Cell and molecular biology

Academic Year: (2019 / 2020) **Review date: 08-05-2020**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: JORCANO NOVAL, JOSE LUIS

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:
CELL BIOLOGY
1. Chemical components of the cell. Cell compartments
2. Membrane Structure
3. Membrane Transport
4. Vesicular Traffic
5. Cell Communication

MOLECULAR BIOLOGY
6. Protein Structure and Function, Proteomics.
7. From DNA to Genes to Genomes. Genomics.
8. 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 lectures (master class) and paper discussion/problem sessions (small class size) and laboratory practical classes. Students are required to read or resolve assigned chapters, articles, problems, etc., before or during the corresponding classes. Visits to hospitals and biomedical laboratories are foreseen. In the discussion and problems sessions, relevant scientific articles and problems will be presented and discussed by the students.
In the laboratory classes, students divided in small groups of 2-3 students will perform experiments with

the help of a supervisor. Students will be required to elaborate lab notes including descriptions of the experiments performed, results obtained as well as the experience and skills gained.

ASSESSMENT SYSTEM

TEACHING METHODOLOGY

Teaching methodology will be mainly based on lectures (master classes), seminars (small class size sessions) and laboratory 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.
Grading will be based on Continuous Evaluation (CE) 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 (40%)
Final Exam: 6 points (60%)

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-tests and assignments: The tests will take place mostly during lectures. Tests and assignments will be announced at least two weeks in advance (short tests and assignments: 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 have 2 parts: Cell Biology topics and Molecular Biology topics.
The minimum score in the Final Exam to pass the subject is 4 (average of the score obtained in Cell Biology and the score obtained in Molecular Biology). It is important to note that to pass the subject it is also needed a minimum score of 4 in each part of the Final Exam: this is a score of 4 in Molecular Biology and 4 in Cell Biology.

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
The student will be asked to indicate her/his preference before the exam starts.

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.
% end-of-term-examination: 60
% of continuous assessment (tests, assignments, laboratory): 40

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

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.