

## SUBJECT TEACHING GUIDE

539 - Applied Tools in the Coastal and Port Field

Master's Degree in Coasts and Ports

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Coasts and Ports			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline					
Course unit title and code	539 - Applied Tools in the Coastal and Port Field				
Number of ECTS credits allocated	4	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS Y TECNICAS DEL AGUA Y DEL MEDIO AMBIENTE				
Name of lecturer	GABRIEL DIAZ HERNANDEZ				
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Other lecturers	MELISA MENENDEZ GARCIA				

### 3.1 LEARNING OUTCOMES

- The student will know how to apply basic technical programming tool, with a worldwide use, which solves the mathematical, numerical and statistical analysis.
- The student will understand and use different discrete and continuous random variables and will be able to perform parameter estimation calculations.
- The student will be able to statistically characterize population of data, from descriptive statistics to statistical mathematical modeling with well-known distribution functions.
- The student will know and understand the different time scales of analysis (seasonality, interannual variability, secular trends, ...) of the environmental variables that will be used throughout the Master.
- The student will be able to analyze data and its graphic manipulation: interpolation, adjustment and regression.
- The student will be able to analyze graphically the: interpolation, adjustment and regression.
- The student will lay the theoretical and practical foundations to extrapolate their future knowledge in technical programming and problem solving in the academic, research and professional fields.
- The student will be able to analyze data sets and equations and perform calculations with numeric, vector and matrix expressions, elaboration of .m files to solve mathematical and / or computational problems, reading, data export and visualization (meshing, animations, graphics, etc.).
- The student will be able to know the different temporal scales of interest (seasonality, interannual variability, secular trends, ...) of the environmental variables.
- The student will handle the best known discrete and continuous distributions, understand the difference between parameters of the distribution and estimators of the parameters (with their confidence intervals), make adjustments of distributions using maximum likelihood methods, moments, obtaining the estimators of the parameters and confidence intervals, perform Monte Carlo simulations, probabilistic analysis tool for multivariate problems that will be used later in other subjects of the Master, will know the characteristics of the middle and extreme wave regimes, knowing when one or the other should be used. Identify and model the random behavior of environmental variables, fundamental to perform a probabilistic analysis of any environmental system.
- The student will be able to manage the different databases (in general time series) of environmental variables.

### 4. OBJECTIVES

The student will know implement and learn the general aspects of programming techniques of the MATLAB ® software . Applied to the solution related to ports and coastal engineering, coastal management, and environmental hydraulics problems in general.

In addition the student will be able to statistically characterize a specific population data from descriptive statistics to the statistical mathematical modelling. Solve distribution functions, considering the timescales that define the behaviour of environmental variables.

6. COURSE ORGANIZATION	
CONTENTS	
1	Matlab Introduction
2	Matrix, Cells, and Sparse arrays
3	Matlab programing applied to coastal and port studies
4	Export, import and manage data with Matlab
5	Graphic representation of data and results with matlab
6	Descriptive statistics
7	Probability and density functions and distributions
8	Common distributions
9	Regressions
10	Time series analysis

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Homework 1	Work	No	Yes	25,00
Homework 2	Work	No	Yes	25,00
Homework 3	Work	No	Yes	25,00
Homework 4	Work	No	Yes	25,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>Continuous evaluation will be carried out throughout the course. The assessment criteria for evaluation will take this into account:</p> <ul style="list-style-type: none"> <li>- Participation in class and interest shown.</li> <li>- Mastering the basic concepts set out in the subject.</li> <li>- Be able to apply the knowledge acquired, solving practical problems.</li> <li>- Present the proposed work in a correct manner.</li> </ul> <p>The instruments used to carry out the evaluation will be: Practical activities and partial tests carried out will have the same weight on the final grade. The minimum grade to pass the course must be a 4.0 in total. Repeated unjustified lack of attendance and punctuality in the course classes may result in the loss of continuous assessment.</p> <p>Only for duly justified causes (eg sanitary restrictions), the evaluations may be organized remotely, with prior authorization from the Center's Directorate.</p>				
<b>Observations for part-time students</b>				
Part-time students will apply the same assessment criteria as full-time students. The temporary distribution of activities will be adapted to the particular conditions of each student when deemed necessary.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

Manual de MATLAB 7 ® (<http://www.mathworks.com>)

Material proporcionado a lo largo de la asignatura (apuntes).

Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers (The Oxford Series in Electrical and Computer Engineering). Rudra Patrap.

Mecánica Computacional en la Ingeniería con Aplicaciones en Matlab , E.W.V Chaves & R. Mínguez. UCLM, Universidad de Castilla-La Mancha

Luceño, A., González, F.J. (2004) Métodos estadísticos para medir, describir y controlar la variabilidad, Servicio de Publicaciones de la Universidad de Cantabria

Chatfield, C. (2003) The analysis of time series. An introduction, Ed: Chapman & Hall/CRC.

Castillo, E. (1993) Introducción a la estadística aplicada con Matemática, Servicio de Publicaciones de la Universidad de Cantabria.

Smith, R.L. (2001) Environmental statistics, Department of Statistics - University of North Caroline

Presentaciones en Powerpoint de la asignatura