Course guide
320111 - PDA - Digital Audio Processing

Unit in charge:	Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	739 - TSC - Department of Signal Theory and Communications.

Degree: BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer: IGNASI ESQUERRA LLUCIA

Others:

PRIOR SKILLS

Students are recommended to have successfully passed the course "Signals and Systems".

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE21-ESAUD. Ability to build, operate, and manage telecommunications services and applications, understood as systems for capturing, analog and digital processing, encoding, transportation, representation, processing, storage, reproduction, management, and presentation of audiovisual services and multimedia information. (Specific Technology Module: Sound and Image)
CE25-ESAUD. Ability to create, encode, manage, disseminate, and distribute multimedia content, taking into account criteria of usability and accessibility of audiovisual, broadcasting, and interactive services. (Specific Technology Module: Sound and Image)

TEACHING METHODOLOGY

Supervised sessions
a) Classroom (large group). The lecturer explains topic contents to students, give practical demonstrations, set exercises and assignments and clarify doubts.
b) Laboratory (small group). The students carry out practical exercises on the laboratory with computers.
c) Assessment. Individual tests.
Unsupervised sessions
d) Individual or group study.
e) Preparation on exercises and assignments.

LEARNING OBJECTIVES OF THE SUBJECT

On completion of the course, students should be able to:
Understand audio signal digitalisation, processing and coding.
Open, visualise, reproduce, edit and store audio files in a programming environment.
Use basic digital techniques to process audio signals.
Analyse and interpret the characteristics of audio signals in terms of time and frequency.
Identify the main voice and audio coding methods.
Program basic functions and applications for processing real signals.

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STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	30.00
Hours small group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. DIGITAL AUDIO

Description:
Introduction to digital audio. Visualization of signals. File formats.

Related activities:
L1: Lecture of audio files

Full-or-part-time: 14h
Theory classes: 6h
Laboratory classes: 2h
Self study : 6h

2. DIGITALIZATION

Description:
Sampling. Quantization. Coding of samples. Resampling.

Related activities:
L2: Format conversion

Full-or-part-time: 22h
Theory classes: 6h
Laboratory classes: 4h
Self study : 12h

3. TIME-DOMAIN PROCESSING

Description:
Fundamentals of digital signal processing. Time-domain analysis. Basic measures.

Related activities:
L3: Analysis of characteristics of audio signals

Full-or-part-time: 28h
Theory classes: 8h
Laboratory classes: 4h
Self study : 16h

4. FREQUENCY-DOMAIN ANALYSIS

Description:
Fourier transform. Windowing. Spectrograms.

Related activities:
L4: Tone frequency analysis

Full-or-part-time: 28h
Theory classes: 8h
Laboratory classes: 4h
Self study : 16h

5. SPECTRAL ESTIMATION

Description:
Periodograms. Linear prediction.

Full-or-part-time: 30h
Theory classes: 6h
Laboratory classes: 4h
Self study : 20h

6. APPLICATIONS

Description:
Digital audio effects. Coding. Audio information retrieval.

Related activities:
L6: Music identification

Full-or-part-time: 28h
Theory classes: 6h
Laboratory classes: 2h
Self study : 20h

GRADING SYSTEM

Exam 1 (35%), Exam 2 (35%), Laboratory (30%)

The second exam is scheduled on the last week of lectures. During the final exams period, all students have a chance to improve their qualifications of previous exams. The final mark is the best of the two for each part.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

BIBLIOGRAPHY

Complementary:

- Steiglitz, Kenneth. A digital signal processing primer: with applications to digital audio and computer music. Menlo Park: Addison-Wesley, 1996. ISBN 0805316841.
- Zölzer, Udo. Digital audio signal processing. 2nd ed. Chichester: John Wiley & sons, 2008. ISBN 9780470997857.
- Gold, Bernard. Speech and audio signal processing: processing and perception of speech and music. New York: John Wiley & Sons, 2000. ISBN 0471351547.