

Data Analysis Methods

Code: 106220
ECTS Credits: 6

Degree	Type	Year	Semester
2504235 Science, Technology and Humanities	OB	2	1

Contact

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Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

External teachers

Ana Arribas Gil

Prerequisites

There are none.

Objectives and Contextualisation

This course deals with basic ideas on Probability and Statistics, with the objective of providing the necessary tools and concepts that allow analysing and managing quantitative information.

Competences

- Analyse questions related to science and technology in society, using basic, essential forms of mathematical and statistical reasoning.
- Innovate in the methods and processes of this area of knowledge in response to the needs and wishes of society.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.

Learning Outcomes

1. Analyse data rigorously to draw conclusions from them.
2. Apply the main statistical distributions, the concept of regression to the mean and the basic notions of statistical inference to specific problems.
3. Collect and interpret data to substantiate the conclusions drawn, including, where necessary, a reflection on social, scientific or ethical matters.
4. Explain some findings from the forefront of science in terms that are accessible to students without in-depth knowledge of the subject matter.
5. Explain the basic mathematical concepts and gain familiarity with mathematical reasoning.
6. Formulate and apply programming models and languages to basic problem solving in statistics and probability.
7. Make competent use of software for analysing, synthesising and transmitting quantitative information, especially through graphs and computer graphics.
8. Make estimates of order of magnitude and avoid common fallacies and errors in the use of numerical information and in the interpretation of scientific results (diagnostic tests, clinical trials, etc.).
9. Summarise the fundamentals of data management and analysis technologies, and tools for representing information.

Content

Introduction: data, information, knowledge

Where to find information: resources, research techniques, reliability

Numeric alphabetisation: percentages, magnitude orders, linearity and non linearity

Graphical information representation techniques and scientific visualization

Spreadsheets as tools for basic data management and representation

Correlation and causality. From data to theory

Discrete correlation: the classification problem. Sensibility and specificity. Bayes theorem

Signal and noise: random phenomena. Binomial, normal and Poisson distributions

Continuous correlation: regression to the mean

Introduction to inferential statistics: surveys and clinical trials

Fundamentals of programming for data analysis

Methodology

Theory: Theory classes with materials available on the web.

Practices: Problem classes. Computing classes using statistical software.

Group tutorials for resolution of problems, doubts etc.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	33	1.32	1, 2, 4, 5, 8, 6, 3, 9, 7

Practical lectures	16	0.64	1, 8, 3, 7
Type: Supervised			
Essay supervision	4.25	0.17	1, 2, 7
Type: Autonomous			
Study and essay writing	94.75	3.79	1, 2, 4, 5, 8, 6, 3, 9, 7

Assessment

Continuous evaluation

Two written tests counting 40% of the final grade.

Group project counting 10% of the final grade.

Final exam

End of course exam counting 50% of the final grade.

In the extraordinary exam, the student will sit a new written exam and will receive a grade equal to the maximum of the exam grade or a weighted average of the exam (50%) and coursework (50%) in the same way as the usual convocation.

Single assessment

Students who opt for the single assessment system will have to take two written tests (50%) and an exam (50%), on the indicated date.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Essay 1	20%	0	0	1, 2, 5, 8, 3, 7
Essay 2	20%	0	0	1, 2, 5, 8, 3, 7
Final exam	50%	2	0.08	1, 2, 4, 5, 8, 6, 9
Group final essay	10%	0	0	1, 2, 5, 8, 6, 3, 7

Bibliography

Basic references

C. Criado Pérez. *La mujer invisible. Descubre cómo los datos configuran un mundo hecho por y para los hombres*. Barcelona: Seix Barral, 2020.

D. Huff. *Cómo mentir con estadísticas*. Barcelona: Crítica, 2015.

D. Peña y J. Romo. *Introducción a la Estadística para las Ciencias Sociales*. Madrid: Mc Graw Hill Interamericana, 1997.

I. Portilla. *Estadística descriptiva para comunicadore*. Pamplona: Editorial EUNSA, 2004.

Additional references

D. Rowntree. *Statistics Without Tears*. London: Penguin Books, 2018.

G. Klass. *Just Plain Data Analysis*. Lanham, MD: Rowman & Littlefield, 2012 (2nd. ed.).

Software

No specific software is required.