69303 - Signal processing and biomedical imaging

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	6.0
Course	---
Period	Indeterminate
Subject Type	ENG/Complementos de Formación, Compulsory
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 general strategy for the methodology of this course is a mixture of sessions devoted to introduce basics concepts of signal/image processing and a set of interleaved practical sessions devoted to make illustrative exercises and examples that help to understand and to learn the concepts. Computer simulations will be performed in most of the sessions, both by the teacher and the students. Many of the sessions will be in a computer room.

5.2.Learning activities

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A01 Lectures (24 hours). The teacher will introduce the main concepts of the subject. As there will be many computer-based examples during the class, this activity should be performed in a computer room in order to facilitate the students the interaction with the simulation program during the class. It is foreseen a high-level of interaction with the students during the lectures. In case that the computer room is not available, students should bring a laptop for the computer simulations.

A02 Applied examples and projects (16 hours). In addition to the applied examples worked during Lectures (A01), more pratical and real-life examples or projects will be worked during these small-group sessions. Due to the increased complexity of the examples, it it crucial that the number of students in each session is small enough. These sessions will be performed in the computer room. A subset of these sessions will include an evaluation task using the platform Moodle.

A03 Laboratory sessions (10 hours). A set of 5 sessions of 2 hours each will be performed in the computer room. Each student will work individually with a computer. Each student will have session guide with the objectives and tasks. These sessions will be also performed in small-grups.

A06 Tutorials The teacher will be available to the students for helping them in their learning process, either in small groups or individually. A minimum of six hours will be offered during each week of the course.

A08 Evaluation A set of tests will be performed during the course, with either a theoretical or practical orientation. These activities are described in more detail in the Evaluation Section. These activities will help to monitor and to assess the quality of the individual learning process for each student.

5.3.Program

1. Origin of biomedical signals and images. Biolectric signals. Imaging modalities. Noise in biomedical signals.
2. Time(spatial) domain represention of biomedical signals and images. Convolution and filtring of signals. Correlation.
3. Frequency domain representation of biomedical signals and images. Power spectral density.
4. Applications of biomedical signal/image analysis: noise reduction, segmentation of images/signals, event detection, feature extraction.

5.4.Planning and scheduling

The timetable of the subject, including lectures and laboratory sessions, will be given by EINA center. This timetable will be given to the students during the first day and it will be available in the Moodle platform https://moodle.unizar.es/ .

5.5.Bibliography and recomended resources

BB	Ingle, Vinay K . Digital Signal Processing using MATLAB. Vinay K. Ingle and John G. Proakis . Third edition. Cengage Learning, 2012
BB	Semmlov, J. Biosignal and Biomedical Image Processing MATLAB-Based Applications / Semmlov J. Marcel Dekker, 2004
BC	Image Processing with MATLAB: Applications in Medicine and Biology / Omer Demirkaya et al. CRC press, 2006
BC	Rangayyan, R.M. Biomedical signal analysis: A case-study approach / Rangayyan, R.M. Wiley-Interscience, 2002

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