Biochemistry

Academic Year: (2019 / 2020) **Review date: 03-05-2020**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: LARCHER LAGUZZI, FERNANDO

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Cell and Molecular Biology

OBJECTIVES

A Biomedical Engineer needs to integrate knowledge from different fields in order to analyze and solve problems in biology and medicine to provide an overall enhancement of health care.

The human body is an elegant devise that requires inputs for sustained operation. The processes responsible for that input rely on proteins, the leitmotiv of biochemistry and the ultimate cell micro-machines. Students will partake of the excitement of understanding the complex problems of biochemistry.

After being introduced to the fundamentals of Cell and Molecular Biology, Biochemistry students will become acquainted with multiple protein and enzyme functions. Students will get familiar with various state-of-the-art methodologies to analyze proteins and their modifications. We will make a strong emphasis on the malfunction of proteins as the leading cause of disease and on the ways to study and tackle these problems. Students will be led through the subject text books and journal papers promoting interactive scientific discussion and team work.

DESCRIPTION OF CONTENTS: PROGRAMME

Proteins act both as building blocks and molecular machines orchestrating cell and tissue function. Our Biochemistry course will cover a variety of normal and pathological protein functions in processes such as metabolism, cell signaling, cancer and others.

1. Introduction
2. Enzymes
3. Protein analysis I
4. Protein analysis II
5. Metabolic routes I Glycolisis. Fermentation
6. Metabolic routes II Krebs cycle. Oxidative phosphorylation
7. Metabolic routes III. Biosynthetic and degradation pathways
8. Signal Transduction
9. Cancer
10. Clinical biochemistry I
11. Clinical biochemistry II (diabetes and obesity).

LABORATORY EXPERIMENTS

a. protein extration quantification and analysis
b. electrophoresis
c. western blot analysis
d. enzyme kinetics

LEARNING ACTIVITIES AND METHODOLOGY

The program will be divided into master (lectures) and discussion/problem classes and, laboratory. Students may be required to read assigned chapters/articles, or solve problems before the corresponding classes. For specific subjects there may be invited lectures given by prestigious professionals in the field. In the discussion and problems sections, relevant scientific articles and problems will be presented and discussed by the students and the teaching team.

In the laboratory classes, students divided in small groups will perform the described experiments with the help of a supervisor and Lab guide prepared by the teaching team. Students will be required to pass an exam at the end of the practices.

ASSESSMENT SYSTEM

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

TEACHING METHODOLOGY

Teaching methodology will be mainly based on lectures, seminars and practical sessions.
Students are 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 (including two continuous evaluation tests, attendance to laboratory and lab exam) and a final exam covering the whole subject. Help sessions and tutorial classes will be held prior to the final exam upon students request.

Attendance to lectures is not compulsory. However, failure to attend any exam or submit the exercises before the deadline will result in a mark of 0 in the corresponding continuous evaluation block (see below).
The practical sessions will consist on laboratory work (one week) and a written test at the end of the week. The attendance to 80% of practical sessions is mandatory.

GRADING:
Total score: 10 points
Continuous 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 (66% of the continuous evaluation mark): Partial exams or assessable individual work (66% of the continuous evaluation grade): The exams will be carried out mainly during classes, and will be announced at least one week in advance. The individual works, either independent or replacing any of the partial exams and will be delivered on a date to be determined. The results of these exams and / or individual works will constitute a means of continuous evaluation (3 points of the total score).
2) Laboratory (33% of the continuous evaluation mark: 1 points of the TOTAL SCORE): written laboratory test (1 points).

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 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, notwithstanding the mark obtained in continuous evaluation.

EXTRAORDINARY EXAM: The mark for students attending any extraordinary examination will be the maximum between:
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 whatsoever will result in a failing grade.

BASIC BIBLIOGRAPHY

- Alberts- Johnson- Lews- Raff- Roberts- Walter Molecular Biology Of The Cell 5th Edition, Cold Spring Harbor, 2009

- Colleen Smith, Allan Marks, Michael A Lieberman. Marks Basic Medical Biochemistry: A Clinical Approach, ISBN: 0781721458 Publisher: Lippincott Williams & Wilkins, 2nd Edition, 2004

- David L. Nelson, Michael M. Cox Lehninger principles of biochemistry , New York : W. H. Freeman and Company , 2008

- David L. Nelson, Michael M. Cox Lehninger principles of biochemistry , New York : W. H. Freeman and Company , 6ª edición

- Thomas M. Devlin Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons , 6th Edition

ADDITIONAL BIBLIOGRAPHY

- Paul Engel Pain-free biochemistry: an essential guide for the health sciences, John Wiley and Sons, 2009