



## COURSE DESCRIPTION COMPUTER INTERFACE FOR BIOLOGICAL SYSTEMS

**SSD: BIOINGEGNERIA ELETTRONICA E INFORMATICA (ING-INF/06)**

DEGREE PROGRAMME: BIOINGEGNERIA INDUSTRIALE (P16)  
ACADEMIC YEAR 2024/2025

### COURSE DESCRIPTION

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### GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: U1591 - BIOMEDICAL IMAGING AND COMPUTER INTERFACE FOR BIOLOGICAL SYSTEMS  
MODULE: U1593 - COMPUTER INTERFACE FOR BIOLOGICAL SYSTEMS  
TEACHING LANGUAGE: INGLESE  
CHANNEL: FG A-Z  
YEAR OF THE DEGREE PROGRAMME: II  
PERIOD IN WHICH THE COURSE IS DELIVERED: SEMESTER II  
CFU: 6

#### REQUIRED PRELIMINARY COURSES

None

#### PREREQUISITES

Basic knowledge of physics, chemistry, biology

#### LEARNING GOALS

To provide essential concepts about electrical activity of excitable cells, biopotentials, their recording and processing for instrumentation design. To illustrate some applications with examples and lab practices to develop problem-solving skills.

#### EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

## **Knowledge and understanding**

The student will acquire knowledge and skills to understand the issues involved in acquiring electrophysiological signals and using them to generate interfaces with equipment and computers.

## **Applying knowledge and understanding**

The student should be able to design an electrophysiological signal acquisition system that allows connection with other devices.

## **COURSE CONTENT/SYLLABUS**

Basic concepts of medical instrumentation and design criteria. Sensors. The origin of biopotentials. Electrical activity of excitable cells, Volume conductor field, functional organization of the nervous system, the electroneurogram, the electromyogram, the electrocardiogram, the electroencephalogram, etc. Biopotential electrodes. Amplifiers, filters, signal conditioning and processing. Biopotential amplifiers. Electrical stimulation of nerves and muscles. Therapeutic pacemakers and defibrillators devices. EMG processing for prosthesis control and other application. EEG processing and feature extraction. Brain Computer Interface. Electrical safety

## **READINGS/BIBLIOGRAPHY**

John G Webster. Medical Instrumentation Application and Design. John Wiley & Sons;  
A. Despopoulos et al. Color Atlas of Physiology Thieme;  
Lecture notes

## **TEACHING METHODS OF THE COURSE (OR MODULE)**

Frontal lectures and practices in lab

## **EXAMINATION/EVALUATION CRITERIA**

### **a) Exam type**

- Written
- Oral
- Project discussion
- Other

### **In case of a written exam, questions refer to**

- Multiple choice answers
- Open answers
- Numerical exercises

### **b) Evaluation pattern**