SUBJECT TEACHING GUIDE

G837 - Treatment of Multimedia Signals

Degree in Telecommunication Technologies Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Transmission and Treatment of Signals				
Course unit title and code	G837 - Treatment of Multimedia Signals				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	http://gtas.unican.es/docencia/tsm				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
Name of lecturer	JESUS PEREZ ARRIAGA
E-mail	jesus.perez@unican.es
Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 2. DESPACHO S272 (S272)
Other lecturers	

3.1 LEARNING OUTCOMES
- Applying tools and concepts of statistical signal processing to solving problems of detection classification, estimation, prediction, modeling and optimal / adaptive filtering.
- Ability to solve problems of statistical signal processing through computer simulation.

4. OBJECTIVES
Solving simple problems of classification and detection.
Estimation of power spectral density of stochastic processes.
Solving basic parameter estimation problems.
Solving basic problems of optimal filtering, channel equalization, system identification, linear prediction, noise and interference cancellation.
Using Matlab to solve statistical signal processing problems.

6. COURSE ORGANIZATION	
CONTENTS	
1	STOCHASTIC PROCESSES AND RANDOM VECTORS. WSS and ergodic processes. Correlation function. Power spectral density. Gaussian processes, ARMA processes. Probability mass function and probability density function of random vectors. Correlation and covariance matrices. Gaussian random vectors.
2	SPECTRAL ANALISYS. Spectral analysis of signals. Power spectrum estimation of random signals. Classical methods: Periodogram, Blackman-Tuckey method, Bartlett method, Welch method. Parametric methods: AR model. Yule-Walker method. Linear prediction.
3	OPTIMAL FILTERING AND ADAPTIVE FILTERING. Wiener filter. Normal equations. Steepest descent algorithm. LMS algorithm. Application to system identification, channel equalization, linear prediction, noise and interference cancelation and channel estimation.
4	PARAMETER ESTIMATION. Bias, variance and mean squared error. Maximum likelihood estimation, least squares estimation and method of moments estimation. Bayesian estimation. MAP estimation.
5	CLASSIFICATION AND DETECCTION. Decision rule. Type of errors. Probability of error, detection and false alarm. ROC curve. Likelihood ratio test (LRT). Generalized LRT. Detection criteria. Detection of signals in noise. M-ary classification. Discriminant functions.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final exam and quizzes The online evaluation of the final exam and quizzes is foreseen in the event that a new health alert for COVID-19 makes it impossible to carry out the regular evaluation.	Written exam	Yes	Yes	60,00
Quizzes.	Laboratory evaluation	No	No	40,00
		No	No	0,00
TOTAL				100,00

Observations

The assessment consists of a set of quizzes and a final exam.
If the final exam score is equal to or greater than 4 out of 10, the final grade is the weighted average of the quizzes (40%) and final exam (60%). If the final exam score is less than 4 out of 10, the student fails the subject.

The online evaluation of the final exam and quizzes is foreseen in the event that a new health alert for COVID-19 makes it impossible to carry out the regular evaluation.

Observations for part-time students

The student must score at least 5 out of 10 in the final exam to pass the course.

The online evaluation of the final exam is foreseen in the event that a new health alert for COVID-19 makes it impossible to carry out the regular evaluation.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

S. M. Kay, Fundamentals of statistical signal processing, vol. I, Estimation theory, Prentice Hall, 1993

S. M. Kay, Fundamentals of statistical signal processing, vol. II, Detection theory, Prentice Hall, 1998

P. Stoica, R. Moses, Introduction to spectral analysis, Prentice Hall, 1997