UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2021/22
Subject (*)	Statistics		Code	730G05012
Study programme	Grao en Enxeñaría Naval e Oceánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalician			
Teaching method	Hybrid			
Prerequisites				
Department	Matemáticas			
Coordinador	Naya Fernandez, Salvador	E-mail	salvador.naya@udc.es	
Lecturers	Cartelle Barros, Juan José Naya Fernandez, Salvador Tarrio Saavedra, Javier	E-mail	juan.cartelle1@udc.es salvador.naya@udc.es javier.tarrio@udc.es	
Web				
General description	This subject introduces the basic concepts of statistical data analysis, from the exploratory analysis (including the main graphic techniques) to statistical inference, through the introduction to probability, the concept of random variable and the fundamental tools of statistical quality control, focusing the teaching to the resolution of practical problems in oceanic, naval and maritime engineering.			
Contingency plan	1. Modifications in the contents: There are no modifications to the contents. 2. Methodologies: Teaching methodologies maintained: - Practices through ICT. - Problem solving. - Mixed test. Teaching methodologies that are modified: 3. Mechanisms of personalized attention to students: Tools: Moodle, Microsoft Teams and e-mail. * Timing: Teams will be used as a support to carry out the theoretical and practical classes, as well as a means to carry out the tutorials. Moodle will be used for the publication of contents and notices, and for the evaluation of the students (continuous evaluation and exam). The e-mail will be used to solve doubts and for the exchange of files and information. 4. Modifications in the evaluation: All methodologies and their weighting in the overall grade will be maintained: problem solving (10%), consisting of the delivery of exercises; practices through ICT (30% on the overall grade), defined by the presentation of works proposed by teachers with the free statistical software R; and the mixed test (60%), consisting of a multiple-choice exam of about 15 and 20 questions, both practical and theoretical, about the contents of the subject (to be performed in a non-presential way in the synchronous mode). Evaluation observations: The weight that each methodology has in the final evaluation will not be modified. The grade of the test exam will be of a maximum of 6 points, while the continuous evaluation will be composed of the grade corresponding to the optional delivery of works related to the practices carried out with the statistical software R (maximum 3 points) and the grade corresponding to the delivery of exercises (maximum 1 point). 5. Modifications of the bibliography or webgraphy:			

Study programme competences	
Code	Study programme competences

A1	Skill for the resolution of the mathematical problems that can be formulated in the engineering. Aptitude for applying the knowledge on: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and in partial derivatives; numerical methods; algorithmic numerical; statistics and optimization
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that include a reflection on relevant subjects of social, scientific or ethical kind
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.
C7	Capacidade de traballar nun ámbito multilingüe e multidisciplinar.

Learning outcomes			
Learning outcomes	Study programme competences		
Acquire knowledge, skills and abilities for statistical analysis of data leading to the extraction of useful knowledge in the industry and in all fields related to naval and ocean engineering.	A1	B2 B3 B5	
Statistical modeling of complex systems and processes in all areas of marine and ocean engineering.	A1	B6	C1
Solve problems with data by applying different statistical techniques, in an effective and useful way for marine engineering.		B2	C1 C4 C7

Contents	
Topic	Sub-topic
The following topics develop the contents established in the tab of the Memoria de Verificación, which are:	Statistical data analysis. Probability calculation. Point estimation and confidence intervals. Hypothesis testing. Introduction to statistical quality control.
Description of a statistical variable.	General Concepts. Frequency distributions. Plots and data visualization. Measurements of position, variability and shape.
Description of several statistical variables.	Statistical vector. Linear regression. Correlation.
Probability.	General Concepts. Axiomatic definition of Kolmogorov. Assigning probabilities: Laplace rule.
Conditional probability.	Definition of conditional probability. Independence of events. Theorems of product, Bayes and law of total probability.
One-dimensional random variables.	Concept of one-dimensional random variable. Discrete and continuous random variables. Transformation of random variables. Typical measures of a random variable. Inequality of Tchebychev.
Probability distributions for discrete variables	Discrete random variables: discrete uniform distribution.Bernoulli distribution. Binomial distribution. Geometric distribution. Negative binomial distribution. Poisson distribution. hypergeometric distribution

Probability distributions for continuous variables	Probability distributions of continuous random variables: Normal distribution. The central limit theorem.Approximate (limit) relationships between probability distributions. Pearson's Chi-square distribution. Student's t-distribution. Fisher-Snedecor's F distribution. Other distributions.
Introduction to Statistical Inference.	General concepts. Sampling. Generation of random variables. Point estimation concept. The sampling distribution of a point estimator.
Point estimation.	Properties of the estimators. Methods of obtaining estimators. Point estimator of the mean. Point estimator of variance. Point estimator of a proportion.
Estimation of confidence intervals.	Confidence interval concept. Confidence intervals for the mean. Confidence interval for variance. Confidence interval for a proportion. Confidence intervals for the difference of two means. Confidence interval for the quotient of two variances. Confidence interval for the difference of two proportions.
Hypothesis tests	General concepts. Critical level (p-value) and significance level of a hypothesis test. Power of a test. General procedure for hypothesis testing. Tests for the mean. Test for variance. Test for a proportion. Tests for the difference of two means. Test for the ratio of two variances. Test for the difference of two proportions. Position Tests. Goodness of fit tests. Independence tests. Homogeneity tests.
Introduction to statistical quality control	Basic concepts. Six Sigma Methodology. Main statistical quality control tools.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 B2 B3 B5 C1	30	30	60
Problem solving	B5 B6 C1	20	20	40
ICT practicals	C1 C4 C7	10	35	45
Mixed objective/subjective test	A1	2.125	2.125	4.25
Personalized attention		0.75	0	0.75
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	The main contents of the subject will be explained with the help of suitable audiovisual means (laptop and video canon).
Problem solving	Problem-solving seminars will be held in intermediate-sized groups in order to establish the concepts presented in the master sessions and to provide knowledge of the methodologies for the practical resolution of statistical problems.
ICT practicals	Part of the practical classes will be carried out in a computer lab where, with the help of a statistical package (free software R), different practices will be developed using real or simulated data, previously provided to the students.
Mixed objective/subjective test	At the end of the couse, a test type exam composed of 15-20 questions (practical and theoretical concerning with the subject contents) will be done.

Personalized attention	
Methodologies	Description

Guest lecture / keynote speech	There will be lectures where the teacher will explain, with the help of appropriate audiovisual media, the main contents of the course. Debate will be encouraged among students and between students and teacher. In the case of students with academic dispensation, person-to-person and virtual tutorials (e-mail, videoconferences) will be available, which will allow the student to follow properly the subject. Contingency plan. In the case of having to change the presential methodology, due to the COVID-19 pandemic, all teaching methodologies will be maintained, changing only the mechanisms of personalized attention to students, which will consist of virtual classes and virtual tutorials with the use of Microsoft Teams and the Moodle platform.

Assessment			
Methodologies	Competencies	Description	Qualification
Problem solving	B5 B6 C1	Delivery of exercices.	10
ICT practicals	C1 C4 C7	Presentation of the works suggested by teachers with free statistical software R.	30
Mixed objective/subjective test	A1	Written exam consisting of between 15 and 20 questions, both practical and theoretical, based on the contents of the subject lessons.	60
Others			

Assessment comments
Evaluation at the first opportunityThe mark of the objective test will be weighted with the score corresponding to the optional delivery of works related to the practices carried out with statistical software R (maximum 3 points) and with the mark corresponding to the attendance at class (1 point), being necessary to obtain at least a score of 3.5 out of 10 in the objective test to be able to make this compensation. Evaluation at thesecond opportunity The evaluation will be done following the same procedure as at the first opportunity. The same assessment criteria will be applied in the advanced exam opportunity. In the case of students with recognition of part-time dedication and academic exemption from attendance that decide not to attend classes, will be evaluated in the two opportunities as the rest of the students who are in a similar situation.

Sources of information	
Basic	- Cao R., Franciso M, Naya S., Presedo M., Vázquez M., Vilar J.A. y Vilar J.M. (2001). Introducción a la Estadística y sus aplicaciones. Editorial Pirámide - Montgomery, D. C. & Runger, G. C. (2004). Probabilidad y Estadística aplicadas a la Ingeniería.. Editorial Limusa-Wiley - http://www.r-project.org/ (). .
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus
Other comments
To help to achieve a sustainable environment and meet the objective of action number 5: ?Healthy and sustainable environmental and social teaching and research? of the "Green Campus Ferrol Action Plan":1.- The delivery of the documentary works carried out in this subject:1.1. It will be requested in virtual format and/or computer support.1.2. It will be done through Moodle, in digital format without the need to print them.1.3. If done on paper:-Plastics will not be used.- Double-sided prints will be made.- Recycled paper will be used.- Draft printing will be avoided.2.- A sustainable use of resources and the prevention of negative impacts on the natural environment must be made.3.- The importance of ethical principles related to the values ??of sustainability in personal and professional behavior must be taken into account.4.- As it is included in the different regulations of application for university teaching, the gender perspective must be incorporated in this subject (non-sexist language will be used, bibliography of authors of both sexes will be used, intervention in student class will be encouraged and students...).5.- We will work to identify and modify prejudices and sexist attitudes, and the environment will be influenced to modify them and promote values ??of respect and equality.6. Situations of discrimination based on gender must be detected and actions and measures will be proposed to correct them.7. The full integration of students who, due to physical, sensorial, psychic or sociocultural reasons, experience difficulties in an ideal, egalitarian and profitable access to university life will be facilitated