Universitat Autònoma de Barcelona

2023/2024

Informatics Tools for Statistics

Code: 104849
ECTS Credits: 6

Degree	Type	Year	Semester
2503852 Applied Statistics	FB	1	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.

Teachers

Aureli Alabert Romero

Sundus Zafar

Prerequisites

Because it is an undergraduate and in the first semester, it has no prerequisite.

Objectives and Contextualisation

The main objectives of the subject are the following:

- Familiarize yourself with the use of an algebraic and calculating manipulator. This manipulator must be considered as a common tool when studying the rest of the subjects.
- Learn how to structure and write scientific texts with the LaTeX word processor.
- Familiarize yourself with the concept of statistical package. In particular, create and transform databases and get used to work environments in graphic mode and command line.
- Learn how to use a command line operating system, taking advantage of the power of current computers to merge, separate or extract data from files or file sets.
- Introduce yourself to the formalization of algorithms using a programming language.

Competences

- Make efficient use of the literature and digital resources to obtain information.
- Select the sources and techniques for acquiring and managing data for statistical processing purposes.

- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- 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.
- Use quality criteria to critically assess the work done.
- Use software for statistical analysis, numerical and symbolic analysis, graphic visualisation, optimisation or others, to solve problems.
- Work cooperatively in a multidisciplinary context, respecting the roles of the different members of the team.

Learning Outcomes

1. Correctly identify the types of data and measurements.
2. Critically assess the work done on the basis of quality criteria.
3. Identify the advantages and disadvantages of the internet as a major source of information in statistics.
4. Make effective use of references and electronic resources to obtain information.
5. Show skill in operations with symbolic calculus packages.
6. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
7. 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.
8. Use programming languages related to statistical applications competently.
9. Use science editors to present papers, problems, reports and scientific texts in general.
10. Work cooperatively in a multidisciplinary context, accepting and respecting the roles of the different team members.

Content

1. Brief introduction to computing. Computing resources at the University available to use in the course.
2. Textprocessor (LaTeX): Localization of the software. Structure of a TeX file.
3. Statistical packs (R): Work environments. Declaration of variables. Creation, obtaining and manipulation of databases. Descriptive tools Graphic environment.
4. Computer Algebra System (Sage): numerical and algebraic calculations. Function graphs. Resolution of equations. Definition of functions. Lists, sets and successions. Logical programming, iterations and procedures.
5. Operating system (Bash): graphic environment. The console First instructions and obtaining help. Manipulation of files.
6. Programming (Python): Introduction to Python.

Methodology

The practical classes are held in computer rooms or classrooms prepared for the use of laptops.

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			
Practice sessions	51	2.04	2, 9, 1, 3, 6, 10, 8, 4
Type: Autonomous			
LaTeX document preparation	10	0.4	2, 9, 3, 10, 4
Preparing for the exam on a computer algebra system	20	0.8	2, 1, 3, 7, 6, 8, 4
Preparing for the exam on an operating system	19	0.76	2, 1, 3, 6, 8, 4
Preparing for the exam on the statistical package	20	0.8	2, 1, 3, 6, 8, 4
Writing a Python program	20	0.8	2, 1, 3, 6, 8, 4

Assessment

Continuous evaluation activities provide a grade; to pass the subject this grade has to be greater or equal than 5, and the mark obtained on each subject block has to be greater or equal than 3. A time of 4 hours is reserved to re-evaluate any exam that the student failed.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Computer algebra system exam	0.26	3	0.12	2, 5, 9, 1, 6, 8, 4
Final exam	0.43	4	0.16	2, 1, 3, 6, 8, 4
LaTeX document delivery	0.13	0	0	2, 9, 3, 7, 6, 10, 4
Operating system exam	0.17	1	0.04	2, 1, 3, 6, 8, 4
Python program delivery	0.22	0	0	2, 1, 3, 6, 8, 4
Statistic package exam	0.22	2	0.08	2, 1, 3, 6, 8, 4

Bibliography

As all work is done on computers, the main source of information will be the *help* of the programs that are used. In addition, as a complementary bibliography we recommend the following online resources.

- Tobias Oetiker, Hubert Partl, Irene Hyna and Elisabeth Schlegl. The not so short introduction toLaTeX2E (or LaTeX in 139 minutes). https://tobi.oetiker.ch/lshort/lshort.pdf
- W.N. Venables, D.M. Smith and the R Development Core Team: An introduction to R.https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf
- GNU Bash manual, https://www.gnu.org/software/bash/manual/
- Guido van Rossum, Fred L. Drake, Jr., editors, The Python Language Reference, http://marvin.cs.uidaho.edu/Teaching/CS515/pythonReference.pdf
- The Sage Reference Manual, https://doc.sagemath.org/html/en/reference/

Software

SageMath, R, Python, LaTeX and GNU/Linux.