Faculty of Experimental Sciences

DEGREE IN ENVIRONMENTAL SCIENCES / DEGREE IN GEOLOGY /DOUBLE DEGREE IN ENVIRONMENTAL SCIENCES AND GEOLOGY

Subject Data

Name:

ESTADÍSTICA Y TRATAMIENTO DE DATOS (LEX-TOT)

English name:

STATISTICS AND DATA ANALYSIS

Codes:	Type:
757709203 – 757609107 – 757914109	Basic/Compulsory

Hours:

	Total	In class	Outclass
Time distribution	150	60	

ECTS:

Standard group	Small groups			
	Classroom	**Lab**	**Practices**	**Computer classroom**
	4			2

Departments:	Knowledge areas:
ECONOMY	Statistics and Operations Research

Year:	Semester
1st year	2nd semester

TEACHING STAFF		
Name:	**E-mail:**	**Telephone**
Isabel Serrano Czaia	iserrano@uhu.es	959219680

Other Data (Tutoring, schedule...)
Timetable of classes: • *Classes*: Wed 9:00 – 10:00, Thu 16:00 – 18:00 • *Computer sessions*: Tue 18:00-20:00. Ten computer sessions. Computer classes start: : 21 February **Tutoring:** Office: P4-33 (Experimental Sciences building, orange doors) Phone: +34 959 218223 Second Semester office hours: • Tue 10:00 – 12:00, • Wed 10:00 – 14:00 Students are welcome to come to my office to discuss homework problems or any aspect of the course during office hours or at other times by email appointment.

SPECIFIC INFORMATION ABOUT THE COURSE

I. Contents description:

I.I In English:
The subject "Statistics" starts from the basic statistical knowledge until arriving at advanced statistical techniques fundamentally looking for the application on interesting models in environmental and geological sciences Contents: • Fundamental concepts of data description and probability theory. • Statistical inference techniques: sampling design, estimation and statistical hypothesis testing. • Advanced statistical models: Regression, introduction to multivariate analysis. • Use of statistical computer tools.

I.2 In Spanish:
La asignatura "Estadística" parte de los conocimientos estadísticos básicos hasta llegar a las técnicas estadísticas avanzadas buscando fundamentalmente la aplicación sobre modelos de interés en Ciencias Ambientales y Geología. Contenidos: • Conceptos fundamentales de descripción de datos y teoría de la probabilidad. • Técnicas de inferencia estadística: diseño muestral, estimación y pruebas de hipótesis estadísticas. • Modelos estadísticos avanzados: Regresión, introducción al análisis multivariante. • Utilización de herramientas informáticas estadísticas.

ANEXO I

2. Background:
2.1 Situation within the Degree:
Acquire and master statistical techniques and methods useful for future professionals in environmental and geological sciences.
2.2 Recommendations
No formal prerequisites are required. Knowledge of basic mathematics (calculus) is helpful for the understanding of the subject. Regular class attendance is an asset. Class participation and solving the problems given as homework and online quizzes are strongly encouraged and can make a difference in the final grade.

3. Objectives (as a result of teaching):
The objective and learning outcomes of this subject is to develop in the students the knowledge of the basic principles of statistics and the management of data through computer packages with statistical applications. In particular, statistical analysis techniques in the field of environmental sciences and geology, and to acquire the skills to: - Extract relevant information from a set of data - Make numerical and graphical summaries from information provided or previously collected. - Get from the observed to the unobserved through induction. - Interpret results when dealing with data with a large number of variables. To this end, students will develop competencies focused on the resolution of questions that arise in the field of environmental and geological sciences, both with traditional statistical analysis techniques and with the handling of data using computer packages with statistical applications.

4. Skills to be acquired
4.1 Specific Skills:
• The specific competences are detailed in the Spanish teaching guides of this subject in the Degree in Geology and / or Environmental Sciences.
4.2 General, Basic or Transversal Skills:

• Basic skills:
    CG2.2 - Ability to solve problems with Qualitative and Quantitative information.
    CG8 - Computer skills related to the field of study: Spreadsheet, processing, and databases.
 	
• Transversal skills:
    TC2. Develop a critical attitude, being able to analyze and synthesize.
    TC4. Acquire Computer and Information Skills (CI2) and apply them working.
    TC3: Development of an attitude of enquiry that allows for the permanent revision and advancement of knowledge.

5. Training Activities and Teaching Methods

5.1 Training Activities:

- Large group lecture: Lecture given by the teacher may have different formats (theory, problems and/or general examples, general subject guidelines). The teacher may be supported by audio-visual and computer aids. This includes hours devoted to exams.
- Small group computer-based classes: This includes classes in which the student uses the computer in a computer classroom (computer classes, use of packages for practical illustration of theory, programming practice). Computer-based assessment tests are also included.
- Small group tutorials: Activities of proposal and supervision of directed work, clarification of doubts about theory, problems, exercises, programs, readings or other proposed tasks, presentation, exposition, debate, or commentary of individual work or work carried out in small groups that do not need to be given in a computer classroom.
- Individual or group self-study.
- Writing exercises, conclusions, or other work.
- Programming/Experimentation or other computer work.

5.2 Teaching Methods::

- Theoretical academic sessions.
- Practical academic / computer sessions.
- Specialized tutorials.

5.3 Development and Justification:

During the course, a distinction is made between:

- Theoretical sessions. In these sessions, the theoretical concepts related to the subject will be explained, with the support of examples or practical cases.
- Practical sessions in the classroom. The contents covered in the theoretical sessions will be applied, with the participation/implication of the student being positively valued.
- Sessions in the computer classroom. The aim of these practical sessions is for the student to apply the techniques studied with the support of computer programs and to acquire skills related to data analysis. There will be ten computer sessions (2h each) covering different aspects of the subject. Computer hangout for each computer session will be at students' disposal.

Through the UHU e-learning platform, students will have access to information, material, and activities on the contents covered in the course.

The student's tasks (study, work, exercises, practices...) will be guided by the lecturer during the tutorial sessions. As for individual tutorials or in very small groups, students will be attended to deal with specific questions related to their homework or to try to solve any other difficulty of the student or group of students related to the subject.

6. Detailed Contents

6.1 THEORETICAL CONTENTS

Module 1: Descriptive Statistics of Datasets
Describing data by tables and graphs. Measures of Location (Central and Relative Position of Data), Dispersion and Shape. Box-Plot diagram.

Module 2: Introduction to Probability, Random Variables and Their Distribution.
Introduction to Probability, Univariate Random Variables (Discrete and Continuous) and Distribution Functions. Some Special Univariate Discrete and Continuous Distributions. The Central Limit Theorem and approximation between distributions. Sampling distributions of sample means.

Module 3: Estimation and Inferential Statistics
Point estimation. Confidence interval. Introduction to parametric Hypothesis testing. Relation between Confidence interval and Hypothesis testing.

Module 4: Computer Sessions (Excel + Rcmdr)
Application of contents using real data. Parametric and non-parametric univariate and bivariate Hypothesis testing. Regression analysis. Relationships Between Two Categorical Variables. Introduction to Multivariate Analysis.

7. Bibliography

7.1 Basic Bibliography:

- *Basic Statistics: Understanding Conventional Methods and Modern Insights*, by Wilcox, Rand R.. Oxford University Press USA - OSO, 2009. ProQuest Ebook Central, http://0-ebookcentral.proquest.com.columbus.uhu.es/lib/bibuhuelibebooks/detail.action?docID=453655.

- *The Art of Data Analysis: How to Answer Almost Any Question Using Basic Statistics*, by Kristin H., John Wiley & Sons, Incorporated, 2013. ProQuest Ebook
Central, http://0-ebookcentral.proquest.com.columbus.uhu.es/lib/bibuhuelibebooks/detail.action?docID=1175199.

- *Statistics: the art and science of learning from data*, by Alan Agresti, Christine A. Franklin, 2nd ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2007.

7.2 Additional Bibliography:

Other references of interest:
Students can find in the Moodle site for this course many links to documents and other material of interest for the different topics treated.

8. Systems and Assessment Criteria

8.1 System for Assessment:

- **Continuous assessment.**
- **Final exam**

FINAL GRADE OF THE SUBJECT:
Final results will be given in terms of a numerical scale between 0 and 10 (including tenths), with the corresponding qualitative ratings below:
• ≤4.9: Fail (D)
• 5.0 - 6.9: Pass (C)
• 7.0 - 8.9: Pass with Merit (B)
• 9.0 - 10: Distinction (A)

The total number of distinctions cannot exceed 5% of the students enrolled in the subject in the academic year (unless the number of students enrolled in lower than 20, in which case one distinction can be awarded).

The grading system is subject to the Bachelor's Degree Exam Regulations at the University of Huelva:
http://www.uhu.es/sec.general/Normativa/Textos_Pagina_Normativa/Normativa_2019/Rgto_evaluacion_grado_mofs_ccgg_19_03_13.pdf

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

Continuous assessment + Final exam:
30% Computer sessions + 10% problem assignments and online questionnaires + 60% final exam.

- Activities in the classroom and online questionnaires. They weigh 10% on the overall rating. No minimum grade is required. Attendance at classes will also be taken into account in this section.
- Once completed the contents of units 1 and 2, there will be a voluntary activity of exercises corresponding to Descriptive Statistics. The mark for overcoming it is 5 points. (weight of 24% on the final rating).
- The contents of units 3 and 4 will also be assessed with partial tests in the same way as the part of the descriptive statistics (36% of the final grade).
- Evaluation of the computer practices (weight of 30% on the final rating): There are two activities (one with Excel and the second with Rcmdr) applying the techniques studied on a set of real data. These activities are graded on a scale from 0 to 10 points. The practical part can be overcome provided that the qualification obtained in each one of the activities is equal to or greater than 5 points.

Students who do not pass any of the proposed tests must take the final exam of the corresponding unit. They must obtain a minimum score of 5/10 in the exam to pass it.

ANEXO I

8.2.2 Examinations Convocatory II

1. The grade obtained in the classroom activities and online questionnaires is maintained (10% of the overall grade).
2. Evaluation of the theoretical content-exercises. If they have passed it in June, their grade will be maintained and they will not have to take this part in exam II. Those who do not pass in June will have to take the final exam of the total content of the course, solving practical questions and exercises on the application of the statistical methods studied. It will represent 60% of the grade of the course. To pass the exam, the grade must be equal to or higher than 5 points.
3. Evaluation of computer practices (weight of 30% of the final grade): The June grade will be maintained if the practices have been passed. Students who have not passed the practical part in June will take an exam in the computer room where they will have to solve exercises using Excel and/or Rcmdr. The practical part can be considered passed as long as the grade obtained in the exam is equal to or higher than 5 points.

8.2.3 Examinations Convocatory III

The student will be assessed according to the criteria established for the single final assessment (section 8.3).

8.2.4 Extraordinary Convocatory

The student will be assessed according to the criteria established for the single final assessment (section 8.3).

8.3 Single Final Evaluation:

- Evaluation of the theoretical content-exercises part (70% of the final rating). It consists of an exam of three or four exercises (60% of the final rating) and a questionnaire (10% of the final rating). Students are required to obtain a minimum score of 5 points in the exam to pass this part.

- Students must perform an activity in the computer room with Excel and Rcmdr, applying the statistical techniques studied, on the same date as the final exam of the subject. The practical part can be overcome provided that the qualification obtained is, at least, 5 points. (30% of the final rating).