Cell and molecular biology

Academic Year: (2023 / 2024) **Review date: 19/12/2023 14:01:45**

Department assigned to the subject: Bioengineering 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

LEARNING OUTCOMES

RA1: Acquire knowledge and understanding of the basic general fundamentals of engineering and biomedical sciences.
RA2: Be able to solve basic engineering and biomedical science problems through a process of analysis, identifying the problem, establishing different methods of resolution, selecting the most appropriate one and its correct implementation.
CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CG1: Adequate knowledge and skills to analyse and synthesise basic problems related to engineering and biomedical sciences, solve them and communicate them efficiently.
CG3: Knowledge of basic scientific and technical subjects that enables them to learn new methods and technologies, as well as providing them with great versatility to adapt to new situations.
CG4: Ability to solve problems with initiative, decision-making, creativity, and to communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the biomedical engineer's activity. Capacity for leadership, innovation and entrepreneurial spirit.
CG8: Ability to solve mathematical, physical, chemical and biochemical problems that may arise in biomedical engineering.
CG13: Knowledge of the fundamental principles of molecular, cellular, structural and biochemical biology applied to human beings.
ECRT6: Acquire a vision of biological systems at the cellular and molecular level and apply them to the resolution of problems in biomedicine and biotechnology.
CT1: Ability to communicate knowledge orally and in writing to both specialised and non-specialised audiences.

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.
2. Cell compartments
3. Membrane Structure
4. Membrane Transport
5. Vesicular Traffic

MOLECULAR BIOLOGY
6. Protein Structure and Function
7. From DNA to Genes to Genomes. Genomics.
8. From DNA to Proteins. Transcriptomics and Proteomics
9. Control of cell expression
10. Control of gene expression

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

ASSESSMENT SYSTEM

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

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. General tutorial classes will be included in the weekly planning.
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).

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) Tests and assignments: tests will be included in the weekly planning and assignments will be announced at least two weeks in advance (tests and assignments: 3 points of THE TOTAL SCORE).
2) Laboratory: One laboratory test (1 point of the TOTAL SCORE).

% end-of-term-examination/test: 40

% of continuous assessment (assigments, laboratory, practicals…): 60

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 4.5 (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. 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

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.