



## Teaching Guide

| Teaching Guide      |                                                                                                                                                                                                 |        |                                                                                                                                                                             |           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Identifying Data    |                                                                                                                                                                                                 |        |                                                                                                                                                                             | 2023/24   |
| Subject (*)         | Statistics                                                                                                                                                                                      |        | Code                                                                                                                                                                        | 614G01008 |
| Study programme     | Grao en Enxeñaría Informática                                                                                                                                                                   |        |                                                                                                                                                                             |           |
| Descriptors         |                                                                                                                                                                                                 |        |                                                                                                                                                                             |           |
| Cycle               | Period                                                                                                                                                                                          | Year   | Type                                                                                                                                                                        | Credits   |
| Graduate            | 2nd four-month period                                                                                                                                                                           | First  | Basic training                                                                                                                                                              | 6         |
| Language            | SpanishEnglish                                                                                                                                                                                  |        |                                                                                                                                                                             |           |
| Teaching method     | Face-to-face                                                                                                                                                                                    |        |                                                                                                                                                                             |           |
| Prerequisites       |                                                                                                                                                                                                 |        |                                                                                                                                                                             |           |
| Department          | Matemáticas                                                                                                                                                                                     |        |                                                                                                                                                                             |           |
| Coordinador         | Francisco Fernandez, Mario                                                                                                                                                                      | E-mail | mario.francisco@udc.es                                                                                                                                                      |           |
| Lecturers           | Aneiros Perez, German<br>Cao Abad, Ricardo<br>Francisco Fernandez, Mario<br>Gómez Rodríguez, Marcos<br>González Santamaría, Iker<br>Oviedo de la Fuente, Manuel<br>Vilar Fernandez, Juan Manuel | E-mail | german.aneiros@udc.es<br>ricardo.cao@udc.es<br>mario.francisco@udc.es<br>marcos.gomez.rodriguez@udc.es<br>iker.gonzalez@udc.es<br>manuel.oviedo@udc.es<br>juan.vilar@udc.es |           |
| Web                 | campusvirtual.udc.es                                                                                                                                                                            |        |                                                                                                                                                                             |           |
| General description | Descriptive statistics. Exploratory data analysis. Probability. Probability models. Statistical inference.                                                                                      |        |                                                                                                                                                                             |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | Capacidade para a resolución dos problemas matemáticos que se poden presentar na enxeñaría. Aptitude para aplicar os coñecementos sobre: álgebra linear; cálculo diferencial e integral; métodos numéricos; algorítmica numérica; estatística e optimización. |
| B3   | Capacidade de análise e síntese                                                                                                                                                                                                                               |
| C2   | Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.                                                                                                                                                                           |

## Learning outcomes

| Learning outcomes                                                                                                                                                                                  | Study programme competences |    |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----|----|
| Knowing how to use auxiliary computer tools for Statistics: statistical packages and programming languages with statistical orientation; and knowing how to critically interpret the results.      | A1                          | B3 | C2 |
| Knowing how to analyze data using descriptive techniques and how to perform inference of population features from partial information, collected by random sampling, using statistical techniques. | A1                          | B3 | C2 |
| Knowing how to model in simple random contexts using probabilistic tools                                                                                                                           | A1                          | B3 | C2 |

## Contents

| Topic                  | Sub-topic                                                                                       |
|------------------------|-------------------------------------------------------------------------------------------------|
| Probability            | Definition of probability. Properties<br>Conditional probability. Bayes? theorem                |
| Random variables       | Discrete random variables<br>Continuous random variables<br>Central limit theorem<br>Simulation |
| Descriptive statistics | Frequency distributions<br>Graphical representations<br>Location and dispersion measures        |



|                       |                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------|
| Statistical inference | Introduction<br>Point estimation<br>Confidence intervals<br>Parametric hypothesis tests<br>Nonparametric hypothesis tests |
| Simple regression     | Simple linear regression<br>Nonlinear regression                                                                          |

| Planning                                                                                                                        |              |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech                                                                                                  | A1 B3 C2     | 30                   | 48                            | 78          |
| Laboratory practice                                                                                                             | A1 B3 C2     | 20                   | 20                            | 40          |
| Seminar                                                                                                                         | A1 B3 C2     | 10                   | 10                            | 20          |
| Mixed objective/subjective test                                                                                                 | A1 B3 C2     | 3                    | 3                             | 6           |
| Personalized attention                                                                                                          |              | 6                    | 0                             | 6           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |              |                      |                               |             |

| Methodologies                   |                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                   | Description                                                                                                                                                                                                                                                                                                                                                                                                   |
| Guest lecture / keynote speech  | Students will receive lectures where the professor, with the help of relevant audiovisual media, will present the theoretical and practical contents of the subject. Participation and debate will be encouraged at all times.                                                                                                                                                                                |
| Laboratory practice             | Laboratory practices will be held in a computer lab. It will be learned how to use the free statistical software R, and its programming structures. Statistical studies using both real and simulated data will be performed.                                                                                                                                                                                 |
| Seminar                         | Seminars will reinforce both the applied nature of the subject and its interactivity. Students will be able to express their doubts and concerns regarding the subject, and they will have the opportunity to perform, with the professor supervision, similar questions to those proposed in the exams. Additionally, with a very individualized attention, they will be able to complete the lab practices. |
| Mixed objective/subjective test | Students will have to show proficiency in the theoretical aspects of the subject and their ability to solve problems in the field of probability and statistics.                                                                                                                                                                                                                                              |

| Personalized attention                                           |                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                                                    | Description                                                                                                                                                                                                                                                                                                                                                                       |
| Guest lecture / keynote speech<br>Laboratory practice<br>Seminar | For problem solving, it will be important to personally help students with the questions that may arise. This attention will also serve, on the one hand, to the professor to detect potential problems in the methodology used to teach the subject and, on the other hand, to the students to strengthen theoretical knowledge and to express their concerns about the subject. |

| Assessment    |              |             |               |
|---------------|--------------|-------------|---------------|
| Methodologies | Competencies | Description | Qualification |



|                                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
|---------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Laboratory practice             | A1 B3 C2 | Students will develop lab practice exercises specifically designed to assess their monitoring of the subject. The correct completion of these exercises will be supervised by the professor in the classroom. To evaluate the degree of understanding and learning of these practices, 2 or 3 assessment tests will be scheduled. They will be performed during the laboratory classes having a 20% of the final grade.<br>For enrolled full-time students, the practice mark is not retrievable by performing another test. Enrolled part-time students, who have not been evaluated of laboratory practices, may perform a specific test to retrieve the 20% of the mark corresponding to that part. | 20 |
| Seminar                         | A1 B3 C2 | During the course, students will prove their interest in the subject and his mastery of it by performing two written tests (controls), each with a maximum mark of 10%. These two tests will correspond to Chapters 1 and 2 of the course.<br>Students who do not obtain the maximum of 20% of the mark corresponding to this part will be able to retrieve the remaining part when taking the final exam of the subject.                                                                                                                                                                                                                                                                              | 20 |
| Mixed objective/subjective test | A1 B3 C2 | The final exam, with a value between 60% and 80% (depending on Chapters 1 and 2 written control grades), will consist of a theoretical and a practical written test.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 60 |

## Assessment comments

Students will finish the class period with a maximum of 40% of the grade, achieved with the two written tests (10% each) and the two or three tests evaluating the laboratory practices (20%).

On the date set by the Faculty in its annual program, students will perform, in writing, the final exam of the subject (60%), where they will have to answer theoretical questions, solve theoretical and practical issues, and calculate the solution of several problems. For this test, students will only bring the material expressly authorized (e.g. pen or calculator). The grade obtained in the final exam (60%) will be re-scaled so that students will have the opportunity to retrieve the 20% of the mark corresponding to the written controls (the 20% of the laboratory practice assessment mark cannot be retrieved). Thus, depending on the score obtained by the student in the two written controls, the highest score of the final exam will be between 6 and 8 points (out of 10).

Thus, denoting by P the laboratory practice grade (between 0 and 2 points), denoting by C the written controls (Chapters 1 and 2) final grade (between 0 and 2 points) and denoting by F the final exam grade (between 0 and 10 points), the course final grade will be  $P+C+0.1 \cdot (8-C) \cdot F$ . The day of the final exam, part-time students, who have not been previously evaluated for the laboratory practice part, will be able to perform a specific test to retrieve the 20% of the mark corresponding to that part.

In the second-chance, the marks obtained by continuous evaluation (the two controls and the tests of the laboratory practices) are maintained and the student only has to repeat the final exam that will be of the same type and with the same weight in the final mark that in the first call, that is, the same formula will be applied to calculate the final grade, but now F is the grade that the student has obtained in the second-chance final exam.

The fraudulent performance of the tests or evaluation activities will directly imply the grade of failure (0) in the subject.

The evaluation system in the case of academic dispensation will be the same as that described in this section.

## Sources of information

|              |                                                                                                                                                                                                                                                                                                                                          |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b> | <ul style="list-style-type: none"> <li>- Cao, R., Francisco, M., Naya, S., Presedo, M.A., Vázquez, M., Vilar, J.A. y Vilar, J.M. (2001). Introducción a la Estadística y sus aplicaciones. Ediciones Pirámide</li> <li>- Eguzkitza Arrizabalaga, J.M. (2014). Laboratorio de estadística y probabilidad con R. Gami Editorial</li> </ul> |
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|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Complementary</b> | <ul style="list-style-type: none"><li>- Blasco Lorenzo, A. y Pérez Díaz, S. (2015). Modelos aleatorios en ingeniería. Paraninfo</li><li>- Devore, J.L. (2005). Probabilidad y Estadística para Ingeniería y Ciencias. Thomson</li><li>- Gonick, L. y Smith, W. (2001). Á estatística ¡en caricaturas!. SGAPEIO</li><li>- Hernández, V., Ramos, E. y Yáñez, I. (2007). Probabilidad y sus aplicaciones en Ingeniería Informática. Ediciones Académicas</li><li>- Horgan, J.M. (2009). Probability with R. An Introduction with Computer Science Applications. Wiley</li><li>- Montgomery, D.C. y Runger, G.C. (2004). Probabilidad y Estadística aplicadas a la Ingeniería. McGraw-Hill</li><li>- R Development Core Team (2000). Introducción a R. <a href="http://www.r-project.org/">http://www.r-project.org/</a></li><li>- Ugarte, M.D., Militino, A.F., Arnholt, A.T. (2008). Probability and Statistics with R. Chapman and Hall/CRC</li></ul> |
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## Recommendations

### Subjects that it is recommended to have taken before

Calculus/614G01003

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Statistical Methods/614G01057

### Other comments

-Non-sexist language will be used, a bibliography of authors of both sexes will be used, the intervention of male and female students will be promoted in class.-Work will be done to identify and modify prejudices and sexist attitudes and the environment will be influenced to modify them and promote values of respect and equality.-It will try to detect situations of discrimination based on gender and propose actions and actions to correct them.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.