VNIVERSITAT DE VALÈNCIA

Course Guide
33180 Cellular technology

COURSE DATA

Data Subject	
Code	33180
Name	Cellular technology
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	First term

Subject-matter

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

Coordination

Name	Department
BLASCO IBAÑEZ, JOSE MIGUEL	21 - Cellular Biology and Parasitology
CRESPO RUPEREZ, CARLOS	21 - Cellular Biology and Parasitology
VAREA LOPEZ, EMILIO	21 - Cellular Biology and Parasitology

SUMMARY

“Cellular Technologies” is a subject that is part of the module “Instrumental Methods in Biotechnology” within the Area of “Cellular and Molecular Methods”. This subject is taught in the third degree courses in Biotechnology and is mandatory. Like all the subjects in the Matter of Cellular and Molecular Methods, “Cellular Technologies” is clearly methodological and provides a broad overview of the main techniques used in Cell Biology for handling and mark cells. Given that the other subjects of this module have molecular approach, the course of “Cellular Technologies” give an approach that is more focused on issues that deal with direct microscopic analysis of cells.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

OUTCOMES

1102 - Degree in Biotechnology

- 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.

LEARNING OUTCOMES

General objectives proposed in this subject:

Knowing the tools that allow the manipulation of cells.

Studying the techniques of cell culture.

Analysing the microscopic techniques and their different applications

DESCRIPTION OF CONTENTS

1. CONVENCIONAL LIGHT MICROSCOPY

Introduction. Theory of image formation with converging lenses. Optical aberrations of the lenses. The Light microscope. Brightfield microscopy.

2. NON-CONVENTIONAL LIGHT MICROSCOPY

Darkfield microscopy. Phase contrast microscopy. Interference contrast microscopy, optical Nomarsky. Polarized light microscopy

3. FLUORESCENCE MICROSCOPY

Confocal microscopy. Two-photon microscopy

4. ELECTRON MICROSCOPY

Introduction. Elements of the transmission electron microscope. Image formation in the electron microscope.

5. SAMPLE PROCESSING

Sample processing for light and transmission electron microscopy. Fixing and manipulation of biological samples. Embedding and sectioning.

6. CELL LABELING TECHNIQUES

The overall process of staining of biological material. Dyes. Staining of fixed cells and living cells.

7. HISTOCHEMICAL LABELING TECHNIQUES

Detection of intracellular carbohydrates, lipids, nucleic acids and metals. Detection of enzymatic activities in the cells: histoenzymology.

8. IMMUNOCYTOCHEMICAL LABELING TECHNIQUES

Fundamentals and applications. Detection and localization of antigens at the subcellular level.

9. AUTORADIOGRAPHICAL LABELING TECHNIQUES

Pulse-chase experiments for the detection of cellular activity and for tracking of metabolic processes. Radioligands and receptor study.

10. CELL CULTURES

Cultures types. Primary cell cultures and organotypical cultures. Cell lines. Applications.

11. CELL ANALYSIS TECHNIQUES

Flow cytometry. Applications.

12. CELL MANAGING

Patch-clamp techniques. Intracellular injection of markers in both live and fixed cells. Extracellular injections of tracers. Reporters. Genetically modified organisms.

13. PRACTICES

PRACTICE 1: Cell Cultures I. Cell lines.
PRACTICE 2: Cell cultures II. Primary cell cultures and explants
PRACTICE 3: Fixation
PRACTICE 4: Embedding and sectioning
PRACTICE 5: Stainings and analysis

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	25,00	100
Laboratory practices	15,00	100
Tutorials	2,00	100
Development of group work	8,00	0
Preparation of evaluation activities	25,00	0
Preparing lectures	25,00	0
Preparation of practical classes and problem	9,00	0
TOTAL	**109,00**	

TEACHING METHODOLOGY

The acquisition of knowledge by the student, will be based on four topics:

1. Theory classes.

Theory classes consist of one hour classroom sessions where the teacher orally transmitted knowledge of the subject to the student. This transmission is supported at all times of the materials the teacher deems appropriate for each topic. In the lectures, the teacher will encourage student participation by asking questions or approach issues and questions arising out of debate. Virtual Classroom will be used as a tool where the teacher can provide students with all learning materials it deems appropriate to supplement the lectures.

2. Practical classes.

Practical classes will consist of laboratory sessions of three hours in which students work and learn the methodology needed for cell manipulation and analysis. All kinds of practices are closely related and allow adequate visualization of the work in the laboratory of cell biology, from the collection of samples, processing, staining, and finally his observation-study using optical or confocal microscope.

3. Seminars.

The seminars in this subject arise as follows. Students in small groups prepare a seminar on a topic related to the subject that the teacher proposes to the beginning of the course. To do this, they will always have the help of the teacher. Finally, it will be a two hour sessions where students from each group will present orally the seminar who prepared the rest of students.

4. Student's class work.

Should be considered as all the work that the student engaged in the preparation of the course regardless of attendance at lectures, practicals, seminars, tutorials and exams. Includes various activities. On one side are the hours of study each week to be spent to expand and consolidate the knowledge acquired in the classroom and in practice. It also includes additional work that the teacher can plan for the student to perform throughout the semester to supplement the lectures and practices (answering questionnaires, editing pictures or diagrams that provide the teacher on some issues, present written work, conduct literature searches ...). All this extra work may arise in some cases as individual work and in others as a collective work to be done in small groups.

EVALUATION

To evaluate the knowledge acquired in the course, students will conduct a written test raising questions of both the topics covered in the lectures and practices undertaken during the course. To pass the course, students must get a minimum of 5 out of 10 in this test. This test will count 90% in the final grade for the course, 10% of the grade correspond to the seminar.

REFERENCES

Basic

- García del Moral, R. (1993) Laboratorio de Anatomía Patológica. Interamericana. Madrid.

- Peinado M.A. y cols. (1996) Avances en inmunocitoquímica y técnicas relacionadas. Servicio de Publicaciones de la Universidad de Jaén.
- Bozzola J.J. y Russell L.D. (1992) Electron microscopy: principles and techniques for biologists. Jones and Bartlett (eds.), Boston

Additional

- Alberts et al. (2008) Molecular Biology of the Cell. 5th. ed, Garland Pub.
- Sampedro, A. et al (1995) Técnicas de fluorescencia en microscopía y citometría. Servicio de Publicaciones de la Universidad de Oviedo.
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- Mercer, E.H., Birbeck, M.S.C. (1974). Manual de microscopía electrónica para biólogos. Ed Blume, Madrid.
- McManus, J.F.A. and Mowry, R.W. (1968) Técnica histológica. Ed. Atika, Madrid.
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- Kiernan, J.A. (1999) Histological and Histochemical Methods: Theory and Practice. Butterworth Heinemann, Oxford.
- Lacey, A.J. (1989) Light microscopy in biology: a practical approach. IRL Press, Oxford.
- Cuello (1985). Immunohistochemistry. John Wiley & Sons, New York.
- Burck, H.C. (1969). Técnica histológica. Ed. Paz Montalbo. Madrid.
- Journal of histochemistry and cytochemistry. Williams and Wilkins (eds.), Baltimore. (publicación mensual)
- Journal of microscopy. Official journal of the International Society for Stereology Royal Microscopical Society. Blackwell Scientific Publications, Oxford. (publicación mensual)
- Durfort, M. et al. (1990). La fixació (cinta de video). Publicaciones de la Universidad de Barcelona
- Durfort, M. et al. (1990). La tinció (cinta de video). Publicaciones de la Universidad de Barcelona.
- Durfort, M. et al. (1990). La microtomía (cinta de video). Publicaciones de la Universidad de Barcelona
- http://www.citometriadeflujo.com/ (citometría de flujo)

- http://www.cellsalive.com/enhance0.htm (microscopía)
- http://www.histology-world.com/ (tinción de tejidos)

ADDENDUM COVID-19

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

English version is not available