Syllabus

Edition 2017-18

1. SUBJECT DESCRIPTION

Degree:	**Biotechnology**
Course:	**Cell Biology**
Department:	**Physiology, Anatomy and Cell Biology**
Year:	**2017-18**
Semester:	**1st semester (fall semester)**
ECTS credits:	**6**
Course:	**1st year**
Type:	**Basic**
Language:	**English**

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

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2. Professors

2.1. Coordinator: J uan Carlos Rodriguez Aguilera

2.2. Instructors	
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 10:30-13:30. Previous appointment required**
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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 (GBTG)*. 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, including main organelles and functions.

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

This course is not a language course*. At least B1 level of English language 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. SKILLS

Skills to be developed and graded within this course (taken from GBTG description)

- 4.1 Basic and generic skills
  - CB1. To demonstrate proper understanding of high-school-level essentials for this course.
  - CG3. To improve proper use of scientific terms in academic activities including scientific analysis and synthesis.
  - CG6. To show proper proceedings in lab safety and proper basic handling skills using lab equipment.
  - CG9. To understand management of scientific information using scientific databases, scientific papers and patents.
  - CG22. To develop autonomous learning.
- 4.2 Module skills
  - CE12. To associate the main cellular structural compartments with their functions, realizing the molecular mechanisms underlying regulation of cellular processes.
  - CE13. To understand how the cell cycle enhances successful cell proliferation.
- 4.3 Particular skills
  - CE72. To explain cellular bioenergetics and associated membrane transport according to scientific standards

5. CONTENTS (Topics)

LECTURES

1. *CELL COMPARTMENTS*. Structure of membranes, properties and functions. The fluid mosaic model. Cell membranes build up separate compartments. Cell surface carbohydrates. Alternatives for selective transport across cellular membranes, simple diffusion vs. 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 and lipid traffic through the endomembrane system. From protein quality control at endoplasmic reticulum to selective protein delivery at Golgi apparatus. Protein tagging and turnover. Control of secretory and endocytic vesicles movement, membrane recycling.

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 enable cell movement (cilia and flagella) and cell crawling.

6. *CELL SIGNALLING*. Cell signaling basic principles. Intracellular receptors vs. cell surface receptors, signal transduction. 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

Lab sessions may include the use of permanent dyes, and hazardous or toxic substances, thus lab coat use is always advised.

- *LAB TRAINING ESSENTIALS*. Handling and dispensing liquids. How to properly use pipetting devices.
- *MICROSCOPY*. Fundamentals of microscopy. Observation of samples under the light microscope.
- *OSMOSIS*. 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.

Data obtained in some of these sessions will be reused in other courses (Physics and Computer sciences) for data analysis 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 although strongly recommended.

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 familiar with 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 1pm).

Week	Wednesday	Thursday	Topic
1	11/09/2017	12/09/2017	Topic#1
2	18/09/2017	19/09/2017	Topic # 1
3	25/09/2017	26/09/2017	Topic # 2
4	02/10/2017	03/10/2017	Topic # 2
5	09/10/2017	10/10/2017	Topic # 3
6	16/10/2017	17/10/2017	Topic # 3
7	23/10/2017	24/10/2017	Topic # 4
8	30/10/2017	31/10/2017	Topic # 4
9	06/11/2017	07/11/2017	Topic # 5
10	13/11/2017	14/11/2017	Topic # 5
11	20/11/2017	21/11/2017	Topic # 6
12	27/11/2017	28/11/2017	Topic # 6
13	04/12/2017	05/12/2017	Topic # 7
14	11/12/2017		Topic # 7

c2) Practical teaching sessions will take 18 hours. There will be seven lab sessions (2.5 hours each). Lab sessions will take place on indicated Mondays at 9:00 am (laboratory 23.B.04 / 23.B.05).

Week	Lab sessions	Location	Topic
#1	11/09/2017	Lab 23.B.05	Kick-off & Lab training
#2	18/09/2017	Lab 23.B.05	Microscopy
#3	25/09/2017	Lab 23.B.05	Osmosis
#4	02/10/2017	to be determined	Scientific databases
#5	09/10/2017	Lab 23.B.04	Cell fractionation
#6	16/10/2017	Lab 23.B.04	Organelle purification
#14	11/12/2017	to be determined	Case Study: Cellular pathology

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 course final grade.

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 (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:

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

  The exam evaluates skills CB1, CG3, CE12 and CE13

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

  - Problem solving

  The topic-specific quizzes evaluate skills CG3, CG22, CE72

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)

These 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

These quizzes evaluate skills CG3, CG6, CG9, CG22.

In all written tests (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 get 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 to evaluate all course competences with full score opportunities. The resit exam accounts for 100% of the overall course score. The exam will contain questions falling into one of these categories:

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

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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