# 1. BASIC INFORMATION

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|---|---|
| **Course** | Statistics |
| **Degree program** | Bachelor in Aerospace Engineering |
| **School** | Architecture, Engineering and Design |
| **Year** | Second |
| **ECTS** | 6 ECTS |
| **Credit type** | Basic |
| **Language(s)** | English |
| **Delivery mode** | On-site |
| **Semester** | Second |
| **Academic year** | 2024/2025 |
| **Professor** | Dr. Manuel García Fernández, Dr. Guillermo Castilla. |
| **Coordinating Professor** | Dr. Manuel García Fernández |

# 2. PRESENTATION

Statistics for Engineering is a 6 ECTS second-year mathematics course. Its overall objective is to equip students with knowledge and skills related to the concepts and basic problems of statistics and probability. The course is an introduction to statistical methods, mainly one-variable analysis, applied to the environment and scientific research in many fields of engineering. This subject is part of the Mathematics module, which consists of the following courses:

- Algebra
- Calculus I
- Calculus II
- Statistics

Students will be able to deal with statistical concepts including measures of central tendency and dispersion, probability distributions, confidence intervals and hypothesis testing, and to apply them to a wide range of situations. They will demonstrate basic mathematical understanding and computational skills, and they will be able to explain and critique mathematical reasoning through speaking and writing in a precise and articulate way.

# 3. COMPETENCIES AND LEARNING OUTCOMES

**Core competencies:**

- CB2: That students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- CB5: That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

**Cross-curricular competencies:**

- CT12: Knowledge of basic subjects and technologies, enabling the student to learn new methods, theories, and technologies, and endowed it with great versatility to adapt to new situations (autonomous learning)
- CT14: Problem Solving with initiative, decision making, creativity, and critical thinking, professionally, and the preparation and defense of arguments (Troubleshooting).
- CT16: To communicate and convey information, ideas and skills in the student's field of specialization, either in writing or orally, both to skilled and unskilled audiences (communication skills).
- CT19: Working in interdisciplinary teams, providing the most efficient on the basis of cooperation, assuming their role within the team, establishing good relationships and exchanging information (teamwork).

**Specific competencies:**

- CE1: Ability to solve mathematical problems arising in engineering. Ability to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations; numerical methods; numeric algorithm; statistics and optimization.

**Learning outcomes:**

- LO1: Be able to solve problems of applied mathematics.
- LO2: perform structured and rigorous engineering reports (based on laboratory practices).

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

| Competencies | Learning outcomes |
|---|---|
| CB2, CB5 | LO1, LO2 |
| CE1, CT12, CT14 | LO1 |
| CT16, CT19 | LO2 |

# 4. CONTENT

The course is divided in five learning units, as detailed in Annex:

- Unit 1. Descriptive Statistics
- Unit 2. Probability.
- Unit 3. Random variables and introduction to stochastic processes
- Unit 4. Probability models.
- Unit 5. Statistical inference.

# 5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Cooperative learning
- Problem Based Learning (PBL)
- Learning assignments (case studies)
- Master class (fase-to-face sessions)

# 6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

**Campus-based mode:**

| Learning activity | Number of hours |
|---|---|
| TEA1: Master classes (face-to-face sessions) | 25 |
| TEA2: Group work (participation in debates and seminars, group activitiesand exercises) | 55 |
| TEA3: Self-studying and autonomous work | 50 |
| TEA4: Tutoring sessions, follow-up and assessments. | 20 |
| **TOTAL** | **150** |

# 7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

**Campus-based mode:**

| Assessment system | Weight |
|---|---|
| Exams, quizzes and other tests of knowledge | 30-35% |
| Preparation of articles, assessment or reports | 15-30% |
| Alternative evaluation techniques | 15-30% |
| Field experiences, conferences and visits | 10% |
| Transversal competences (rubrics) | 10-15% |

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

## 7.1. First exam period

To pass the course in the first exam period, you must:

- Attend at least 50% of the lectures, with the exception of some special cases included in the School regulations.
- Obtain a final course grade of at least 5 out of 10 (weighted average).
- Obtain a grade greater than or equal to 5.0 out of 10 in the final exam.
- Obtain a grade greater than or equal to 5.0 out of 10 in the group project.

In any case, you will need to obtain a grade of at least 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

### 7.2. Second exam period

Students who do not pass the course during the normal assessment period will have a second chance to retake the course in the Supplementary Exam Period. The same requirements and assessment rules mentioned in the previous section (regular assessment period) hold also in this period, with the exemption of the attendance requirement.

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at least 5.0 in the final exam for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period or those that were not delivered in the first place. They will carry out new activities of similar difficulty and length. These activities will be published in the Virtual Campus at the beginning of the Supplementary Exam Period.

## 8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

| Assessable activities | Deadline |
|---|---|
| Lab session with Matlab.<br>Group Activity Unit 1 | Week 3 |
| Individual Activity Units 1 and 2. | Weeks 6-7 |
| Individual Activity Unit 3 | Weeks 9-11 |
| Midterm exam | Weeks 8-9 |
| Class Activity Unit 4 | Weeks 11-12 |
| Class Activity Unit 5 | Week 14-15 |
| Group Project: first hand in<br>(presentation of data for validation) | Week 4 |
| Group Project: report hand in | Week 15-16 |
| Project group presentation | Week 15-17 |
| Final exam | Week 16-17 |
| Visit/conference | To determine |

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

## 9. BIBLIOGRAPHY

The recommended Bibliography is:


- R. E. WALPOLE, R.H. MYERS, S.L. MYERS. *Essentials of probability & statistics for engineers & scientists*. PEARSON
- R. E. WALPOLE et al. *Probabilidad y Estadística*. México, McGraw-Hill.
- R. S. Witte, J.S. Witte. *Statistics*. WILEY


## 10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

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

## 11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.