

Academic Year: ( 2023 / 2024 )

Review date: 19-04-2023

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: RAMIREZ GARCIA, DAVID

Type: Electives ECTS Credits : 6.0

Year : 1 Semester : 1

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

STUDENTS ARE EXPECTED TO HAVE COMPLETED

The student should have basic knowledge of

- probability theory and statistics
- linear algebra.

## OBJECTIVES

The main objective of this course is that the student is able to extract relevant information contained in the signals under study with the aid of statistical signal processing tools. To achieve this, the student will study advanced techniques of:

- Random signals analysis
- Estimation
- Detection

## DESCRIPTION OF CONTENTS: PROGRAMME

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- Parameter estimation
  - Method of moments
  - Maximum likelihood
  - Bayesian estimation
- Signal Estimation
  - MMSE estimation
  - Linear estimation and prediction
  - Optimal and adaptive filtering
- Hypothesis testing
  - Wald tests
  - Likelihood ratio methods
  - Bayesian tests

## LEARNING ACTIVITIES AND METHODOLOGY

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The course is imparted in specific rooms and laboratories for the Master Program. It will include:

- Lectures for the presentation, development and analysis of the contents of the course.
- Practical sessions for the resolution of individual problems and practical projects in the laboratory.
- A project for each part of the course.
- Seminars for discussion with reduced groups of students

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## ASSESSMENT SYSTEM

<b>% end-of-term-examination:</b>	30
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	70
SE1	Participation in class
SE2	Individual or team works made during the course
SE3	Final exam

Evaluation systems (%)	Minimum weighting (%)	Maximum Weighting
SE1	0	20
SE2	0	100
SE3	0	60

## BASIC BIBLIOGRAPHY

- Murphy, K.P. Machine Learning. A probabilistic perspective, MIT Press, 2012
- C. P. Robert, G. Casella Monte Carlo Statistical Methods, Springer, 2004
- H. Stark, J. W. Woods Probability and Random Processes with Applications to Signal Processing, Prentice Hall, 2002
- L. Wasserman All of Statistics, Springer, 2013
- Poor, V An Introduction to Signal Detection and Estimation, Springer, 1994

## ADDITIONAL BIBLIOGRAPHY

- Barber, D Bayesian Reasoning and Machine Learning, Cambridge University Press, 2012
- Bishop, C.M. Pattern Recognition and Machine Learning, Springer, 2006