1. FUNDAMENTAL DATA

Subject	Statistics and Optimisation
Degree	Degree in Computer Engineering
School/ Faculty	School of Architecture, Engineering and Design
Course	Second Year
ECTS	6 ECTS
Type	Fundamental
Language	English
Modality	On-site / On-line
Semester	Second Semester
Academic Year	2025/2026
Coordinating Professor	Manuel García Fernández
Professor	Manuel García Fernández/Luis Poderoso Labrador

2. PRESENTATION

Statistics for Engineering is a basic second-year subject, worth 6 ECTS, of the University Degree in Computer Engineering. It belongs to the Mathematics module made up of the following subjects:

• Algebra.
• Mathematical analysis
• Statistics and optimization.

The overall objective of the subject is to equip students with the knowledge, tools and statistical methods necessary to analyze and solve various problems within the field of Engineering, such as qualitative and quantitative data analysis or determining the significance of the results obtained in a scientific study. The subject also develops attitudes associated with Mathematics, such as critical vision, the need for verification, the assessment of precision or the questioning of intuitive assessments. In addition, reasoning and the application of mathematical methodology in multiple aspects of professional training will be encouraged.

3. COMPETENCES AND LEARNING OUTCOMES

Knowledge:

CON01 Knowledge of basic subjects and technologies that enable learning and development of new methods and technologies, as well as providing great versatility to adapt to new situations.

Competencies:

CP01 Ability to conceive, write, organize, plan, develop, and sign projects in the field of computer engineering that aim, according to the knowledge acquired as specified in the specific competences of this degree, at the conception, development, or exploitation of computer systems, services, and applications.

Skills:

HAB02 Ability to solve mathematical problems that may arise in engineering. Proficiency in applying knowledge of linear algebra, differential and integral calculus, numerical methods, numerical algorithms, statistics, and optimization.

4. CONTENTS

Subject content is divided in 6 learning units, each divided into 2 or 3 chapters.

- Unit 1. Descriptive Statistics and Linear Regression

    - Chapter 1: Centrality and Dispersion measurements.
    - Chapter 2: Data representation and organization.
    - Chapter 3: Linear Regression.

The objective of this unit is to learn how to perform a descriptive analysis of a set of data, using measures of centrality, dispersion and various representation systems (histograms, box plots...), as well as making predictions and studying correlations using linear regression.

- Unit 2. Probability

    - Tema 4: Probability.
    - Tema 5: Combinatorics.

The objective of this unit is to apply probability calculation techniques to solve problems in the field of Engineering and Science, developing the necessary theoretical framework.

- Unit 3. Random Variables

    - Tema 6: Unidimensional Random Variables.
    - Tema 7: Multidimensional Random Variables.

The objective of this unit is to understand the concept of random variable and its use to probabilistically model phenomena of all types.

- Unit 4. Probabilistic modes: Random Distributions

    - Tema 8: Discrete random distributions

- Tema 9: Continuous random distributions.
- Tema 10: The Central Limit Theorem.

The objective of this unit is to know and learn the most important discrete and continuous probabilistic models and their direct application to specific problems.

- <u>Unit 5. Statistical Inference</u>

  - Tema 11: Point Estimate.
  - Tema 12: Confidence Intervals
  - Tema 13: Hipothesis constrast.

The objective of this unit is to learn to analyze the relationship between different types of variables obtained in a scientific study, to determine their statistical significance and to make predictions, estimates and inferences from the data obtained.

- <u>Unit 6. Optimisation</u>

  - Introduction to optimisation

5. TEACHING METHODOLOGIES

The next teaching methodologies will be used:

- Interest and objective survey.

- Masterclass and seminar.

- Group work.

- Designs, undertood as practical proposals for developing solutions.

- Practical Case Studies.

6. TRAINING ACTIVITIES

Here the time used for each training activity is described:

On-site:

Training Activityity	Hours	Use of AI
Master classes, reading of main topics and complementary materials, carrying out individual and collaborative application activities (includes participation in collaborative learning forums).	50 h	Not allowed
Integrative group work, which consists of participating in debates and seminars, and carrying out group application activities of an integrative nature, mainly in the classroom.	25 h	Allowed

Autonomous work	50 h	Recommended
Tutorials, academic monitoring and evaluation, both in the classroom and through the Virtual Campus.	25 h	Not allowed
TOTAL	**150 h**	

On-line:

Actividad formativa	Número de horas	Use of AI
Autonomous work	50 h	Recommended
Individual reading of topics and complementary materials and carrying out individual application activities. Subsequently, asynchronous group debate via forum on the Virtual Campus, and virtual seminar with the synchronous e-learning tools of the Virtual Campus	50 h	Not allowed
Integrative group work, which consists of participation in debates and seminars, and carrying out integrative application activities in groups. Carried out with the support of the Virtual Campus (debates are via forums, seminars are virtual). In addition, each group has asynchronous communication tools to prepare group work (mainly forums), as well as synchronous communication tools (mainly virtual meeting tools).	25 h	Allowed
Tutorials, academic monitoring and evaluation, through the Virtual Campus. Some evaluation tests that require it (e.g. exams) may be carried out in person.	25 h	Not allowed
TOTAL	**150 h**	

7. EVALUATION

Here the evaluation system used and the weight on the subject

Modalidad presencial:

Assignment	Evaluation criteria	Weight (%)
Group Assignment	• Actively participates with the group members. • Shows capacity for collaborative work. • The resolution of the activity is correct and includes explanations and conclusions that facilitate reading and understanding.	20%
Individual Assignment	• The resolutions of the problems are correct and include explanations to facilitate reading and understanding. • The steps are properly argued and the data is correctly identified and its meaning determined. • The method has been used correctly and orderly and the most efficient process has been chosen to obtain the results from the given data.	20%
Midterm Exam	• Understands mathematical concepts and knows how to apply them. • Makes correct use of the mathematical tools necessary to apply the concepts in solving problems Organizes results logically and expresses themselves precisely.	20%
Final Exam	• Understands mathematical concepts and knows how to apply them. • Makes correct use of the mathematical tools necessary to apply the concepts in solving problems Organizes results logically and expresses themselves precisely.	40%

Modalidad semipresencial:

Assignment	Evaluation Criteria	Weight (%)
Group Assignment	• Actively participates with the group members. • Shows capacity for collaborative work. • The resolution of the activity is correct and includes explanations and conclusions that facilitate reading and understanding.	10%

Individual Assignement	• The resolutions of the problems are correct and include explanations to facilitate reading and understanding. • The steps are properly argued and the data is correctly identified and its meaning determined. The method has been used correctly and orderly and the most efficient process has been chosen to obtain the results from the given data.	30%
Final Exam	• Understands mathematical concepts and knows how to apply them. • Makes correct use of the mathematical tools necessary to apply the concepts in solving problems Organizes results logically and expresses themselves precisely.	60%

In the Virtual Campus, when you access the subject, you will be able to consult in detail the evaluation activities that you must carry out, as well as the delivery dates and evaluation procedures for each of them.

7.1. Ordinary Evaluation

To pass the subject in the ordinary call you must meet the following requirements:

• Pass, independently, the group project and the final integrative test (grade equal to or greater than 5.0).
• Meet the minimum class attendance requirements demanded by the Engineering School (50%).
• Obtain a final average grade for the course equal to or greater than 5.0 points out of 10.

Those students who do not meet one or more of the above requirements will be graded with a final grade that may not exceed 4.0 points out of 10.

7.2. Extraordinary Evaluation

To pass the extraordinary call subject you must repeat the modules not passed (individual activities, group project and the final integrative test), maintaining the grade in those that are passed. The details of these substitute activities will be published on the Virtual Campus at the end of the Ordinary Evaluatuon.

8. CRONOGRAM

Here the Units and the dates

Asignments	Learning Unit	Dates	Weight
Individual Assignements	UA1	Weeks 2-3	15%
	UA2	Weeks 5-6	
	UA3	Weeks 7-8	
	UA4	Weeks 11-12	
	UA5	Weeks 13-14	
	UA5	Weeks 15-16	
Group assignment	UA1 – UA6	Weeks 2-16	25%
Midterm Exam	UA1, UA2, UA3	Weeks 9-10	20%
Final Exam	UA1, UA2, UA3, UA4, UA5, UA6	Weeks 17-18	40%

Este cronograma podrá sufrir modificaciones por razones logísticas de las actividades. Cualquier modificación será notificada al estudiante en tiempo y forma.

9. BIBLIOGRAPHY

The next books will be the bibliography employed:

- M. C. Mavrakakis & J. Penzer, Probability and Statistical Inference. CRC Press.

- G. C Canavos. Applied Probability and Statistical Methods. McGraw Hill

10.   DIVERSITY AND INCLUSION UNIT

From the Educational Guidance and Diversity Unit (ODI) we offer support to our students throughout their university life to help them achieve their academic achievements. Other pillars of our action are the inclusion of students with specific educational support needs, universal accessibility on the different campuses of the university and the equalization of opportunities.
This Unit offers students:
1. Accompaniment and monitoring by providing personalized advice and plans to students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made, that is, at the level of methodology and evaluation, in those students with specific educational support needs, thereby pursuing equity of opportunities for all students.
3. We offer students different extracurricular training resources to develop various skills that will enrich their personal and professional development.
4. Vocational guidance by providing tools and advice to students with vocational doubts or who believe that they have made a mistake in choosing a degree.

Students who need educational support can write to us at:
 orientacioneducativa@universidadeuropea.es

11.   SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to participate in satisfaction surveys to detect strengths and areas for improvement regarding the teaching staff, the degree and the teaching-learning process.

The surveys will be available in the survey space of your virtual campus or through your email.

Your assessment is necessary to improve the quality of the degree.

Thank you very much for your participation.