Universidad Zaragoza

Year : 2019/20

69303 - Signal processing and biomedical imaging

Syllabus Information

Academic Year: 2019/20
Subject: 69303 - Signal processing and biomedical imaging
Faculty / School: 110 -

Degree: 330 - Complementos de formación Máster/Doctorado
547 - Master's in Biomedical Engineering

ECTS: 6.0
Year: 330 - Complementos de formación Máster/Doctorado: XX
547 - Master's in Biomedical Engineering: 1

Semester: 330 - First semester
547 - First semester
547 - First semester
547 - First semester
Subject Type: 547 - Compulsory
330 - ENG/Complementos de Formación
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It is based on a mixture of sessions devoted to introduce the basics concepts of signal/image processing and a set of interleaved practice sessions devoted to make illustrative exercises and examples that help to understand and to learn these concepts. Computer simulations will take place in most of the sessions, both by the teacher and the students therefore many of the sessions will be in a computer room.

4.2.Learning tasks

The course includes the following learning tasks:

- **(A01, A02) Lectures** (40 hours). The following activities are related to this learning task: 1. the contents of the course are provided; 2. introduction of applied examples; 3. exercises and problems.
- **(A03) Laboratory sessions** (10 hours).
- **(A05) Periodic assignments**. 1. Exercises or problem solving; 2. Software-based signal or image processing miniprojects; 3. Group reports (3 people).
- **(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) Assessment**.

4.3.Syllabus

The course will address the following topics:

PART 1: Biomedical signals and images.

- Signals and biomedical signals.
- Images and biomedical images (modalities).
- Representation of signals in mathematics: functions, sequences, vectors, matrixes.
- Signal processing with computers. Vectors in the frequency domain: DFT_N (Discrete Fourier Transform).
- Biolectric signals, action potential.

PART 2: Continuous-time signals and systems.

- Signals as functions.
- Basic signals (Dirac, step, tones).
- Continuous-Time Fourier Transform.
- Energy, power, scalar product.
- Continuous-time systems. Properties.
- Linear Invariant continuous-time systems. Convolution and frequency response.

PART 3: Discrete-time signals and systems.

- Sampling. Signals as sequences.
- Frequency and transform domain: Z Transform, Discrete-Time Frequency Transform.
- Discrete-time systems. Linearity and invariance. Convolution and frequency response.
- FIR and IIR linear filtering.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website and the Moodle platform https://moodle.unizar.es/.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=69303&year=2019