VNIVERSITAT DE VALÈNCIA

Course Guide
46793 Signal and Data Processing

COURSE DATA

DATA SUBJECT

Code: 46793
Name: Signal and Data Processing
Cycle: Doctorate / Master's Degree
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2269 - Master's Degree in Electronic Engineering	Escola Tècnica Superior d'Enginyeria	1	Second quarter
3131 - PhD in Electronic Engineering	Escola de Doctorat		Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2269 - Master's Degree in Electronic Engineering 3131 - PhD in Electronic Engineering	Tratamiento Digital de Señales	COMPULSORY

COORDINATION

MARTIN GUERRERO JOSE DAVID

SUMMARY

This course presents the most usual techniques for data and signal processing. In particular, the structure of the course consists of three main blocks.

The first one deals with a review of digital signal processing, as a necessary step to study how to process signals from a probabilistic and statistical point of view.

The second part of the course will be a basic introduction of exploratory data analysis.

Finally, a review of digital filtering will be carried out, with special emphasis on advanced techniques, such as optimal and adaptive filtering that will naturally lead to neural models and other machine learning approaches.

Different lab sessions will be performed to complement the theoretical tuition.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

No one. The bachelors degree to access the master ensures the basic knowledge to follow the course correctly.

COMPETENCES / LEARNING OUTCOMES

2269 - Master's Degree in Electronic Engineering

Conduct a critical analysis, evaluation and synthesis of new ideas to solve problems in complex or unfamiliar environments within broader contexts in the field of electronic engineering and related multidisciplinary fields.

Create mathematical models and simulations in the field of electronic engineering and related multidisciplinary fields.

Demonstrate a systematic knowledge and a mastery of technical, personal, social and methodological skills in the field of electronic engineering and related multidisciplinary fields.

Design systems and processes that meet electronic, regulatory, economic, social, ethical and environmental specifications.

Gain the professional skills and cooperation abilities that are suitable for practising in the field of electronic engineering and related multidisciplinary fields.

Handle specialised software and hardware, as well as design, simulation and programming environments in the field of electronic engineering and related multidisciplinary fields.

Identify, formulate and solve problems in the field of electronic engineering and related multidisciplinary fields.

Interpret technical documentation and regulatory standards for equipment and systems in the field of electronic engineering and related multidisciplinary fields.

Know advanced techniques of digital signal and data processing systems, from conception to implementation in real-time hardware systems.

Project, calculate and design products, processes and installations in the field of electronic engineering and related multidisciplinary fields.

DESCRIPTION OF CONTENTS

1. Digital Signal Processing

1. Review of digital signal processing
1.1. Sampling and aliasing
1.2. Z-transform
2. Probability
3. Statistics
4. Information theory

2. Exploratory Data Analysis

1. Missing values and outliers
2. Dimensionality reduction
3. Descriptive Statistics
4. Normalization and coding
5. Visualization

3. Digital Filtering

1. Review of digital filtering: zeros and poles in the Z-plane
2. Optimal digital filtering: Wieners filter
3. Adaptive filtering

4. Machine Learning

1. Supervised learning
1.1 Linear models
1.2 Nonlinear models
1.2.1 Neural networks
1.2.2 Support vector machines
1.2.3 Decision trees
2. Unsupervised learning
3. Other types of learning

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	25,00
Laboratory	20,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	22,50
Preparation of lessons	10,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

- Master class with examples of practical use cases.

- Guided lab exercises to be solved by the students.

- Flipped classroom.

EVALUATION

The grade will be obtained as follows:

- SE1 (50%): Final examination with theoretical and/or practical questions. A minimum grade of 5 (out of 10) in this part will be needed to pass the course.

- SE2 (50%): Evaluation of practical tasks by means of deliverables, oral presentations and/or other tests.

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

In any case, the system of evaluation will be ruled by the established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters.

(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

REFERENCES

- Tratamiento Digital de Señales. Principios Algoritmos y Aplicaciones. / John G. Proakis, Dimitris G. Manolakis, Prentice Hall, 2008.

- Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modelling, Adaptive Filtering & Array Processing. D. Manolakis, V.K. Ingle, S.M. Kogon. Artech House 2005.

- Análisis de datos experimentales. Emilio Soria, José D. Martín, Antonio J. Serrano, Daniel Aguado. Universidad Politécnica de Valencia, 2007.

- Machine Learning. Ethem Alpaydin, MIT Press, 2009.