



Course guide

320116 - APA - Algorithms and Audiovisual Programming

Last modified: 19/04/2023

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, Spanish

LECTURER

Coordinating lecturer: Vallverdu Bayes, Sisco

Others: Nogueiras Rodriguez, Albino

PRIOR SKILLS

Students will be expected to have passed all of the subjects related to mathematics and IT/programming, as well as Signals and Systems, Digital Image Processing and Digital Audio Processing.

REQUIREMENTS

To pass the subject with experimental work, 80% of attendance is mandatory

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

- Face-to-face lecture sessions.
- Face-to-face practical work sessions.
- Independent learning and exercises.
- Preparation and completion of group activities subject to assessment.

In the face-to-face lecture sessions, the lecturer will introduce the basic theory, concepts, methods and results for the subject and use examples to facilitate students' understanding.

Students will be expected to study in their own time to become familiar with the concepts, using their own notes taken in theory classes and the compulsory and recommended reading lists. It is particularly important that students read in their own time the assigned articles from the scientific literature.

Students are expected to complement in-class programming activities with independent learning activities outside of class in order to gain sufficient algorithm-coding practice in Python



LEARNING OBJECTIVES OF THE SUBJECT

This subject will cover audio- and video-signal processing applications that use PC technology. Students will learn to develop and program systems that operate in real time, and receive a hands-on overview of the various theoretical concepts by means of specific practicals.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours small group	30,0	20.00

Total learning time: 150 h

CONTENTS

PYTHON FOR SIGNAL PROCESSING

Description:

Python for signal processing

Specific objectives:

Introduction to Python
Input/output
Procedimental programming
Functional programming
Moduls and lybraries

Full-or-part-time: 40h

Theory classes: 8h
Laboratory classes: 8h
Self study : 24h

Advanced

Description:

Tasques vinculades:

- Construcció d'una llibreria algebraica bàsica
 - o Definició de vectors i matrius amb POO
 - o Operacions algebraiques usant sobrecarga d'operadors
 - o Altres mètodes magics
- Filtrat de senyals
 - o Disseny i implementació de filtres FIR i IIR
 - o Filtratge per blocs
- Estimació espectral
 - o L'espectrograma i les seves limitacions
 - o Mètodes clàssics
 - o Estimador de màxima entropia

Full-or-part-time: 40h

Theory classes: 8h
Laboratory classes: 8h
Self study : 24h



SIGNAL PROCESSING APPLICATIONS

Description:

.

Full-or-part-time: 70h

Theory classes: 14h

Laboratory classes: 14h

Self study : 42h

GRADING SYSTEM

- Exams: 40% (20% first term, 20% second term)
- Laboratory: 40%
- Final project: 20%

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.

EXAMINATION RULES.

Any application and development should be error free in order to be considered in the global marks

BIBLIOGRAPHY

Basic:

- The Python standard library [on line]. [Consultation: 19/04/2022]. Available on: <https://docs.python.org/3/library/index>.
- Ramey, Chet; Fox, Brian. Bash reference manual [on line]. 2020 [Consultation: 12/04/2022]. Available on: <https://www.gnu.org/software/bash/manual/bash.pdf>.
- The Python tutorial [on line]. [Consultation: 19/04/2022]. Available on: <https://docs.python.org/3/tutorial/index>.
- González, Rafael C. Digital image processing. 3rd ed. Harlow: Pearson Prentice Hall, 2010. ISBN 9780132345637.
- Advanced course on computer speech processing. Computer speech processing. Englewood Cliffs, NJ: Prentice-Hall International, 1985. ISBN 0131638416.

Complementary:

- Ingle, Vinay K. Digital signal processing using Matlab. Pacific Grove: Brooks/Cole, 2000. ISBN 0534371744.

RESOURCES

Other resources:

Calss notes available in Atenea