



Teaching Guide

Identifying Data					2022/23
Subject (*)	Statistics	Code	610G02005		
Study programme	Grao en Bioloxía				
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	Jacome Pumar, Maria Amalia	E-mail	maria.amalia.jacome@udc.es		
Lecturers	Jacome Pumar, Maria Amalia López Cheda, Ana Piñeiro Lamas, Beatriz	E-mail	maria.amalia.jacome@udc.es ana.lopez.cheda@udc.es b.pineiro.lamas@udc.es		
Web					
General description	This subject provides a first contact with the statistical techniques: statistical modelling, statistical tools to analyze data, and methods for the critical diagnosis and interpretation of the results in terms of the considered problem.				

Study programme competences / results

Code	Study programme competences / results
A21	Deseñar modelos de procesos biolóxicos.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A30	Manexar adecuadamente instrumentación científica.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B6	Organizar e planificar o traballo.
B10	Exercer a crítica científica.

Learning outcomes

Learning outcomes	Study programme competences / results		
To design experiments, to get information and to explain the results	A21 A26 A30	B2 B3 B10	
To apply an inquisitive, logical and creative reasoning to solving problems effectively.		B2 B3 B6	

Contents

Topic	Sub-topic
Probability Theory	Basic concepts on probability theory Random variables Basic probability distributions in Biology
Descriptive Statistics	Describing univariate data Describing bivariate data



Statistical Inference	Introduction Point estimation Interval estimation Parametric hypothesis testing of one and several samples Nonparametric hypothesis testing of one and several samples
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Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Short answer questions	A21 B2 B3 B6	2	0	2
ICT practicals	A26 A30 B2 B3 B6 B10	13	26	39
Problem solving	A21 B2 B3 B6 B10	8	19.2	27.2
Guest lecture / keynote speech	A21 A26 B2 B3 B10	24	50.4	74.4
Supervised projects	A26	0.5	1.9	2.4
Objective test	A26 A30 B2 B3 B10	3	0	3
Personalized attention		2	0	2

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Short answer questions	Short answer and/or test questions with the aim of controlling the progress in the PROBABILITY contents block.
ICT practicals	Practicals in the computer lab to introduce a statistical software helpful to solve problems.
Problem solving	Seminars in small groups for the explanation and discussion of problems from the different contents blocks.
Guest lecture / keynote speech	Face to face keynote speeches, where the lecturer will show the fundamental parts of the theoretical program, suitably illustrated with practical examples.
Supervised projects	Practical project of analysis of a real data set with statistical software
Objective test	Final exam, with short answer questions and/or reasoned solution of practical problems, of the DESCRIPTIVE STATISTICS and STATISTICAL INFERENCE theoretical and practical content blocks.

Personalized attention	
Methodologies	Description
ICT practicals	<p>Optionally, some academic work consisting on the solution of a practical problem using the statistical software introduced in the ICT practicals, could be carried out.</p> <p>There will be personalized advice sessions during the development of the practical works. These sessions will take place by means of the interaction teacher/students at the moment of solving the different activities suggested in class: solving doubts, correcting mistakes, suggesting proper approaches to deal with the proposed problems and reviewing initial versions of the works. In addition, students will have the opportunity of receiving personalized advice face-to-face. Personalized advice may be also received via online, by means of e-mail, virtual platform,...</p> <p>Part-time students may also perform these works and submit them to the teachers for their assessment. Part-time students can also receive personalized assistance using both face-to-face and virtual approaches.</p>

Assessment			
Methodologies	Competencies / Results	Description	Qualification



Short answer questions	A21 B2 B3 B6	Achievement test to assess the progress in the PROB and ED-INF blocks.	10
Objective test	A26 A30 B2 B3 B10	Final test to assess the knowledge in the PROB block and DS-INF blocks.	70
Supervised projects	A26	Practical project in groups to analyze real data set with statistical software	20

Assessment comments

The subject is split in two blocks: 1- Probability Theory (PROB) and 2-Descriptive Statistics-Statistical Inference (DS-INF). Each block will be assessed independently, so that passing one block will not affect the grade of the other. The score of block PROB is 45% (40% the objective test + 5% short answer questions), and the score of block DS-INF is 55% (supervised project 20% + objective test 30% + short answer questions 5%).

To pass the whole subject, it will be strictly necessary to pass each block separately. Otherwise, the final score will be 4.5 at most:

(a) PROBABILITY: to pass this block the final score (objective test + short answer questions) must be 4.5 out of 10 at least. Besides, the score of the objective test must be 4 out of 10 at least.

(a) ED-INF: to pass this block the final score (objective test + short answer questions + supervised projects) must be 4.5 out of 10 at least. Besides, the score of the objective test must be 4 out of 10 at least.

During the course, one exemption exam for the PROB block might be performed, so that the student who passes the PROB block with this exemption exam, will have the corresponding block passed regarding the May/July final calls.

To get the grade/mark NP (No grade reported, absent) in the first call (May), the student should not have attended any exemption exams nor the official test, nor submitted any supervised project. To get the grade/mark NP in the second call (July), the student should not attend any final exam.

The attendance to the seminars, practical sessions, personalized attention, etc. and involvement along with the performance in the self-evaluation test (not evaluable) might be additionally scored with one extra point at most to be added to the final mark.

For the second chance in July, the criterion to pass the subject will be the same as in the first call in June.

All previous observations are applicable to part-time students and/or with academic exemption.

Fraud

in tests or evaluation activities will

directly involve the implementation of the current rules in the Assessment, review and complaint regulation of the UDC and the Student Statute of the UDC

Sources of information

Basic	<p>? ARRIAZA GÓMEZ, A.J. (2008) Estadística básica con R y R-Commander. Servicio PublicacionesUCA. Disponible en http://sestio.uca.es/repos/ebrcmdr/pdf/13marzo/ebrcmdr.pdf? BEHAR GUTIÉRREZ, R. y GRIMA CINTAS, P. (2010). 55 respuestas a dudas típicas de estadística. 2a Ed. Díaz de Santos, Madrid.? CAMPOS ARANDA, M. (2011). Más de 777 preguntas de Bioestadística y sus respuestas. Murcia, DM.? CAO ABAD, R. y otros (2001). Introducción a la estadística y sus aplicaciones. Ed. Pirámide. ? DE LA HORRA NAVARRO, J. (2001). Estadística Aplicada. 2ª Edición. Díaz de Santos.? GONICK, L. Y SMITH, W. (2001). A estatística ¡en caricaturas! SGAPEIO.? MARTÍN, A. A. Y LUNA, J. C. (1999). Bioestadística para las Ciencias de la Salud. 4ª Edición revisada. Ediciones Norma.? MILTON, J. S. (2001). Estadística para Biología y Ciencias de la Salud.3ª edición. McGraw-Hill.? RIUS DÍAZ, F. y otros. (1999). Bioestadística: Métodos y Aplicaciones. Universidad de Málaga.? RIUS DÍAZ, F. y BARÓN LÓPEZ, F.J. (2005). Bioestadística. Thomson.? SAMUELS, M. L.; WITMER, J.A. Y SCHAFFNER, A. (2012). Fundamentos de estadística para las ciencias de la vida. 4ª edición. Pearson España? TOMEIO PERUCHA V. y UÑA JUÁREZ I. (2003). Lecciones de Estadística Descriptiva. Paraninfo.</p>
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Complementary	<p>? BARÓ LLINAS, J. (1988). Estadística Descriptiva, Cálculo de probabilidades e Inferencia estadística (tres volúmenes). Ed. Parramón. ? CANAVOS, G.C. (1989). Probabilidad y Estadística. Aplicaciones y métodos. MacGraw-Hill. ? CUADRAS, C.M. y otros (1989). Ejercicios de Bioestadística. Editorial Universitaria de Barcelona. ? HERNÁNDEZ, V. RAMOS, E. y YÁNEZ, I. (1995). Estadística I. ITIS. UNED. ? DANIEL, W. W. (1991). Biostatistics. A Foundation for Analysis in the Health Sciences. J. Wiley. ? FISHER, L.D. Y VAN BELL, G. (1993). Biostatistics. A Methodology for the Health Sciences. John Wiley & Sons. ? JOHNSON, R. A. Y BAHTTACHARIYA, G. K. (1992). Statistical Principles and Methods. J. Wiley. ? MANN, P. S. (1995). Introductory Statistics. J. Wiley & Sons, INC. ? NAVIDI, W. (2006). Estadística para ingenieros y científicos. 1ª Edición, Mc Graw-Hill. ? PAGANO, M. Y GAUVREAU, K. (2001). Fundamentos de Bioestadística. 2ª Edición. Math Learning. ? PEÑA SÁNCHEZ DE RIVERA, D. (1991). Estadística. Modelos y Métodos, 1. Fundamentos. Alianza Universidad. ? QUESADA, V., ISIDORO, A. Y LÓPEZ, L. J. (1984). Curso y Ejercicios de Estadística. Alhambra Universidad. ? ROSNER, B. (1990). Fundamentals of Biostatistics. PWS-KENT Publishing Company. ? SOKAL, R.R. Y ROHLF, F.J. (1995). Biometry. The Principles and Practice of Statistics in Biological Research. 3ª Edición. W. H. Freeman and Company. ? VIEDMA, J. A. (1976). Bioestadística (Métodos Estadísticos Aplicados a la Biología y Medicina). Ed. del autor. ? ZAR, J.H. (1996). Biostatistical Analysis. Prentice Hall International Editions. RECURSOS WEB ? BARÓN LÓPEZ, F.J. Bioestadística. https://www.bioestadistica.uma.es/baron/apuntes/clase/apuntes/pdf/bioestadistica-libro.pdf? SÁEZ CASTILLO, A.J. (2010). Métodos estadísticos con R y R Commander. https://cran.r-project.org/doc/contrib/Saez-Castillo-RRCmdrv21.pdf? SEEFELD, K. Y LINDER, E. (2007). Statistics Using R with Biological Examples. https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf BLOGS Y REPOSITARIOS ? https://365datascience.com/explainer-videos/#statistics Vídeos de curta duración que explican de forma intuitiva e gráfica conceptos básicos de Estadística Descriptiva, Cálculo de Probabilidades e Inferencia. Aínda que están en inglés, baixo o vídeo podes ler exactamente o texto do audio. ? https://estadisticaorquestainstrumento.wordpress.com/Curso-de-Estadística, escrito nunha linguaxe sinxela e clara, por Jaume Llopis Pérez. ? https://www.cienciasinseso.com/estadistica/Os contidos versan sobre temas metodolóxicos estadísticos xerais, e están dirixidos a persoal biosanitario e científico en xeral, dunha forma amena e asequible a persoas non especializadas nestes temas. ? https://www.fisterra.com/formacion/metodologia-investigacion/Fisterra é un repositorio, produto de Elsevier, que proporciona aos profesionais relacionados coas ciencias da saúde un acceso doado e rápido á información máis rigurosa e de actualización constante. BASES DE DATOS ? https://vincentarelbundock.github.io/Rdatasets/datasets.html Bases de datos dispoñibles en paquetes de R. Indícase o nome do paquete, o nome do arquivo de datos, número de observacións e tipo de variables. Permite a descarga directa en formato CSV e doc. ? https://stats.idre.ucla.edu/other/dae/Bases de datos clasificadas polas diferentes técnicas estadísticas para as que serviron de exemplo. ? http://www.statsci.org/data/first.html Ofrece exemplos con datos reais das técnicas estadísticas máis básicas.</p>
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Recommendations

Subjects that it is recommended to have taken before

Mathematics/610G02003

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Data Analysis in Biology/610G02044

Other comments

Highly recommended: 1- Attendance and participation in the keynote sessions, practicals and seminars. 2- To solve every explained exercise, both with and without the statistical software. 3- To supplement the course material with the sources of information. 4- To study the course material and to solve the proposed problems frequently. 5- Active involvement in the practicals and seminars. 6- To become familiar with the statistical software by using it constantly and regularly.

7- To try to use the statistical techniques in other different subjects. 8- Attendance to and taking advantage of the personalized attention sessions.



(*)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.