Teaching Guide					
Identifying Data					2018/19
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	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Matemáticas				
Coordinador	Jacome Pumar, Maria Amalia		E-mail	maria.amalia.jacome@udc.es	
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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 have a questioning, logical and creative thinking to solve 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

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	52.8	76.8
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 keys of the theoretical program, illustrated suitably with practical examples.
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 contents.

Personalized attention	
Methodologies	Description
ICT practicals	Optionally, some academic work consisting of the solution of a practical problem using the statistical software introduced in the ICT practicals, could be requested. 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 in the office of the teachers. Personalize advice may be also received via online, by means of e-mail, virtual platform,... Part-time students may also perform these works and provide them to the teachers for their assessment. Part-time students can also receive personalized assistance using both face-to-face and virtual approaches.

Assessment

Methodologies	Competencies / Results	Description	Qualification
Short answer questions	A21 B2 B3 B6	Achievement test to assess the knowledge in the PROBABILITY THEORY block.	40
Objective test	A26 A30 B2 B3 B10	Achievement test to assess the knowledge in the DESCRIPTIVE STATISTICS and STATISTICAL INFERENCE block.	60

Assessment comments
The subject is split into two blocks: 1- Probability Theory and 2-Descriptive Statistics-Statistical Inference. Each block will be assessed independently, so that passing one block will not affect the grade or mark of the other block. To pass the whole subject, it will be strictly necessary to pass each block separately. During the course, two exemption exams might be performed, each for any of the two blocks, so that the student who passes any of the exemption exams, will have the corresponding block passed regarding the may/july final exams. The PROBABILITY THEORY block represents the 40% qualification, and the DESCRIPTIVE STATISTICS and STATISTICAL INFERENCE block the remaining 60%. To get the grade/mark NP (No grade reported, absent) in may, the student should not have attended any exemption exams nor the official test. To get the grade/mark NP in july, the student will not be able to attend the final exam in july. The attendance and participation of the seminars, practicals, personalized attention, etc. is not compulsory but additionally could be valued with a maximum of one point over the final mark. All previous observations are applicable to part-time students.

Sources of information	
Basic	? 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.? SAMUELS, M. L.; WITMER, J.A. Y SCHAFFNER, A. (2012). Fundamentos de estadística para las ciencias de la vida. 4ª edición. Pearson España? TOMEO PERUCHA V. y UÑA JUÁREZ I. (2003). Lecciones de Estadística Descriptiva. Paraninfo.? RIUS DÍAZ, F. y BARÓN LÓPEZ, F.J. (2005). Bioestadística. Thomson.

Complementary	? 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 Principes 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? Interesante texto electrónico que contén exercicios de autoevaluación. Annette Dobson et altri. University of Newcastle, Australia. http://www.anu.edu.au/nceph/surfstat/surfstat-home/surfstat.html ? Permite traballar con conceptos coma o histograma, diagrama de caixas, etc. distinguindo entre variables discretas e continuas. Calcula intervalos de confianza para a media, a varianza, e contrastes paramétricos e non paramétricos dunha mostra e de dúas. Ademais visualiza os erros tipo I e II en función dos parámetros das distribucions normais na hipóteses nula e alternativa. https://lstat.kuleuven.be/newjava/vestac/ ? Versión html do libro Bioestadística, escrito por F. Rius y F.J. Barón e editado pola editorial Thomson. http://www.bioestadistica.uma.es/libro/

Recommendations
Subjects that it is recommended to have taken before
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 speeches, 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 get familiar with the statistical software using it constantly and regularly. 7- To try to use the statistical techniques in other different subjects.8- Usage and exploitation of the personalized attention sessions.