Cell and molecular biology

Academic Year: (2017 / 2018) **Review date: 28/04/2017 13:53:16**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: RIO NECHAEVSKY, MARCELA ANDREA DEL

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Introduction to bioengineering

OBJECTIVES

Students will become familiar with the principles governing cell and tissue function and the alterations at the base of human diseases. They will also study and use modern cellular and molecular techniques that allow us to analyze cell function.
Students will also learn how to raise biomedical problems, seek and use relevant information and find innovative solutions to them, taking into account the different biological and engineering tools that are taught in this degree. To do this, they will have to work in cooperative teams. They will also have the opportunity to get in touch, in hospitals and biomed/biotech companies, with actual problems and the solutions and limitations of existing technologies.

DESCRIPTION OF CONTENTS: PROGRAMME

To understand biological materials and systems and design new ways to repair or replace them, it is imperative to understand their cellular and molecular components and functions. Cell and Molecular Biology form the foundation of biotechnology and biomedical industry today.
This course covers a detailed analysis of the structures, mechanisms and molecules that control cell function, proliferation and differentiation as well as the changes that lead to pathological conditions. It also teaches, both in master and laboratory classes, modern molecular techniques to analyze cell function.

PROGRAMME:
0. Introduction to cells
1. Chemical components of the cell
2. Membrane Structure
3. Membrane Transport
4. Intracellular Compartments and Transport
5. Cell Communication
6. Cytoskeleton
7. Protein Structure and Function, Proteomics.
8. From DNA to Genes to Genomes. Genomics.
9. From DNA to Proteins. Control of Gene expression. Transcriptomics.
10.Genetic Variation. Genetic Diseases.

LABORATORY EXPERIMENTS:
1. Plasmid DNA Isolation.
2. Restriction Digestion. Plasmid Maps.
3. Ligation and Transformation.
4. Human Cell Culture.

LEARNING ACTIVITIES AND METHODOLOGY

The program will be divided into master classes, discussion and problems sections and laboratory practical classes. Students are required to read or resolve assigned chapters, articles, problems, etc., before the corresponding classes. For specific subjects there will be invited lectures given by prestigious professionals in the field. Visits to hospitals and biomed/biotech companies are foreseen. In the discussion and problems sections, relevant scientific articles and problems will be presented and discussed by the students.
In the laboratory classes, students divided in small groups of 3-4 will perform the described experiments with the help of a supervisor. Students will be required to elaborate a report discussing the experiments performed, the obtained results, the relevance and applications in biomedicine and the experience and skills gained.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

TEACHING METHODOLOGY

Teaching methodology will be mainly based on lectures, seminars and practical sessions.
Students may be required to read assigned documentation before lectures and seminars. Lectures will be used by the teachers to stress and clarify some difficult or interesting points from the corresponding lesson, previously prepared by the student.
Grading will be based on continuous evaluation tests and a final exam covering the whole subject. Help sessions and tutorial classes will be held prior to the final exam upon student's request.
Attendance to lectures and seminars is not compulsory. However, failure to attend any test will result in a mark of 0 in the corresponding continuous evaluation block (see below).

The practical sessions will consist on laboratory work (5 sessions) and a written test at the end of the sessions (short answers may be requested or multiple choice). The attendance to 80 % of practical sessions is mandatory otherwise the score will be 0 in this item.

GRADING:
Total score: 10 points
Continuos evaluation: 4 points out of 10
Final exam: 6 points out of 10

CONTINUOUS EVALUATION: It accounts for up to 40% of the final score of the subject (4 points of the TOTAL SCORE), and includes two components:
1) Short-exams: These exams will take place mostly during lectures or seminars and will be announced at least one week in advance (3 points of THE TOTAL SCORE).
2) Laboratory: One written laboratory test will take place at the end of the laboratory sessions (1 point of the TOTAL SCORE).

Attendance to at least 80% of the practical sessions is mandatory; otherwise the score will be 0 in this item.

FINAL EXAM: The final exam will cover the whole subject (including the laboratory sessions) and will account for the 60 % of the final score. The minimum score in the final exam to pass the subject is 4,5 over 10 (at least 4 in each part of the exam: this is 4 in Molecular Biology and 4 in Cell Biology examen), notwithstanding the mark obtained in continuous evaluation.

EXTRAORDINARY EXAM: The mark for students attending any extraordinary examination will be:
a) 100% exam
b) 60% exam and 40% continuous evaluation if it is available in the same course

ACADEMIC CONDUCT: Unless specified all exams will be closed-book, closed-notes, no PC or mobile phone, or anything else other than a writing implement and the exam itself. Plagiarism, cheating or other acts of academic dishonesty will not be tolerated. Any infractions what so ever will result in a FAILING GRADE.

BASIC BIBLIOGRAPHY

- Bruce Alberts et al. Essential Cell Biology, 3rd Edition, Ed. Garland Publishing, Inc. New York and London.

- Harvey Lodish et al. Molecular Cell Biology, 5th Edition, Ed. Freeman and Company, New York..

- J. Sambrook, E.F. Fritash and T. Maniatis. Molecular Cloning: A laboratory Manual, 3rd Edition., Ed. Cold Spring Harbour Press..

- Jennie P. Mather and David Barned. Animal Cell Culture Methods., Ed. Associated Press.

- John D. Bancroft and Marilyn Gamble. Theory and Practice of Histological Techniques. , 5th edition.