1. OVERVIEW

Subject area	Computational Statistics
Degree	Bachelor's Degree in Data Science
School/Faculty	Faculty of Science, Engineering and Design
Year	Second
ECTS	6 ECTS
Type	Core
Language(s)	Spanish
Delivery Mode	On campus
Semester	1

2. INTRODUCTION

Computational Statistics is an area of technological science which deals with the impact computing has on statistical methods. This includes the following: algorithms; graphical modelling; intensive inferential methods for recurrent calculations; exploratory data analysis; statistical software assessment; simulation studies for statistical methods; and statistical methods in data mining and image and signal processing. This subject provides theory and practical knowledge of statistical modelling and also deals with all the changes and applications that computer science is generating in this field.

3. SKILLS AND LEARNING OUTCOMES

Basic and core skills:

- CG2 - Ability to plan and carry out an independent piece of work on project management in the different areas of physics.
- CB3 - Students must have the ability to gather and interpret relevant data (usually within their study area) to form opinions which include reflecting on relevant social, scientific or ethical matters.
- CB5 - Students have developed the learning skills necessary to undertake further study in a much more independent manner.

Cross-curricular skills (CT, by the acronym in Spanish):

- CT5 - Analysis and problem-solving: be able to critically assess information, break down complex situations, identify patterns and consider different alternatives, approaches and perspectives in order to find the best solutions and effective negotiations.

- CT6 - Adapting to change: be able to accept, consider and integrate different perspectives, adapting your own approach as required by the situation at hand, and to work effectively in ambiguous situations.

Specific skills (CE, by the acronym in Spanish):

- CE05 - Understand, evaluate and know how to use the most significant experimental models, and be able to independently carry out experiments, describing, analysing and critically evaluating the experimental data.
- CE07 - Ability to use electronic instruments and IT tools in the study of physics problems and search for solutions.

Learning outcomes (RA, by the acronym in Spanish):

- RA1: Analyse experimental approaches through integrated statistical and mathematical software packages which apply statistical and mathematical techniques to data processing, the search for relationships between variables and making predictions.
- RA2: Use programming languages and a wide variety of essential algorithms for statistical and mathematical problems.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CG1, CB3, CB5, CT5, CE07	RA1: Analyse experimental approaches through integrated statistical and mathematical software packages which apply statistical and mathematical techniques to data processing, the search for relationships between variables and making predictions.
CB3, CB5, CT6, CE05, CE07	RA2: Use programming languages and a wide variety of essential algorithms for statistical and mathematical problems.

4. CONTENTS

1. Principles of statistical programming language and mathematical software packages.
2. Introduction to software such as R, Python and NumPy/Matlab.
3. Computational analysis methods.
4. Applying techniques to real databases.
5. Applying techniques to resolve statistical and mathematical/physics problems.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Collaborative learning: students learn to work with other people (colleagues and professors) to find creative, comprehensive and constructive solutions to questions and problems that arise from the given case studies, using relevant knowledge and available resources in relation to each subject.

- Problem-based learning: students face problems they must solve either working as a team or independently.

- Master Lecture: presentations by the professor using the appropriate technological tools to facilitate understanding of the subject matter.

- Workshop teaching: students acquire knowledge working with the instruments they will use in their future profession. This emphasises “learning by doing”.

- Directed academic activities: more independent tasks (individual or in groups), involving search for information, written summaries, debates and public defence of work.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus/online:

Learning activity	Number of hours
Master classes	22
Spoken presentation of projects and debates	13
Report writing	10
Formative assessment	5
Practical work (problems, tasks, projects, workshops and/or laboratory work)	20
Tutorials	6
Independent working	74
TOTAL	**150**

7. ASSESSMENT

The assessment methods, plus their weighting in the final grade for the subject area, are as follows:

On campus:

Assessment system	Weighting
On campus knowledge tests, either theoretical or practical	55%

Oral defence	10%
Submission or reports, tasks and group and/or individual projects	25%
Performance observation	10%

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

PLAGIARISM RULES

In accordance with the Disciplinary Regulations for Universidad Europea students:

• Plagiarism of all or part of any kind of intellectual work is considered to be a very serious offence.

• If any student commits the very serious offence of plagiarism or cheating to pass an assessment test, they will be disqualified from the corresponding exam, and their absence and the reason for this absence will be filed in their academic record.

8. BIBLIOGRAFÍA

A continuación, se indica bibliografía recomendada:

- Arturo Montejo Ráez, Salud María Giménez, Curso de Programación Python, Ed. Anaya, 2019
- Juan José de Haro, Introducción a la programación con R: R como primer lenguaje de programación, orientado a la aplicación científica.
- Introducción a Mathematica online: https://www.wolfram.com/language/elementary-introduction/2nd-ed/preface.html.es