

## 69327 - Bioelectricity and electrophysiology

### Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering 330 - Complementos de formación Máster/Doctorado
ECTS	3.0
Course	XX
Period	Indeterminate
Subject Type	ENG/Complementos de Formación, Optional
Module	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

The learning process designed for this course is based on:

**A01 Active master class** (20 hours). Exposition of the main contents of the course by the teacher. This activity will be performed on-site in the designated classroom.

The class will consist of the exposition of the topic with practical examples, wherever it is necessary, to show the taught

## 69327 - Bioelectricity and electrophysiology

concepts. Additionally, there will be a seminar given by an invited expert in the subject.

**A03 Practical sessions** (6 hours). Activities developed in dedicated rooms with informatics equipment (informatics rooms). The course has two practical sessions of two hours each in informatics rooms. For each practical session, the students will have to prepare the concepts previously studied in class, and write a report with the main results and conclusions of the session. There will be a third session of two hours to finish the work of the previous sessions. The practical sessions will be assessed according to the presented reports. The obtained score, E3 evaluation (practical sessions), will correspond to 20% of the final score.

**A05 Applied practical or research works.** A tutored work consisting of the resolution of an electrophysiological simulation problem will be performed either individually or in pairs. Each group will present a report with the main results and conclusions. Evaluation will be performed according to E2 evaluation point of this guide.

**A06 Professor Office hours.** Schedule to agree with the students with purpose of reviewing and discussing the materials and subjects given, both theoretical and practical.

**A08 Evaluation.** Set of theoretico-practical tests and presentation of reports used in the evaluation of the progress of the students. Further explanation about the evaluation is given in the corresponding section.

### 5.2.Learning activities

**The teaching methodology of this course is based on:**

Active master classes taking the work by Prof. Roger G. Mark, 2004 *Principles Of Cardiac Electrophysiology*. Massachusetts Institute Of Technology Departments of Electrical Engineering, Mechanical Engineering, and the Harvard-MIT Division of Health Sciences and Technology as a reference (two first subjects of the program).

Active master classes based on Power Point slides (rest of the subjects of the program).

Two tutored practical sessions in the classroom divided into two parts: 1) presentation of the software to use (OpenCOR and Matlab) by the teacher, and 2) individual work of the students in their personal computers or in the informatics room.

One tutored session about the practical work of the course, based on the second practical session.

### 5.3.Program

**The program offered to the students to help them fulfilling the expected results consists of the following activities:**

Cardiac cell electrophysiology

Physical principles of electrophysiology

Bioelectric models of the cellular membrane and ionic channels

## 69327 - Bioelectricity and electrophysiology

Action potential modelling

Action potential propagation, tissue models

Numerical solution of action potential propagation

Resolution of the extracellular potential. Solution for the torso

### 5.4.Planning and scheduling

#### Schedule of the on-campus sessions and presentations of works

The schedule of the course, both on-site sessions and practical sessions, will be determined by the academic schedule established by the university for the corresponding course. The schedule for the presentations of works will be announced at the beginning of the course.

### 5.5.Bibliography and recommended resources

- |           |   |
|-----------|---|
| <b>BB</b> | Ferrero Corral, José María. Bioelectrónica General (I) : señales bioeléctricas / José María Ferrero Corral : Universidad Politécnica de Madrid, Escuela técnica superior de Ingenieros industriales, cátedra de electrónica, sección de publicaciones, 1981 |
| <b>BB</b> | Gulrajani, Ramesh M. Bioelectricity and Biomagnetism / Ramesh M. Gulrajani. New York ; Chichester : John Wiley Sons, 1998   |
| <b>BB</b> | Malmivuo, Jaakko. Bioelectromagnetism: Principles and Applications of Bioelectric and Biomagnetic Fields / Malmivuo, Jaakko; Plonsey, Robert. Oxford University Press 1995  |
| <b>BB</b> | Mark, Roger G. Principles of Cardiac electrophysiology / Roger G. Mark. Massachusetts : Institute Of Technology Departments of Electrical Engineering, Mechanical Engineering, and the Harvard-MIT Division of Health Sciences and Technology, 2004         |

#### LISTADO DE URLs:

Malmivuo, Jaakko; Plonsey, Robert. Bioelectromagnetism: Principles and Applications of Bioelectric and Biomagnetic Fields. Oxford University Press 1995.  
[<http://www.bem.fi/book/>]