 points.

2. Resolution of questions about the experimental procedure: 3 points.

3. Exam: 5 points

Literature

No modification has been made