Syllabus

Edition 2016-17

1. SUBJECT DESCRIPTION

Degree:	**Biotechnology**
Course:	**Cell Biology**
Department:	**Physiology, Anatomy and Cell Biology**
Year:	**2016-17**
Semester:	**1st semester (fall semester)**
ECTS credits:	**6**
Course:	**1st year**
Type:	**Basic**
Language:	**English**

Model:	**B1**
a. Basic Teaching (BT):	**60%**
b. Practices (PT):	**40%**
c. Guided Academic Activities (AD):	

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2. Professor

2.1. Coordinator: J uan Carlos Rodriguez Aguilera

2.2. Teachers	
Name:	**J uan Carlos Rodriguez Aguilera**
School:	**Experimental Sciences**
Department:	**Physiology, Anatomy and Cell Biology**
Area:	**Cell Biology**
Category:	**Senior Lecturer**
Office hours:	**Wednesdays and Fridays 11:30-14:30. Previous appointment required**
Office:	**Building 21; Office 1.07**
E-mail:	**jcrodagu@upo.es**
Phone:	**954 349380**

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3. TRAINING PLAN

3.1. Goals

- To know the basic structure and function of the eukaryotic cells
- To understand the functional interaction among different cell organelles
- To envisage the response mechanisms of the cell against external stimuli

3.2. Contribution to training plan

This course is included in the training module *Fundamentals of Biology, Microbiology and Genetics* of the degree in Biotechnology. This module contains the introduction to the complexity of the structural and functional design of living organisms (from microorganisms to higher organisms: animals and plants) and the basic properties of these organisms in their energy maintenance and reproduction.

This course provides to the students the essentials for understanding the structures and functions of the cells, tissues and organs of animals and plants. The training received in this course is the basis for other courses along the grade, such as *Plant Physiology*, *Animal Physiology*, *Plant Biotechnology*, *Animal Biotechnology*, or *Cell Culture.*

3.3. Recommendations or previous knowledge required

Essential: previous knowledge of the concept of cell and its structure.

Recommended: basic computer skills (use of any *Office-like* suite and Internet browsing)

This course is not a language course*. At least B1 level of English is needed to follow this course properly, although B2 level is strongly recommended. In all written tests (exams and quizzes) minimal grammatical and vocabulary competence is essential (B1 level).*

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4. COMPETENCES

4.1 Degree competences developed within this subject

- Analysis and synthesis skills
- Information management
- Communication skills: improvement on speech and writing performance

4.2 Course competences to be developed

- Professional skills
  - Improvement of computer information management
  - Scheduling and time management

- Attitudes
  - Criticism ability
  - Scientific judgement
  - Proper proceedings in a biological, chemical or biochemical laboratory; techniques related with health and safety

4.3. Subject-specific competences to be developed

- a) Cognitive skills (to know):
  - To understand the concept of cell organization
  - To know the different cell structures and their functions.
  - To know the molecules and structures involved in the relationship between the cell and the environment and the mechanisms supporting these interactions.
  - To understand the eukaryotic cell cycle, its regulation and the molecular mechanisms involved.

- b) Instrumental skills (to know-how)
  - To learn how to observe cells through the optic and fluorescence microscopes and to distinguish subcellular structures.
  - To fractionate the cell structures
  - To identify the different phases of mitosis under the microscope.
  - To be able to perform cell counting and viability assays.
  - To develop basic skills in handling the cell biology lab equipment

- c) Attitudinal skills
  - Autonomous learning
  - Applying theoretical concepts to practice.

5. CONTENTS (Topics)

LECTURES

1. *CELL COMPARTMENTS*. Structure of membranes: properties and functions. The fluid mosaic model. Main proteins at the cell membrane. Cell surface: membrane carbohydrates. Selective transport across membranes: simple diffusion, passive and active transport.

2. *CELLULAR INFORMATION MANAGEMENT*. Nucleus keeps DNA secure. Nuclear envelope and nuclear pores enable two-way communication with the cytosol.

3. *INTRACELLULAR TRAFFIC*. Protein traffic through the endomembrane system. From protein quality control at endoplasmic reticulum to protein delivery at Golgi apparatus. Protein tagging and turnover. Control of secretory and endocytic vesicles. Endosomes, lysosomes, membrane recycle.

4. *FUELING THE CELL*. Mitochondrial membranes are designed to use of oxygen safely. Main bioenergetics processes take place inside mitochondrial compartments. Oxygen under control to produce energy: respiratory chain, ATP synthesis and also heat production. Oxygen out of control generates free radicals and cell damage.

5. *CELLULAR MOVEMENTS*. The cytoskeleton supports cellular structures with three different components: actin, tubulin and filaments. Polymerization and depolymerization control. Cell movement: crawling, cilia and flagella.

6. *CELL SIGNALLING*. Cell signaling basic principles. Intracellular receptors. Cell surface receptors: channels, G protein and enzyme associated receptors. Signals integration. Cellular responses to external stimuli.

7. *CELL RENEWAL*. Cellular proliferation is a strictly controlled process: cell cycle control and checkpoints. Distribution of the cellular information (mitosis) and its control. Distribution of the cellular resources: cytokinesis. Cell survival and cell death: apoptosis.

PRACTICES

Sessions may include the use of permanent dyes, and hazardous or toxic substances, thus lab coat use is always advised:

- *MICROSCOPY.* Fundamentals of light and electron microscopy. Observation of samples under the light microscope.
- *LAB TRAINING ESENTIALS.* Handling and dispensing liquids. How to properly use pipetting devices.
- *THE IMPORTANCE OF PLASMA ELECTROLYTIC COMPOSITION*. Alterations of plasma membrane ionic equilibrium and its consequences on cell structure.
- *CASE STUDY I.* Searching in scientific databases.
- *CELL FRACTIONATION I.* Isolation of subcellular components of biological samples. Different methods used in cell fractionation.
- *CASE STUDY II*. Cell pathology.
- *CELL FRACTIONATION II*. Cytochemical markers, purity and enrichment calculations.

6. METODOLOGY AND RESOURCES

This course accounts for 6 ECTS credits (i.e. 150 hours) distributed as follows:

Activities	In-class (session hours)	Off-class (homework hours)	Evaluation (exam and online quizzes)	TOTAL
Basic	27	90	15	
Practice	18			
TOTAL	**45**	**90**	**15**	**150**

a) Basic teaching

Basic teaching focuses on the theoretical principles of Cell Biology. Computer presentations will be used to reinforce the understanding of the concepts to be learnt. The lecturer will solve the questions and doubts raised during the classes.

These will cover the main aspects of the topics, paying attention to the most complex concepts. Session dynamics include frequent student interaction and problem-solving proposals. Some of these, and also others not covered by basic teaching sessions, may be proposed as homework.

Attendance to basic teaching sessions is voluntary.

b) Practices

During the sessions, the lecturer will make a brief introduction to the goals of the session and the methodology to be used. The student will get related to laboratory techniques and different pieces of equipment. Students will obtain their own results, and learn from the conclusions from the experiments.

These conclusions include experimental work in the lab sessions, and related non-experimental tasks as homework.

Attendance to these sessions is compulsory unless absence is properly justified (written evidences may be required).

c) Timing

Adequate time management is essential. Thus, this subject is scheduled as described hereafter:

c1) Basic teaching sessions will take 27 hours (one hour per session, indicated Mon. & Tue. at noon, classroom E24A101):

- 1 kick-off session, for presentation and introduction to course rules
- 26 sessions to go through four monthly topics along the academic fall semester

Week	Wednesday	Thursday	Topic
1	12/09/2016	13/09/2016	Kick-off & Topic#1
2	19/09/2016	20/09/2016	Topic # 1
3	26/09/2016	27/09/2016	Topic # 2
4	03/10/2016	04/10/2016	Topic # 2-3
5	10/10/2016	11/10/2016	Topic # 3
6	17/10/2016	18/10/2016	Topic # 3
7	24/10/2016	25/10/2016	Topic # 4
8	30/10/2016		Topic # 4
9	07/11/2016	08/11/2016	Topic # 5
10	14/11/2016	15/11/2016	Topic # 5
11	21/11/2016	22/11/2016	Topic # 6
12	28/11/2016	30/11/2016	Topic # 6-7
14	12/12/2016	13/12/2016	Topic # 7
15	19/12/2016	20/12/2016	Topic # 7

c2) Practical teaching sessions will take 18 hours. There will be six lab sessions (3 hours each). Lab sessions will take place on indicated Mondays at 9:00 am (laboratory 23.B.04 / 23.B.05).

Week	Lab sessions	
#3	26/09/2015	Lab 23.B.05
#5	10/10/2015	Lab 23.B.05
#6	17/10/2015	to be determined
#8	07/11/2015	Lab 23.B.04
#7	21/11/2015	to be determined
#14	12/12/2015	Lab 23.B.04

d) Homework and office hours

Homework is evaluated by uploading to the Virtual Campus tool. Announcements, grades, schedules or homework deadlines will also be run through this web-based learning tool.

Office hours are intended for additional student assistance; this can be either at the office (during office hours only) or on-line. However, in any case *previous appointment is always required*.

e) Tips for successful course completion.

• Before each session, please revise the key topic aspects and resources that are available online, search documentation list

• During the sessions, all doubts should be clarified addressing your questions. Try to obtain the most from the professor's time dedicated to in-class sessions

• After the sessions, perform your topic reports and revise them through a brief study

• Try to *understand* the biological processes that are covered in all the topics, avoiding memorization of doubts or unclear concepts

• Keep your timing as strict as possible

• Professors can be reached along the semester either by e-mail, by phone or at the office (office hours, appointment required). Online sessions are available (office hours, appointment required, by invitation only).

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7. EVALUATION

According to University regulations, all written contents in homework, exams and quizzes must be original. Illegal copying will be prosecuted and may lead to a fail in the final mark.

The total score of this course is distributed as follows:

a) Basic teaching (70% of the overall course score)
This component will be evaluated by a written exam (Friday, January 15th 2016, timing and classroom to be determined) and online topic-specific quizzes.

- The exam *(60% of the overall course score)* will contain questions falling within these categories:

  - **Short answer**
  - Pair matching
  - Combinations
  - Fill-in blanks
  - Multiple choice
  - True/False
  - **Problem solving**

- Topic-specific quizzes *(10% of the overall course score)* will contain questions falling within these categories:

  - Short answer
  - Problem solving

b) Practices (30% of the overall course score)

Evaluation of these in-class sessions will be based mainly on online quizzes (30% of the overall course score)

The quizzes will contain questions falling within one of these categories:

- Short answer
- Long answer

- Calculated answer
- Pair matching
- Combinations
- Fill-in blanks
- Scrambled answers
- Multiple choice
- True/False
- Problem-solving

In all written tests (reports, exams and quizzes) minimal grammatical and vocabulary competence will be required (B1 level).

Basic teaching and practices must be passed separately. A minimum of 5 points out of 10 must be obtained in each section in order to access to the weighted score (70%+30%). Fail to reach this minimum score leads to the resit exam.

According to University regulations, those students failing the course will have a resit exam (June 14th 2016) with full score opportunities. The resit exam accounts up to 100% of the overall course score. The exam will contain questions falling into one of these categories:

- Basic teaching
- Practices

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8. RECOMMENDED LITERATURE

Title	Authors	Editorial	Year
Molecular biology of the cell (6th Ed.) ISBN 9780815345244	**Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter**	**Garland Science**	**2015**
Molecular biology of the cell (5th Ed.) ISBN 9780815341062	Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter	Garland Science	2007